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OPINION – Manpreet Sethi

Limited Use of Nuclear Weapons: Political and Military Implications

Among the many things nuclear that 2018 will be remembered for, the rather cavalier statements made by leaders in the US, Russia and North Korea on the utility of nuclear weapons certainly stand out. Indeed, the US Nuclear Posture Review released early in the year, brought low-yield nuclear weapons and their limited use back into the nuclear discourse, even if others like Russia and Pakistan had already been touting a nuclear strategy of ‘escalate to de-escalate’ for many years.

To go back a little in time though, it may be recalled that the idea of limited nuclear war had actually gained currency in the US in the late 1950s mostly as a counter to the doctrine of massive retaliation. It was propagated as an idea that could bring about an effective use of nuclear weapons as a rational instrument of policy by suggesting that means of deterrence be proportionate to the objectives at stake. Proponents of the concept of limited nuclear war argued that such an attack could limit the total amount of damage threatened, planned for and caused by choosing military targets such as missile sites, bomber bases or command and

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control centres instead of cities. Such an attack was meant to showcase only a sample of the destruction potential of the weapon in order to enable bargaining for an agreed termination of hostilities. In order to make such an attack possible, the focus accordingly shifted towards pursuit of counterforce capabilities of high precision and accuracy for more flexible strategic options for a ‘discriminate’ nuclear war.

However, the question that soon raised its head was whether it was at all possible to direct nuclear forces to execute a controlled nuclear response in a crisis. Many scholars pointed out that this would not only call for hugely sophisticated nuclear forces in

numbers, types of weapons, and planning and command and control capability, but also the adversary's willingness to play the game of limited nuclear war. On both counts, the situation was uncertain. There was never any guarantee that the USSR would play along with only limited strikes of its own.

In his book, *The Evolution of Nuclear Strategy*, Lawrence Freedman rightly described these as "battles of great confusion; the casualties would be high; troops would be left isolated and leaderless; and morale would be hard to maintain. It would be difficult to ensure uncontaminated supplies of food and water or even of spare parts. The Army found it extremely difficult to work out how to prepare soldiers for this sort of battle and to fight it with confidence." As this realisation emerged, the idea of limited nuclear war receded. By the 1980s, Presidents Reagan and Gorbachev had reached the understanding that nuclear wars could not be won, and must not be fought.

In contemporary times, as the idea of deterrence through a limited nuclear exchange resurfaces, the political and military implications once again need to be well understood. The belief that one could successfully conduct a 'limited' nuclear exchange, keep it limited, and somehow come back to business as usual is not only bizarre, but also has serious implications for military buildup. It will lead to a renewed focus on building more accurate counterforce weapons for precision targeting. Showcasing the feasibility of limited nuclear use will lead to a greater focus on the war-fighting aspects of nuclear weapons, and drive up tendencies for building arsenals with low-yield weapons and necessary counterforce delivery

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Another major impact could be a heightened possibility of nuclear terrorism by non-state actors, who might feel liberated from the pressure of the nuclear use taboo. In fact, a limited nuclear exchange is likely to bring about a sense of complacency in nuclear use that will be most harmful for international security.

systems. Vertical nuclear proliferation may, therefore, increase, leading further to greater chances of deterrence breakdown due to miscalculation and misunderstanding.

Even more importantly, the taboo against use of nuclear weapons will be seriously damaged. The conduct of a nuclear exchange and the successful ability of the parties involved to keep nuclear war limited could set a precedent that others could be tempted to follow. The idea that two countries can survive a limited nuclear exchange and resume 'near normal' relations could tempt others to acquire small arsenals to settle scores with adversaries. Nuclear proliferation could then be on the rise. Another major impact could be a heightened possibility of nuclear terrorism by non-state actors, who might feel liberated from the pressure of the nuclear use taboo. In fact, a limited nuclear exchange is likely to bring about a sense of complacency in nuclear use that will be most harmful for international security.

In the final analysis, it may be said that a limited nuclear exchange would be a human disaster of significant proportions. Even if the countries are big, and resilient enough to weather such a disaster, a general sense of acceptability of using nuclear weapons will not only make all nuclear weapon possessors reassess their nuclear force structures and postures towards greater offence, but also seriously vitiate the global security environment by setting into motion a cycle of negatives. So, while countries may survive a 'limited' nuclear exchange in the short to medium-term, the world may not be able to do so in the real long-term,

especially if others develop a tendency to follow this precedent.

Understanding these dangerous implications, India has developed its nuclear strategy based on deterrence by punishment. It does not believe in war-fighting with nuclear weapons and considers limited nuclear war an oxymoron. Its nuclear doctrine categorically establishes that retaliation in case of any use of nuclear weapons would be designed to cause unacceptable damage. The same thought was reiterated by Prime Minister Narendra Modi when he announced the first deterrent patrol of INS Arihant. As other nuclear-armed states once again explore old ideas of limited nuclear war, India must stay the course on its stated nuclear doctrine and try to send this message across through the platforms it is able to use. May 2019 bring greater nuclear sense across the world.

Source: www.ipcs.org, 26 December 2018.

OPINION – William Holland

Cold Start: India Seeks to Upset Pakistani Nuclear Dominance

Every other year India's Army Commanders Conference gathers to address the impact technology has on doctrine and organizational operations. This year marks significant achievement in the elimination of old distinctions of corps, division and brigades favouring an IBG that seeks to harmonize a previously archaic posture into dynamic fighting redundancies that render Pakistan's nuclear achievements in asymmetry vulnerable.

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Termed "Cold Start," operationalizing IBG is India's way of parlaying Pakistan's nuclear gamesmanship through proactive war. Examining the doctrinal development of India's army throughout its post-independence period reveals British-led concepts of Defense-in-depth that neatly fit within India's operational purview beginning with its first Prime Minister Jawaharlal Nehru through Congress party dominance. Both the Indo-Pakistani war of 1971 and the liberation of Bangladesh proved the necessity of fast-moving mechanized arms. By

envisaging deep mechanized thrusts into Pakistan, Indian Army leadership sought to punish Pakistan with strike-and-hold corps.

Islamabad answered with powerful nuclear asymmetries and jihadist proxies aimed at

permanently destabilizing Jammu and Kashmir in the hope of pinning down superior Indian infantry. "Cold Start" is India's response to operating in a contested nuclear environment.

Witnessing Pakistani insurgent terrorists hit the Indian Parliament in 2001, New Delhi ordered Operation Parakram – full-scale mobilization aimed at coercive diplomacy. It ended in failure. The mobilization effort was hampered by the inordinate operational time it took for India to mobilize and deploy from garrisons deep in the interior.

Army chief General Sundararajan Padmanabhan acknowledged an inability for strike-and-hold corps to move from positions of cold start to mobilization. Dr Walter Ladwig's analysis post-Parakram meant thinking in ways to "establish the capacity to launch a retaliatory conventional strike against Pakistan that would inflict significant harm on the Pakistan Army before the international community could intercede, and at the same time, pursue narrow enough aims to deny Islamabad a justification to escalate the clash to the nuclear level."

Rapid mobilization and the fielding of mass firepower meant rethinking existing force

structures. “Cold Start” doctrine is meant to address two distinct challenges from Pakistan. It seeks to deny Islamabad a superior tactical achievement of mobilization while launching long, shallow thrusts into Punjab and throughout the Line of Control. India’s strategic thought is to capture and hold territory it can gainfully use in post-conflict negotiations. The deployed gamesmanship is really between two irreconcilable characterizations of nuclear conflict. Pakistan’s full spectrum deterrence doctrine calls for flexible response to India’s prolonged conventional war aims of IBG that seek to march through Pakistan in open defiance of Islamabad’s jihadist proxies.

Both are deadly configurations, but only one is credible. Full spectrum nuclear deterrence is hampered by political, economic and strategic components that currently are not favourable to Pakistan. India’s forbearance and welcomed regional soft power are positive political variables that would favour New Delhi in a prolonged conflict.

From an operational perspective, India would need to field fixed-wing close air support for Cold Start to be credible. It also needs to address its historically low operational readiness rate that hampered previous entanglements with Pakistan.

India’s ability to sustain thrusts into Pakistan would mean it must address its extremely limited availability of self-propelled artillery while acquiring currently non-existent dedicated satellite bandwidth for net-centric operations. All of these operational achievements remain dependent on India’s weak logistical support system. Getting India’s political class up to par on providing its armed-forces leadership with credible threat deterrence may prove more difficult than actually fighting Pakistan.

Source: <http://www.atimes.com>, 26 November 2018.

OPINION – Usha Sahay

What did We Learn about Nuclear Weapons, Deterrence, and Arms Control in 2018?

After President Donald Trump’s infamous threat to North Korea last summer, I suppose we should consider ourselves lucky that the only “fire and fury” we got in 2018 was a tell-all book. Indeed, while 2017 gave journalists, analysts, and policymakers ample reason to worry about a volatile president with singular authority to launch a nuclear attack, in 2018 those fears abated (somewhat). Headlines this year were perhaps less nerve-wracking, but 2018 still offered many opportunities to re-examine long-held assumptions about nuclear use and nuclear stability. On War on the Rocks this year, we hosted lively, still-unresolved debates on the role of nuclear weapons —

particularly lower-yield weapons — in U.S. and Russian strategy during an era of renewed near-peer competition. We also saw a consensus begin to emerge about the need to update the longstanding framework of agreements, norms, and procedures that has been built around the world’s nuclear arsenals over the past seven decades.

The Trump administration kicked off the year with its Nuclear Posture Review, which focused our attention on great power competition with Russia and China and opened a big debate about a little nuke. The fundamental question: Do lower-yield, more “usable” nuclear weapons make nuclear conflict more or less likely? We saw some lively disagreements about the “discrimination problem” of low-yield weapons and Russia’s much-litigated escalate-to-de-escalate doctrine. The latter was particularly relevant, as the Nuclear Posture Review cited the doctrine as a justification for building America’s own lower-yield weapons, but skepticism soon emerged in these pages about whether this was indeed Russia’s doctrine — and

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about whether the escalate-to-de-escalate terminology was all that useful. Ultimately, as Olya Oliker and Andrei Baklitskiy suggested in their article, the lesson may be less about Russian practice than about the dangers of any nuclear power pursuing “usability.”

Commentary on the Nuclear Posture Review was plentiful and excellent, but Frank Gavin’s insightful introduction to a Texas National Security Review roundtable counseled humility in our analysis of the document, given the longstanding gap between rhetoric and reality in U.S. declaratory nuclear policy and the difficulty of measuring the effects of U.S. actions in this realm. And the conversations sparked by the Nuclear Posture Review aren’t new. As Joshua Rovner took stock of the discussion in March, he reminded us that this debate is in some ways an iteration of a broader, more enduring one about the nuclear revolution: Did nuclear weapons fundamentally change statecraft, as many academics argue, or are they normal weapons of warfighting, as many leaders have treated them?

Moreover, as Janne Nolan wrote nearly three decades ago and reiterated in her roundtable entry with Brian Radzinsky, policymakers have long searched in vain for more limited, flexible, and credible nuclear options. A year later, much about American and Russian nuclear warfighting doctrine and thought remains unresolved, suggesting Rovner and Nolan are right that this is a bigger, intractable debate and vindicating Gavin’s thesis that we know less about nuclear strategy and history than we think.

If the debate about low-yield weapons and U.S. nuclear posture offered an opportunity to apply some enduring Cold War precepts to a new strategic landscape, experts found themselves in

comparatively uncharted waters when it came to arms control. This year (2018), writers in *War on the Rocks* and elsewhere observed a marked shift away from the traditional model of arms control, which emphasizes bilateral agreements focusing on quantitative limits on strategic systems. This shift was a product both of the Trump administration’s apparent antipathy to arms control agreements and of a changing strategic situation that has made some aspects of the conventional model less relevant. In an excellent

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historical essay in March, Austin Long argued that it would be impossible to revive treaty-based U.S.-Russian arms control without addressing Moscow’s long-abiding hang-ups about American missile defenses. Alexandra Bell and Andrew Futter were more sanguine, arguing that there is opportunity in the supposed “death” of the old way of doing arms control. Their article advocated for new

approaches that take emerging technologies into account and integrate new experts who may be less steeped in the Cold War model. Emerging technology and arms control created a fruitful nexus indeed, with several *War on the Rocks* authors examining how cyber and information warfare and high-precision weapons could be used against the U.S. nuclear arsenal.

Moving beyond the traditional bilateral arms control architecture also involves acknowledging the relevance of new nuclear powers. In an article that framed much of the discussion about the U.S. withdrawal from the INF Treaty, Eric Sayers explained that the INF discussion had to consider not just the European theater but the increasingly important Indo-Pacific one as well. Shortly after the announcement of the withdrawal, writing in the Texas National Security Review, Scott Cuomo outlined a comprehensive post-INF approach for the U.S. military in the Western Pacific.

Nuclear stability vis-a-vis near-peer adversaries was a major theme this year thanks in large part to Trump administration strategy documents. At the same time, authors in our electronic pages continued to analyze two longstanding nuclear proliferation challenges — North Korea and Iran. ... On Iran, paradoxically, the main takeaway this year seems to be that America's myopic policy has stopped treating this like a nuclear problem. Increasingly, U.S. "nonproliferation" efforts in Iran are thinly disguised regime change policy (or simply an anti-Obama political football).

Finally, it's worth noting that while the world did go another year without a nuclear attack, another weapon of mass destruction was repeatedly used this year with seemingly little consequence — though we may justifiably question the wisdom of placing chemical and biological weapons in the catch-all "WMD" category rather than treating them as another weapon of war. Several authors highlighted the importance — and difficulty — of robust multilateral action to hold perpetrators of chemical attacks accountable. And Al Mauroni was trenchant, as always, on how the U.S. government should organize to deal appropriately with WMD terror threats.

Editing War on the Rocks is always refreshing in that it offers an opportunity to step back from a frenetic national security news cycle and think more deliberately about what's changed, what hasn't, what matters, and what doesn't. This is especially true of nuclear issues. Given the high stakes of today's nuclear developments, it is easy, tempting, and — frequently — justified to react with hand-wringing and alarmist headlines. But the high stakes also make it especially important

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to be critical and exacting about the historical assumptions, the analytical categories, and the terms themselves that we use in our discussions. As an eventful year in the nuclear policy space comes to a close, I'm grateful to War on the Rocks writers for the opportunity to work together on improving our collective understanding of this most terrible weapon.

Source: <https://warontherocks.com>, 26 December 2018.

OPINION – Charlie Gao

Introducing Russia's Ultimate Weapon: A Nuclear Bomb 'Cannon'?

The Soviets developed the 2A3 as a response to American nuclear artillery. Unfortunately, as its development dragged on the entire concept became obsolete. In the 1950s, both NATO and Warsaw Pact doctrine focused on the employment of tactical nuclear weapons. Truly strategic nuclear weapons and the doctrine of MAD were at their infancy at the time, so nuclear weapons were seen as a tactical as well as a strategic tool.

As a result, both the United States and the Soviet Union developed a multitude of battlefield nukes, from the tiny Davy Crockett nuclear recoilless rifle to the M65 Atomic Cannon. The Soviet Union responded in kind, beginning the development of their own massive atomic

howitzers and even mortars.

The largest of these pieces was the massive 406mm Soviet 2A3 "Kondensator." But in the end, this piece was a failure. It was mechanically complex and obsolete by the time it was adopted.

Why did the Soviet Union produce these massive white elephants? Can anything be learned from

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the folly of the 2A3? Why the calibre was so huge compared to American guns? The story of the 2A3 begins in 1954. The United States had rolled out the 280mm M65 atomic cannon just a year before, and the Soviets needed to catch up. Their response came in two forms, the 406mm howitzer (2A3/Object 271) and a 420mm mortar (2B1/Object 273).

The initiative to develop these two weapons was approved by the Council of Ministers in April 1955. The first ballistic test barrel was completed later that year, and in December 1956 the first prototype was created by mating the gun with the chassis. The design was paraded on Red Square in 1957.

The chassis for the 2A3 was derived from the T-10 heavy tank with additional hydraulic shock absorbers to absorb the massive recoil force of the 406mm projectile. Despite these measures, the 2A3 would travel a few meters back with every shot, and inevitably something would break and minor repairs would have to be conducted.

Aiming the gun was largely achieved by rotating the chassis, although small precision adjustments could be made with a limited electric traverse mechanism. The reason for the massive calibre of the cannon was simple: Soviet engineers at the time weren't sure if they could construct compact nuclear ammunition, so a large calibre was specified to make the design of the nuclear projectile easier. The final projectile design weighed 570kg and could be launched out to a range of around twenty-five kilometres, just a few less than the M65 Atomic Cannon and far less than modern conventional artillery. The whole vehicle weighed around sixty-five tons.

As a result of this massive weight, the 2A3 was incredibly slow and faced significant mobility challenges; it couldn't travel across most bridges and its massive size meant that it couldn't really

travel through cities or even under some low hanging power lines.

production of the 2A3 was cut off after only four units were produced in favour of newer nuclear rocket such as the Luna (FROG-7). These missile systems were far more mobile and compact relative to the massive 2A3 and had almost tripled the range at seventy kilometres. The Soviets developed the 2A3 was a response to American nuclear artillery. Unfortunately, as its development dragged on the entire concept became obsolete.

The range was also found to be lacking relative to nuclear rockets or modern tactical missiles. As a result, production of the 2A3 was cut off after only four units were produced in favour of newer nuclear rocket such as the Luna (FROG-7). These missile systems were far more mobile and compact relative to the massive 2A3 and had almost tripled the range at seventy kilometres.

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Perhaps what can be learned is that in making "big" guns and rockets, it's always best to keep an eye on upcoming technologies that could fundamentally alter the battlefield such guns might fight on. The Soviets would continue developing tactical nukes for use in artillery, but later shells utilized miniaturized warheads that allowed nukes to fit in compact projectiles in the Soviet-standard 152mm and 203mm calibres. Likewise, the United States also made nuclear shells in the 155mm and 203mm calibres after abandoning the 260mm M65 cannon.

Source: <https://nationalinterest.org>, 23 December 2018.

OPINION – World Nuclear News

The Logic of Nuclear Power for Central Asia

Many observers were surprised this year when Uzbekistan announced its decision to build a nuclear power station, which will be the first in Central Asia in the last 30 years, writes Jurabek Mirzakhmudov, director general of UzAtom, the state nuclear agency which was established in July.

Why, we were asked, would a leading gas producer opt to go nuclear when we could easily increase

our gas-fired electricity production? We are doing so largely because of growth. Uzbekistan, Central Asia's most populous nation, has one of the fastest growing economies in the world. The World Bank is forecasting GDP growth of about 5% this year and next, and 5.5% in 2020. Current projections indicate that, to match these trends and consumer demand, we will need to double electricity output by 2030.

We could of course do this by burning our ample supplies of natural gas, but we have chosen a different course. Our parliament recently ratified the Paris Agreement on Climate Change, having signed the accord in April last year. We are committed to dramatically reducing our consumption of natural gas for power generation to free it for other higher-value purposes, including in particular the petrochemicals industry.

We have chosen to build a Russian-designed third-generation VVER two-unit NPP with a capacity of 2.4 GW. We anticipate this plant will generate approximately 15% of Uzbekistan's power needs by 2030. This will free up an estimated 3.5 billion cubic meters of gas annually.

We now plan to make our transmission systems more efficient, to renovate our existing gas-fired and hydroelectrical facilities, and to build new ones, and to adopt renewable energy sources such as solar. But as part of the strategic energy plan supported by President Mirziyoyev, we believe it to be a mistake to keep converting gas to electricity just because current gas prices are low. Instead, we have chosen to build a Russian-designed third-generation VVER two-unit NPP with a capacity of 2.4 GW. We anticipate this plant will generate approximately 15% of Uzbekistan's power needs by 2030. This will free up an estimated 3.5 billion cubic meters of gas annually — more than half a billion dollars at current price levels.

Today, nuclear power is one of the most reliable and environmentally safe types of energy available. In the multiple agreements being prepared in association with this massive project, we anticipate the highest environmental and safety standards. Moreover, Rosatom, our partner in the project, is currently developing a fourth

generation technology enabling reuse of reactor waste, such that we may be able to collaborate in this area as well.

In the month ahead, we will be preparing an engineering, procurement and construction (EPC) contract and, based on a geological survey, selecting a location for the facility. The programme will take full advantage of Uzbekistan's existing knowledge base in the nuclear field. Up to 8000 workers will be needed for the construction work and another 2500 will be needed to operate the plant after its launch.

We recognise that, as a newcomer to nuclear power generation, we have much to do beyond the construction of the nuclear power plant. We will need to develop the regulatory and educational infrastructure to support the programme. Together, Russia's regulator, Rostekhnadzor, and the IAEA will be helping our own new independent regulator to gain the expertise it will need, and on IAEA advice we will be adapting Russia's standards and regulations.

Uzbekistan is no novice in the use of nuclear power for peaceful purposes. Over the past 60 years our country has been actively researching nuclear technologies at our Institute of Nuclear Physics of the Academy of Sciences, which operates a 10 MW research reactor. We have been an active and committed member of the IAEA since 1994, and are already in discussions with its experts to ensure full compliance with international regulations.

Many steps have been taken already to solve the personnel challenges with regard to construction of the nuclear power plant, including the creation of the educational programmes for training students in the sphere of nuclear power. But nuclear power plants don't spring up overnight. We expect it will take 8-10 years before the plant begins contributing to our energy needs. In the meantime, the existing electrical power production and transmission systems are scheduled for wide-ranging modernisation and expansion, including 42 new

hydro power stations and 32 existing stations scheduled for modernisation. Up to 7100 km of power lines and 2500 transformer points will be either modernised or built.

This is a huge undertaking where international expertise and investment are required, and there is active cooperation in this area with leading companies of the USA, South Korea, Germany, Russia, France, China, and many other countries. Step by step, we are seeking to engage with the world's leading nations and their leading businesses in accordance with the principles of mutual respect and trust. Ultimately what we expect to gain from all this is a balanced energy future which would simply be impossible without nuclear power generation.

Source: <http://world-nuclear-news.org>, 27 December 2018.

NUCLEAR STRATEGY

CHINA

China is Designing a Giant Machine to Test Nuclear Bombs

Welcome to the newest U.S.-China arms race: giant machines that test nuclear weapons. China is building a device that's equivalent to America's Z Machine, a device that reproduces the conditions of a nuclear bomb – but in the controlled safety of the laboratory. Except that China says that it's machine will be bigger than America's.

The Z Pulsed Power Facility “is the world's most powerful and efficient laboratory radiation source,” according to the Sandia National Laboratory in Albuquerque, New Mexico. “It uses high magnetic fields associated with high electrical currents to produce high temperatures, high pressures, and powerful X-rays for research in high energy density science.”

“The Z machine creates conditions found nowhere else on Earth,” Sandia claims. But those conditions may soon be found in the city of Mianyang, in southwest China, where the Chinese Academy of Engineering Physics develops nuclear weapons.

China's Z machine is “designed to produce about 60 million joules of energy in an instant – roughly 22 times the 2.7 million joules generated at the Sandia facility,” according to the South China Morning Post. “It does this by firing powerful electrical pulses at a target about the size of a spool of thread consisting of hundreds of tungsten wires, each thinner than a human hair. When the pulses pass through the wires, the tungsten explodes, evaporates and creates a plasma with a magnetic field so strong that the exploded particles are forced inward. The particles collide, producing intense radiation – mostly X-rays – and creating conditions that more accurately reflect a real nuclear explosion.” “With so much energy, we can heat a target to more than 100 million degrees Celsius,” boasted one Chinese nuclear physicist. “It will dwarf the machine in Sandia.”

The National Interest contacted the Sandia laboratory; a spokesman replied that while U.S. researchers were aware of the Chinese project, they could not comment on it. Building facilities to develop better nuclear bombs comes as tensions are rising between the U.S. and China. President Trump has threatened to pull out of the 1987 Intermediate-Range Nuclear Forces, or INF, treaty between the U.S. and Soviet Union. The treaty banned most medium- and short-range nuclear missiles. Trump accuses Russia of violating the treaty by deploying new missiles: Russian President Vladimir Putin has threatened to retaliate by building more nuclear weapons.

These developments haven't been lost on Beijing. “China Youth Daily reported in May that the academy [of Engineering Physics] aimed to beat

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the US in nuclear weapon development,” noted the South China Morning Post. “‘Must surpass the US’ has become a motto for scientists and engineers working in the top-secret research facilities, the official newspaper of the Communist Youth League said.

Even if China’s machine is bigger than America’s, as with so much of the nuclear arms race, it is not clear how much advantage Beijing would derive. The U.S. has almost 7,000 nuclear warheads to destroy China and Russia as functioning societies: Russia has a similar number to return the favor to America. With an estimated 300 nuclear warheads, China’s arsenal is distinctly smaller, but not small enough that it couldn’t severely damage the U.S. More efficient nuclear bombs may kill more people, but they won’t change the underlying equation of mutually assured destruction.

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Source: Michael Peck, <https://nationalinterest.org>, 25 December 2018.

RUSSIA

Russia Begins Testing Nuclear Weapon that can Travel Underwater and ‘Nothing’ Can Stop It

Moscow has reportedly begun testing an underwater nuclear weapon that has been touted as invincible by Russian President Vladimir Putin. The Poseidon, previously known as the Status-6 Oceanic Multipurpose System and dubbed Kanyon by the U.S.-led NATO Western military alliance, is a state-of-the-art nuclear-capable drone being developed by the Russian armed forces. Citing a defense industry source, the state-run Tass Russian News Agency reported that the Russian navy had begun trials for the weapon at sea.

“In the sea area protected from a potential enemy’s reconnaissance means, the underwater trials of the nuclear propulsion unit of the Poseidon drone are underway,” the source said, according to the official outlet.

The Poseidon’s true power has never been revealed, but rumors of its existence have swirled among defense circles for years. In September 2015, The Washington Free Beacon cited Pentagon sources as saying Russia was developing submarines armed with “Kanyon” nuclear-capable drones dubbed “city busters,” with “tens” of megaton explosive power and capable of traveling long distances at high speeds. Two months later, Russian state media outlet NTV showed blueprints of a nuclear-capable underwater drone, titled “Status-6 Oceanic Multipurpose System,” while covering a meeting of officials.

Putin revealed the drone’s existence during his State of the Nation address in March, along with an arsenal of other advanced weapons said capable of thwarting even the most

modern defense systems—and many of which were capable of being fitted with nuclear warheads. At the time, he said that Russia had completed its development of “an innovative nuclear power unit” 100 times smaller than existing submarine reactors, but still more powerful and capable of hitting its maximum capacity 200 times faster, while carrying “massive nuclear ordnance.”

“We have developed unmanned submersible vehicles that can move at great depths (I would say extreme depths) intercontinentally, at a speed multiple times higher than the speed of submarines, cutting-edge torpedoes and all kinds of surface vessels, including some of the fastest,” Putin told his federal assembly in March. “It is really fantastic. They are quiet, highly maneuverable and have hardly any vulnerabilities for the enemy to exploit. There is simply nothing in the world capable of withstanding them.”

The Poseidon received its name later that month after the Russian Defense Ministry held a poll in which users also dubbed the Peresvet laser weapon system and 9M730 Burevestnik nuclear-

powered cruise missile. A number of reports have claimed that the weapon may be capable of producing massive, radioactive tsunamis that would pose a threat to major cities. Some experts have corroborated this theory, although they have questioned the tactical effectiveness of this strategy.

Russia has set out to modernize its strategic and conventional arsenal in response to a perceived threat posed by the U.S. military dominance and development of a global missile shield made possible by Washington's withdrawal of the ABM treaty in 2001.

Russia has set out to modernize its strategic and conventional arsenal in response to a perceived threat posed by the U.S. military dominance and development of a global missile shield made possible by Washington's withdrawal of the ABM treaty in 2001. President Donald Trump has since threatened to pull out of the INF treaty banning land-based missile systems ranging from 310 to 3,400 miles, while Moscow has claimed that the Trump administration has not responded to offers to start talks regarding the renewal of the New START.

Washington has accused the Kremlin of attempting to influence the 2016 U.S. presidential election in Trump's favor, something Putin and his officials have denied. Though the Republican leader set out to rebuild deteriorating ties between Washington and Moscow upon coming to office, the U.S. has since expanded sanctions against Russia and relations have only worsened between the two leading powers.

Source: Tom O'Connor, <https://www.newsweek.com>, 25 December 2018.

Russia Tests Hypersonic 'Impossible to Intercept' Nuclear Missile

Russian President Vladimir Putin oversaw a test of a new hypersonic glide vehicle, declaring that the weapon is impossible to intercept and will ensure Russia's security for decades to come.

Speaking to Russia's top military brass after watching the live feed of the launch of the Avangard vehicle from the Defense Ministry's control room, Putin said the successful test was a "great success" and an "excellent New Year's gift to the nation."

The test comes amid bitter tensions in Russia-U.S.

relations, which have sunk to their lowest level since the Cold War times over the conflict in Ukraine, the war in Syria and the allegations of Russian meddling in the 2016 U.S. presidential election.

Putin's hopes for repairing ties with Washington under President Donald Trump have fizzled amid investigations into allegations of Trump's campaign ties with Russia, and tensions have escalated as the U.S. administration slapped Russia with new waves of sanctions.

The Avangard was among the array of new nuclear weapons that Putin presented in March, saying that Russia had to develop them in

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response to the development of the U.S. missile defense system that could erode Russia's nuclear deterrent.

In [the last] test, the weapon was launched from the Dombrovskiy missile base in the southern Ural Mountains. The Kremlin

said it successfully hit a designated practice target on the Kura shooting range on Kamchatka, 6,000 km (3,700 miles) away. "The Avangard is invulnerable to intercept by any existing and prospective missile defense means of the potential adversary," Putin said after the test, adding that the new weapon will enter service next year with the military's Strategic Missile Forces.

When first presenting the Avangard in March, the

Russian leader said the new system has an intercontinental range and can fly in the atmosphere at 20 times the speed of sound, bypassing the enemy’s missile defense. He emphasized that no other country currently has hypersonic weapons. Putin has said that Avangard is designed using new composite materials to withstand temperatures of up to 2,000 degrees Celsius (3,632 degrees Fahrenheit) that come from a flight through the atmosphere at hypersonic speeds.

Source: Vladimir Isachenkov, <https://6abc.com>, 26 December 2018.

BALLISTIC MISSILE DEFENCE

USA

US Navy, Missile Defense Agency Shoot Down an IRBM in Space

The U.S. Navy and Missile Defense Agency continued a hot streak when they successfully shot down an intermediate-range ballistic missile target in space from its Hawaii-based Aegis Ashore facility. The test marked the second consecutive successful intercept for the SM-3 Block IIA missile in development.

The intercept followed an October success, which shook off two hard-luck consecutive failures – one caused by a sailor error and a second caused by a misfired third-stage rocket motor. Both tests were on course for a successful intercept when the respective mishaps occurred, officials told Defense News.

The missile, which was launched from Hawaii, fired on a track from a sensor that was a significant distance from the Aegis Ashore Missile Defense Test Complex at the Pacific Missile Rang Facility at Kauai, said Mark Wright, spokesman for the Missile Defense Agency. Aegis Ashore never had a native track on the missile, Wright confirmed, meaning the missile that was shot from that facility successfully locked onto a target, which was entirely tracked by a non-native sensor relaying its tracking data, a key capability under

The MDA said the missile was fired by a U.S. Air Force C-17 “thousands of miles southwest of the Aegis Ashore test site that launched the SM-3 Block IIA interceptor.” “The engagement leveraged a ground, air and space-based sensor/command and control architecture linked by the Ballistic Missile Defense System’s Command and Control, Battle Management, and Communications (C2BMC) suite”.

development by the MDA.

The SM-3 Block IIA is a co-development between the U.S. and Japan, and it is expected to be equipped on both the U.S. Aegis Ashore stations in Romania and Poland and the future Aegis Ashore stations in Japan — making it a keystone to America’s short- and intermediate-range missile defense strategies. The European Aegis Ashore sites have been the source of significant tension between Russia and the U.S., with Russian President Vladimir Putin regularly criticizing the platform and accusing the U.S. of attempting to upset the strategic balance.

In a release, the MDA said the missile was fired by a U.S. Air Force C-17 “thousands of miles southwest of the Aegis Ashore test site that launched the SM-3 Block IIA interceptor.” “The engagement leveraged a ground, air and space-

based sensor/command and control architecture linked by the Ballistic Missile Defense System’s Command and Control, Battle Management, and Communications (C2BMC) suite,” the release said.

In a statement, the head of the MDA said the test proved the technology going into the missile defence capabilities in Europe are on course.

“Today’s successful flight test demonstrated the effectiveness of the European Phased Adaptive Approach Phase 3 architecture,” said Lt. Gen. Sam Greaves. “It also was of great significance to the future of multi-domain missile defence operations and supports a critical initial production acquisition milestone for the SM-3 Block IIA missile program.

“This system is designed to defend the United States, its deployed forces, allies, and friends from a real and growing ballistic missile threat. I offer my congratulations to all members of the team, military, civilian, contractors and allies who helped make this possible.” This is the third successful intercept out of five intercept tests for the SM-3 Block IIA.

Source: www.defensenews.com, 11 December 2018.

NUCLEAR ENERGY

CHINA

China Starts Operating Most Powerful Single Nuclear Reactor

China has completed and is now operating an advanced french designed EPR nuclear reactor with 1750 MW of power. This is the most energy from a single nuclear reactor. The main design objectives of the third generation EPR design are increased safety while providing enhanced economic competitiveness through

improvements to previous PWR designs scaled up to an electrical power output of around 1650 MW (net) with thermal power 4500 MW. The reactor can use 5% enriched uranium oxide fuel, reprocessed uranium fuel or 100% mixed uranium plutonium oxide fuel. The EPR was designed to use uranium more efficiently than older Generation II reactors, using approximately 17% less uranium per unit of electricity generated than these older reactor technologies.

The first two EPR units to start construction, at Olkiluoto in Finland and Flamanville in France, are both facing costly delays (to at least 2020). Construction commenced on two Chinese units at Taishan in 2009 and 2010. Taishan 2 is expected to begin operation in 2019. Two units at Hinkley Point in the United Kingdom received final approval in September 2016 and are expected to be completed by 2025.

There are new EPR redesigns which will allow for simpler and faster construction. The EPR design has several active and passive protection measures against accidents:

* Four independent emergency cooling systems, each providing the required cooling of the decay heat that continues for 1 to 3 years after the reactor’s initial shutdown (i.e., 300% redundancy)

* Leak tight containment around the reactor

* An extra container and cooling area if a molten core manages to escape the reactor (see containment building)

* Two-layer concrete wall with total thickness 2.6 meters, designed to withstand impact by airplanes and internal overpressure

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Source: Brian Wang, <https://www.nextbigfuture.com>, 25 December 2018.

GENERAL

Should We Subsidize Nuclear Power to Fight Climate Change?

Last month (Nov 2018), the Union of Concerned Scientists (UCS) put out a report entitled The Nuclear Power Dilemma: Declining Profits, Plant Closures, and the Threat of Rising Carbon Emissions that calls for offering subsidies to unprofitable nuclear power plants. Not surprisingly, it has been widely welcomed by nuclear advocates, who interpret the report as essentially saying “yes to nuclear power” in order to reduce carbon emissions. But that interpretation misses the many important but less prominent insights

Nuclear power plants are associated with significantly less carbon dioxide emitted per unit of electricity produced when compared to fossil fuel plants, even when including the emissions associated with the fuel chain required to generate nuclear energy. Therefore, the report’s basis for argument—if utilities were to replace “existing nuclear plants with natural gas and coal rather than low-carbon sources,” then it would compromise “our ability to achieve the deep cuts in carbon emissions” is obvious.

in the UCS report.

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generate nuclear energy. Therefore, the report's basis for argument—if utilities were to replace “existing nuclear plants with natural gas and coal rather than low-carbon sources,” then it would compromise “our ability to achieve the deep cuts in carbon emissions” (p. 1)—is obvious. Whether nuclear plants would be replaced by fossil fuelled plants is questionable.

Nuclear plants are hugely expensive, and it has been known for a while that they are not an economically competitive choice. Thus, building new nuclear plants makes no sense. In the UCS report too, the power planning model used does not recommend constructing new nuclear plants, even at the highest assumed price of carbon. The authors, unfortunately, do not highlight this outcome of their modelling, sidestepping its implications by not “assessing the potential role of new nuclear plants in meeting long-term emissions reduction targets” (p. 12). For decades, nuclear advocates had a comforting response: although expensive to build, nuclear plants are cheap to operate and profitable in the long run. That is no longer true. Several nuclear plants have been shut down because the utilities operating them are losing money. As shown by the UCS report and similar studies, many more are likely to be shuttered.

So, the question in essence is how to deal with a dying source of electricity generation in the United States. Globally, the share of nuclear energy in the world's electricity generation has been declining continuously since 1996. The UCS report is a plea to keep the nuclear industry on life support by states providing subsidies to nuclear power plants that are not profitable, provided the operators of the nuclear plants and the states play by some rules. Regardless of these subsidies, it remains the case that over the next few decades, the reactor fleet will have to be retired. Some of these reactors are nearly half a century old, and some have a checkered past.

Many others have demanded that states subsidize nuclear plants, and there is even a tool kit to help plant owners to continue profiting at public expense. It is the imposition of various requirements that distinguishes the UCS report

from the rest of the chorus—and unfortunately the media has by and large highlighted the call for subsidies without the conditions. The conditions are: “Require plant owners to open their financial books and demonstrate need”; “make financial support for distressed plants temporary [and] periodically assess whether continued support is necessary and cost effective”; “Ensure that qualifying plants maintain strong safety performance”; “Strengthen renewable energy and efficiency standards”; “Develop transition plans for affected workers and communities”; and state “requirements [on resources subject to state jurisdiction, such as the use of local water supplies for cooling and the impact of cooling-water discharges] need to be vigorously enforced”.

These requirements are not easy to meet, and other proponents of nuclear subsidies are, in some cases, undermining them. The Nuclear Energy Institute “has proposed merging the highest and second-highest safety ratings”—measures of plant safety produced by the Nuclear Regulatory Commission—which “would effectively render the rating meaningless” (p. 24). In Connecticut, the Millstone nuclear plant's “owner refused to make a disclosure” when seeking subsidies (p. 41).

These subsidies are being offered to an industry that has profited enormously in the past from direct and indirect subsidies. As the Illinois attorney general explained, current subsidy demands “amount to a third round of subsidies for these plants.”

Let us return to the most basic assumption needed for the argument for subsidies to stick, namely that utilities would replace shut down nuclear plants with fossil fuelled plants. This is possible but by no means necessary, especially with continued falling costs for renewable energy and storage technologies. The energy industry is changing so rapidly that what the UCS report attempts, to forecast costs and plan over multi-decadal periods, is all but impossible to do with any degree of certainty.

Further, the report's inputs to the electricity planning model are already outdated. For example, “the central cost figures it uses for nuclear reactor

costs are significantly lower than the costs of the two reactors currently being constructed in the state of Georgia. In contrast, costs of solar PV plants and wind turbines are significantly higher than the most recent numbers. Renewables are not just getting cheaper, they are also quick to construct.”

All these factors undermine the report’s central assumption that nuclear plants will be replaced by fossil fuelled plants. To be fair, the UCS report does call for periodically assessing whether continued support is necessary and cost effective. But such support might already not be cost effective. All told, the economic basis for subsidies is uncertain at best; more likely, it is flawed. Either way, it may be best to get onward with the transition from fossil fuels and nuclear power to renewables.

Source: <https://blogs.scientificamerican>, 03 December 2018.

PHILIPPINES

Revival of Nuclear Power Plans Seen

The Philippines’ readiness for a national nuclear energy program may revive plans to build nuclear power plants in the country, with 13 potential sites spread out across the archipelago. According to the IAEA, the Department of Energy has had only one comprehensive plan—since it was created in 1992—that included nuclear as a long-term option for a source of electricity supply. This was the Philippine Energy Plan 1998-2035, which the government adopted amid the power supply crisis of the 1990s.

Back in 1998, the DOE envisioned that a 600-MW nuclear power plant—other than the 620-MW one in Bataan that was mothballed and never put into operation—would have been built and running by 2025. After that, three additional nuclear facilities at 600 MW each were planned for completion in 2027, 2030 and 2034. Each power plant was slated for a 10-year construction period. This plan, if it

were implemented, would have provided the Philippines a total of 2,400 MW of nuclear power capacity.

Also, the government through a nuclear power steering committee identified 13 potential sites for future nuclear power plants. These include Mapalan Point in Morong, Bataan; San Juan, Batangas; Padre Burgos, Quezon; Port Irene and Rakat Hill in Cagayan; Palicpican in Ternate, Cavite; Tagbarungis in Inagauan, Palawan and Concepcion in Tanabag, Palawan. There were also potential sites in Baluangan in Cauayan, Negros Oriental; Cansilan Point in Bayawan, Negros Occidental, and Talusan Point in Sipalay, Negros Occidental.

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Source: *Ronnel W. Domingo*, <https://business.inquirer.net/262735/revival-of-nuclear-power-plans-seen>, 26 December 2018.

SOUTH AFRICA

SA Students Explore Benefits of Nuclear Energy for Africa

Five South African students have returned from a trip of a lifetime in Russia where they learned about study opportunities offered to foreigners in the field of nuclear science in the Russian Federation. North-West University masters’ students Naomi Mokhine, Koketso Kgorinyane and Veronica Gouws and University of Limpopo graduates Harriet Mphaho and Thabo Mametja were selected to tour Russia after successful entries into the “Atoms Empowering Africa” youth video competition sponsored by Russian State Atomic Energy Corporation Rosatom.

The five joined 11 students from across Africa for the unique opportunity to learn about educational programs available for foreign students. In addition, the guests visited top Russian universities specializing in nuclear engineering including the National Research

Nuclear University MEPhI in Obninsk, Central Russia and Tomsk Polytechnic University (TPU) in Tomsk, Siberia.

More than 30 students from Sub-Saharan Africa took part in the contest, run in cooperation with African Young Generation in Nuclear, the SA Institute of Electrical Engineers and the SA Network for Nuclear Education Science and Technology. Under the theme “Atoms Empowering Africa”, students had to post a two-minute video about peaceful atoms. The aim was to encourage young people between the ages of 18 to 30 to research various nuclear applications and the benefits they might have for the continent.

Mphaho said the trip did much to open her eyes about the technological advantages nuclear energy could provide Africa. “We learnt a lot about how nuclear can be beneficial in many spheres such as agriculture and medicine, and with the production of the electricity,” she said. “I personally was not aware of the full spectrum of nuclear energy applications.”

MEPhI is the leading Russian university with more than 75 years’ expertise in nuclear engineering. MEPhI is the key partner of Rosatom in the field of training high-qualified nuclear specialists. Today more than 1500 foreign students from 57 countries study there, including over 50 students from sub-Saharan Africa, including South Africa.

TPU is one of the leading state universities which specialize in the training of specialists in the nuclear field along with training of professors for universities in Rosatom partner countries. In over 60 years, more than 12 000 specialists graduated TPU, including 8 000 trained in nuclear engineering and research. It is the only Russian

university equipped with a nuclear research reactor, which is now used for peaceful atom technologies such as nuclear medicine, transmutation neutron alloying, isotope engineering among others.

The African delegation visited the first ever nuclear power plant in the world, which was operational from 1954 till 2002, and which now functions as a memorial

complex. It is located in the city of Obninsk, 100 km south-west from Moscow, and includes the first nuclear reactor with the capacity of 5MW as well as the museum of history of the nuclear industry. The delegation also visited Tomsk Atomic Energy

Information Center set up in 2008 with the purpose of promoting nuclear science and technologies as well as education. During the cultural aspect of the program guests were acquainted with the history of Russia including its gastronomical traditions....

Source: <https://www.businessghana.com>, 25

December 2018.

USA

Congress Passes Bipartisan Bill to Boost Advanced Nuclear Energy

The House voted to make it easier to deploy advanced nuclear reactors. The bipartisan bill, approved by voice vote, is aimed at boosting nuclear energy and would modernize the federal government’s approval process for advanced reactors. The approval comes a day after the Senate did the same. President Trump is expected to sign the bill. ...

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The legislation directs the Nuclear Regulatory Commission to create a licensing process for advanced reactors that is less prescriptive, allowing for faster approvals. Advanced reactors are seen as key to improving the fortunes of nuclear energy, which emits no carbon, giving it a level of bipartisan support for its potential to help combat climate change.

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“It’s heartening to again see Congress step up to the plate in a big bipartisan way to bolster advanced nuclear technologies that are major part of the future of U.S. and global clean and reliable power,” said Rich Powell, executive director of Clear Path, a conservative group that supports nuclear energy. “Bringing any new energy technology into the marketplace is daunting, and that’s doubly-true for heavily regulated industries like nuclear.” The smaller advanced reactors, still in the development phase, are supposed to be cheaper to operate and safer because they produce less waste.

“I am proud to have worked with this bipartisan group on this bill, which will give our nuclear regulator the flexibility it needs to bring new, safe reactors online to produce carbon-free energy,” said Sen. Sheldon Whitehouse, D-R.I., a cosponsor of the Senate version of the bill, which was introduced by Sen. John Barrasso, R-Wyo., chairman of the Environment and Public Works Committee. The nuclear industry got more help, when the Energy Department announced a plan to purchase power from advanced reactors designed by NuScale Power.

The Energy Department said it will buy power from two of 12 advanced nuclear reactors being built by utility Utah Associated Municipal Power Systems at the site of the Idaho National Laboratory. The agreement stipulates that one of the reactors will be used for research and development and another for power needed by the lab, which is under the purview of the Energy Department.

Source: <https://www.washingtonexaminer.com>, 21 December 2018.

NUCLEAR COOPERATION

ARGENTINA–RUSSIA

Argentina, Russia Expand Nuclear Energy Cooperation

Russia and Argentina plan to expand their cooperation in the peaceful use of nuclear energy following the signing of a strategic document on the side-lines of the G20 summit in Buenos Aires. Following the signing ceremony, Likhachov said: “The signed document will allow us to broaden the existing cooperation with our Argentinian

The two countries will also implement joint projects in third world countries, including the construction of research centres and human resources development. The document also provides for opportunities for Argentina and Russia to cooperate in other areas, including joint research and personnel training.

partners. All of us at Rosatom are certain that this step will incentivise our mutually beneficial cooperation in the application of nuclear technology for peaceful purposes.”

Rosatom said one of the fundamental areas of mutual cooperation

outlined in the document is “the development of various project execution strategies to be applied to large and small capacity nuclear power plant construction projects in Argentina”. The two countries will also implement joint projects in third world countries, including the construction of research centres and human resources development. The document also provides for opportunities for Argentina and Russia to cooperate in other areas, including joint research and personnel training.

According to the document, the two countries will also consider the joint operation of a fleet of Russian-designed floating nuclear power plants. A cooperation ‘roadmap’ on the implementation of specific Russian-Argentine nuclear energy projects was also signed.

... Russia and Argentina signed an intergovernmental agreement in July 2014 on cooperation in the peaceful use of atomic energy. That agreement replaced an earlier one that expired in December 2012 and expanded areas of cooperation. These areas included design, construction, operation and decommissioning of nuclear power plants and research reactors,

including water desalination facilities. They also included support of the nuclear fuel cycle, radioactive waste management, and isotope production.

In April 2015, Russia and Argentina signed an MoU establishing a “framework for cooperation” for construction of a 1200 MWe VVER unit in the South American country. JSC Rusatom Overseas and Nucleoeléctrica Argentina SA also signed a preliminary project development agreement on construction of the country’s sixth reactor.

In January this year, Russia and Argentina signed a memorandum of understanding (MoU) on uranium exploration and mining in the South American country. The MoU aims to promote cooperation between Russia and Argentina in uranium exploration and mining, with a particular focus on the in-situ recovery method of uranium extraction.

Argentina has three operating nuclear power plants, all pressurised heavy water reactors. With total generating capacity of 1627 MWe, the three units - Atucha 1 and 2 plus Embalse - provide about 10% of the country’s electricity. A prototype domestically designed and developed 25 MWe small pressurised water reactor - CAREM - is under construction at a site adjacent to the Atucha plant.

Source: <http://world-nuclear-news.org>, 03 December 2018.

FINLAND–RUSSIA

Finnish-Russian Nuclear Plant Delayed by Four Years

The nuclear power industry has suffered its latest embarrassing delay in Europe after a Russian

project in Finland was forced to push back its proposed starting date by four years. The delay is humiliating for the Finnish operator — a group of energy and industrial companies in the Fennovoima consortium — as well as Rosatom, the Russian state nuclear company, after they had promised that the project would run on time because it was based on proven technology.

Fennovoima said shortly before Christmas that the Hanhikivi 1 power plant was now scheduled to begin commercial operations in 2028, four years behind the original schedule and eight years after the proposed start when Finland’s parliament approved the project in 2010. The consortium had already warned in 2017 of potential delays due to problems for Rosatom in receiving approval from Finland’s notoriously tough safety regulator to begin construction.

The revival of nuclear power in Europe following the Chernobyl disaster three decades ago has been subject to lengthy and costly delays. Regulators have pushed for stricter controls after the Fukushima nuclear accident in Japan in 2011, including that core reactors must be able to withstand direct impact from an aircraft.

Another new nuclear project in Finland — the Olkiluoto 3 plant being built by a consortium of France’s Areva and Germany’s Siemens — has been delayed by more than a decade, leading to multiple lawsuits as it ended three times over budget. Other nuclear plants in France and the UK have been delayed several times and cost far more than expected.

The Fennovoima project was designed to

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overcome these problems by using a reactor from Rosatom, which continued building nuclear plants after the Chernobyl disaster unlike European rivals such as Areva, which has since been bought by France's EDF. But Rosatom has struggled to meet the strict demands of STUK, the Finnish nuclear regulator renowned as one of the most demanding in the world.

... The Hanhikivi reactor has also proved politically divisive with the Green party quitting the then government in 2014 after Russia's annexation of Crimea, protesting that the nuclear project was a case of "Finlandisation" — a loaded term that refers to a small country adapting its policies to suit a larger, more powerful neighbour.

Source: Richard Milne, <https://www.ft.com>, 26 December 2018.

INDIA–FRANCE

France Submits Techno-Commercial Offer for Jaitapur Nuclear Power Project

French company EDF has submitted a techno-commercial proposal to the government for the Jaitapur Nuclear Power Plant (JNPP), in a significant step towards the progress of the project, sources said. A techno-commercial offer is an important step in the negotiations process as it helps the two parties determine the cost of the project and tariff of the electricity generated from it.

The offer comes less than a week after External Affairs Minister Sushma Swaraj and French Foreign Minister Jean-Yves Le Drian agreed to expedite work on the project. "Both countries are working to start the Jaitapur nuclear energy project as soon as possible. We are glad that NPCIL and EDF have made progress based on the Industrial Way Forward Agreement. ...

Sources said the proposal has been submitted to the NPCIL, an atomic power plants operating public sector undertaking under the Department of Atomic Energy. The government will now study the techno-commercial offer, sources added. This includes the cost of the project, loan to be given by France and overall tariff of the electricity.

The Indo-French deal was signed in September 2008. Negotiations first began with French company Areva, but last year, French utility company EDF took over its nuclear reactor business after the former faced financial issues. There have been several factors that were hindering the power plant, which includes the "reference plant". Since Areva, and now EDF was bringing in new technology, the AERB, the country nuclear watchdog, asked for a reference plant. A reference plant is a functional power reactor and the Areva had then cited a power reactor at Flamanville. The JNPP, proposed to be the largest nuclear park in the country to be built in coastal Maharashtra, will have six reactors with a capacity of 1650 MW each.

Source: <https://www.businesstoday.in>, 24 December 2018.

IRAN–EUROPE

Iran, Europe Agree on Boosting Nuclear Cooperation

Iran and Europe stressed the need for promoting peaceful nuclear cooperation within the framework of JCPOA, IRNA reports. In a statement at the end of a two-day Seminar on Nuclear Cooperation in Belgium, they called for continued collaboration in the field of nuclear energy. The statement said that the third high-level seminar on Iran-EU nuclear cooperation was held in Brussels from November 26-27. The seminar is a platform to pursue discussions of the two earlier events.

Referring to presence of officials, including Secretary General of European External Action Service Helga Schmid, deputy foreign minister Abbas Araqchi and Iran's nuclear chief Ali Akbar Salehi, the statement said that senior representatives of Joint Research Centre and international cooperation and innovation and research divisions of European Commission presented a report on the measures taken on enforcement of Annex III of JCPOA.

Source: <https://en.trend.az>, 28 November 2018.

NUCLEAR DISARMAMENT

RUSSIA

Vladimir Putin Furiously Attacks the Soviet Leadership for Nuclear Disarmament

Vladimir Putin launched an attack on the leadership of the Soviet Union for protecting the dominance of the US rather than the interests of Russia, during a meeting with military personnel. Attacking the Soviet Union, he said: “Only God knows why the leadership of the Soviet Union did agree to this one-sided disarmament, but this was done, and our partners continued to develop such systems. “Mikhail Gorbachev and Ronald Reagan signed the INF in 1987 which aimed to reduce both sides nuclear capacity.”

By the treaty’s deadline of 1 June 1991, the Soviet Union had destroyed 1,846 such weapons compared to just 846 by the US. Speaking to his military leaders, Putin also vowed to increase Moscow’s military going forward. He said: “Strengthening defence capabilities and Russian security, and building reliable protection from exterior threats have been and remain our priority, key tasks.

“I emphasize that our political and governmental leaders, the society, and all the citizens of our country understand perfectly well the exclusive, vital importance of these tasks.” In particular, he made reference to Russia’s nuclear capability, threatening to start to once again build up the country’s nuclear arsenal. Donald Trump has threatened to withdraw the US from the INF treaty when it expires in 2020. The US President has blamed Russia for failing to stick to the terms of the agreement.

However, the Kremlin has attacked Washington for holding defence missiles in Europe in violation of the spirit of the INF. Putin said: “In case of the breakdown of the treaty by the US — I have already said it publicly and I deem it necessary to state once again directly — we will have to take

additional measures to strengthen our security.”

The arms race would put the world in danger of the start of a second Cold War, with both countries expanding their nuclear capability. Accusing Trump for being responsible for any future conflict, he said pulling out of the INF was not compatible with the “aspirations of a peace-loving nation”.

Source: <https://www.express.co.uk>, 19 December 2018.

NUCLEAR PROLIFERATION

NORTH KOREA

North Korea Won’t Give Up Nuclear Weapons Unless the US Removes Nuclear Threat

North Korea said it will never unilaterally give up its nuclear weapons unless the United States first removes what Pyongyang called a nuclear threat.

The surprisingly blunt statement jars with Seoul’s rosier presentation of the North Korean position and could rattle the fragile trilateral diplomacy to defuse a nuclear crisis that last year had many fearing war.

The latest from North Korea comes as the United States

and North Korea struggle over the sequencing of the denuclearization that Washington wants and the removal of international sanctions desired by Pyongyang. The statement carried by the North’s official Korean Central News Agency also raises credibility problems for the liberal South Korean government, which has continuously claimed that North Korean leader Kim Jong Un is genuinely interested in negotiating away his nuclear weapons as Seoul tries to sustain a positive atmosphere for dialogue.

The North’s comments may also be seen as proof of what outside sceptics have long said: that Kim will never voluntarily relinquish an arsenal he sees as a stronger guarantee of survival than whatever security assurances the United States might provide. The statement suggests North Korea will eventually demand the United States withdraw or

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significantly reduce the 28,500 American troops stationed in South Korea, a major sticking point in any disarmament deal.

Kim and President Donald Trump met June 12 in Singapore where they agreed on a vague goal for the “complete denuclearization” of the Korean Peninsula without describing when and how it would occur. The leaders are trying to arrange another meeting for early next year.

But North Korea for decades has been pushing a concept of denuclearization that bears no resemblance to the American definition, with Pyongyang vowing to pursue nuclear development until the United States removes its troops and the nuclear umbrella defending South Korea and Japan. In the statement, the North made clear it’s sticking to its traditional stance on denuclearization. It accused Washington of twisting what had been agreed on in Singapore and driving post-summit talks into an impasse.

“The United States must now recognize the accurate meaning of the denuclearization of the Korean Peninsula, and especially, must study geography,” the statement said. “When we talk about the Korean Peninsula, it includes the territory of our republic and also the entire region of (South Korea) where the United States has placed its invasive force, including nuclear weapons. When we talk about the denuclearization of the Korean Peninsula, it means the removal of all sources of nuclear threat, not only from the South and North but also from areas neighbouring the Korean Peninsula,” the statement said.

North Korea for decades has been pushing a concept of denuclearization that bears no resemblance to the American definition, with Pyongyang vowing to pursue nuclear development until the United States removes its troops and the nuclear umbrella defending South Korea and Japan. In the statement, the North made clear it’s sticking to its traditional stance on denuclearization. It accused Washington of twisting what had been agreed on in Singapore and driving post-summit talks into an impasse.

Since engaging in diplomacy, North Korea has unilaterally dismantled its nuclear testing ground and parts of a missile engine test facility and suspended nuclear and long-range missile tests. However, none of those moves were verified by outsiders, and most experts say they fall short as material steps toward denuclearization.

The United States removed its tactical nuclear weapons from South Korea in the 1990s. Washington and Seoul have not responded to the North Korean statement. North Korea’s reiteration

of its long-standing position on denuclearization could prove to be a major setback for diplomacy, which was revived early this year following a series of provocative nuclear and missile tests that left Kim and Trump spending most of 2017 exchanging personal insults and war threats. The statement could jeopardize a second Trump-Kim summit as the United States may have difficulty negotiating further if the North ties the future of its

nukes to the U.S. military presence in the South, analysts said.

South Korean President Moon Jae-in, who met Kim three times this year and lobbied hard for the Trump-Kim meeting, has said Kim wasn’t demanding the withdrawal of U.S. troops from the Korean Peninsula as a precondition for abandoning his nuclear weapons. But Kim has never made such comments in public.

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moves were verified by outsiders, and most experts say they fall short as material steps toward denuclearization. In the third meeting between Kim and Moon in September, the North also said it would dismantle its main nuclear facility in Nyongbyon if the United States takes “corresponding measures,” which the state media later specified as sanctions relief.

Kim declared his nuclear force was complete after the torrent of weapons tests in 2017, including the detonation of a purported thermonuclear weapon and three test-flights of intercontinental ballistic missiles potentially capable of reaching the U.S. mainland. Several reports from private analysts in recent weeks have accused North Korea of continuing nuclear and missile development, citing details from commercial satellite imagery.

“If we unilaterally give up our nuclear weapons without any security assurance despite being first on the U.S. list of targets for pre-emptive nuclear strikes, that wouldn’t be denuclearization — it would rather be a creation of a defenceless state where the balance in nuclear strategic strength is destroyed and the crisis of a nuclear war is brought forth,” the KCNA said.

“The corresponding measures we have asked the United States to take aren’t difficult for the United States to commit to and carry out. We are just asking the United States to put an end to its hostile policies (on North Korea) and remove the unjust sanctions, things it can do even without a snap of a finger.”

The North Korean statement came a day after Stephen Biegun, the Trump administration’s special envoy on North Korea, told reporters in South Korea that Washington was reviewing easing travel restrictions on North Korea to facilitate humanitarian shipments to help resolve the impasse in nuclear negotiations.

During his four-day visit, Biegun plans to discuss with South Korean officials the allies’ policies on North Korea, including the enforcement of sanctions. The meetings are likely to include conversations about a ground-breaking ceremony the Koreas plan to hold at the border village of Panmunjom for an aspirational project to reconnect their roads and railways. The North has yet to respond to Biegun’s comments.

Source: Kim Tong-Hyung, *www.time.com*, 20 December 2018.

NUCLEAR TERRORISM

IRAN–ISRAEL

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

A few weeks later, the terrorist group released a video suggesting that it would target the reactor. Nasrallah, again in August of last year (2017), hinted that his terror group would target the Dimona reactor. According to the United Nations’ 2005 ICSANT, attacking the Dimona facility could constitute nuclear terrorism.

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 (2017),

hinted that his terror group would target the Dimona reactor. According to the United Nations' 2005 ICSANT, 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.

Israel has repeatedly warned that it will act to prevent Iran and its terror proxy Hezbollah from establishing a permanent military presence in Syria and said it would continue to strike weapons convoys en route from Tehran to Hezbollah. Iranian-controlled Hezbollah is in complete political and military control of Lebanon and Israel is concerned that the Shiite terror organization now has a much-larger and developed arsenal of weapons than it did during the Lebanon war in 2006. ...

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

NUCLEAR SAFETY

GENERAL

IAEA Workshop Promotes Adherence to Key Nuclear Safety International Conventions

An IAEA workshop held in December in Vienna aimed to encourage countries to join the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management. "The Convention on Nuclear Safety and the Joint Convention are the major cornerstones of the international legal framework for nuclear safety," said Wolfram Tonhauser, Head of the Nuclear and Treaty Law Section in the IAEA Office of Legal Affairs.

The conventions aim to commit participating States to maintain a high level of safety by setting international benchmarks to which States would subscribe. The IAEA Director General is the depositary for both conventions. "Being a contracting party to these conventions contributes, through the review process, to reaching a higher level of safety worldwide and

demonstrates a firm national commitment to nuclear safety and safety in the management of spent fuel and radioactive waste," said Gerard Bruno, Head of the IAEA Radioactive Waste and Spent Fuel Management Unit. "The conventions are based on the IAEA safety standards, which reflect an international consensus on what constitutes a high level of safety for protecting people and the environment from harmful effects of ionizing radiation."

The state-backed Japan Atomic Energy Agency said it would need to spend about 1.9 trillion yen (\$17.1 billion) to close 79 facilities over 70 years, in its first such estimate. The total costs could increase further, as the agency said the estimated figure, which would be shouldered by taxpayers, excludes expenses for maintenance and replacing aging equipment.

...The peer review process for both conventions culminate at review meetings, held every three years. Ahead of such meetings, contracting parties submit national reports on their work under the convention for review by other countries. The workshop featured a simulated Joint Convention review meeting to

strengthen participants' understanding of the peer review process. ...

The two conventions are closely related and complement each other. The Convention on Nuclear Safety, with 85 contracting parties, sets international benchmarks in the area of nuclear installation siting, design, construction and operation. The Joint Convention, with 80 contracting parties, is the only legally binding international instrument to address the safety of spent fuel and radioactive waste management on a global scale.

Also highlighted at the workshop was the IAEA's legislative assistance, which is offered to Member States to enhance their understanding of the conventions and other international legal instruments, and to facilitate their implementation in national nuclear legislation.

Source: <https://www.iaea.org>, 20 December 2018.

JAPAN

Costs for Scrapping 79 Nuclear Facilities Estimated at 1.9 Trillion Yen

The state-backed Japan Atomic Energy Agency said it would need to spend about 1.9 trillion yen (\$17.1 billion) to close 79 facilities over 70 years, in its first such estimate. The total costs could

increase further, as the agency said the estimated figure, which would be shouldered by taxpayers, excludes expenses for maintenance and replacing aging equipment.

The JAEA plans to close more than half of the 79 facilities over the next 10 years due in part to the increased costs to operate them under stricter safety rules introduced after the 2011 Fukushima nuclear crisis. The agency, which has led nuclear energy research in Japan with its predecessors since the 1950s, owns a total of 89 facilities.

Of the estimated costs, the expense for closing the nation's first spent-fuel reprocessing plant in the village of Tokai, Ibaraki Prefecture, northeast of Tokyo, accounts for the largest chunk of 770 billion yen. It will cost 150 billion yen to decommission the trouble-plagued Monju prototype fast-breeder nuclear reactor.

As for nuclear waste, the agency said about 100 kiloliters of high-level radioactive waste and up to 114,000 kl of low-level radioactive waste were estimated to have been produced but it has yet to decide on disposal locations. The Japanese government aims to restart nuclear power plants after a nationwide halt following the nuclear crisis, despite persistent concern over the safety of atomic power generation.

Source: <https://mainichi.jp>, 27 December 2018.

RUSSIA

Rosatom's Accident-Tolerant Fuel to Make Nuclear Power Safer

Accident-tolerant nuclear fuel Rosatom specialists created in 2018 will considerably enhance the safety of nuclear power plants, the A.A. Bochvar High Technology Research Institute for Inorganic Materials (VNIINM) said in a news release. Tolerant fuel is resistant to major nuclear power plant failures. It is to stay integral in complex breakdowns at nuclear power plants and by no means trigger zirconium-steam reaction that causes the emission of explosive hydrogen.

"The introduction of accident-tolerant nuclear fuel

is of key importance to bringing the systemic security and reliability of nuclear power to a qualitatively new level," the news release says. Earlier, it was announced that Rosatom specialists had made experimental samples of unique accident-tolerant nuclear fuel for nuclear power plants and in the near future will load it into the research reactor MIR of the Scientific Research Institute of Atomic Reactors (an affiliate of Rosatom).

VNIINM CEO Leonid Karpyuk said the institute had coped with the task of creating accident-tolerant fuel in just one year. "Research into this fuel has been underway around the world for a rather long time, about ten years. It was essential for us to conduct research and development works and develop uranium-molybdenum fuel and the know-how of applying protective coating to the fuel assemblies. We coped with this task successfully," he said.

Companies' Profiles: TVEL

incorporates enterprises for the manufacturing of nuclear fuel, conversion and enrichment of uranium, production of gas centrifuges and also research, development and design organizations.

It is the sole provider of nuclear fuel for Russian nuclear power plants and 72 nuclear power reactors in 14 countries around the world, research reactors in eight countries and Russian ships' nuclear power plants. The A.A. Bochvar High Technology Research Institute for Inorganic Materials (VNIINM) conducts research, development and design work for creating accident-tolerant fuel and is Russia's main designer of fuel assemblies.

Source: <http://tass.com/economy/1038403>, 28 December 2018.

NUCLEAR WASTE MANAGEMENT

AUSTRALIA

Defence Under Attack on Nuclear Waste Dump

Woomera must be revisited as a potential site for Australia's first nuclear waste dump, says Centre Alliance senator Rex Patrick, - who accuses the

The introduction of accident-tolerant nuclear fuel is of key importance to bringing the systemic security and reliability of nuclear power to a qualitatively new level Rosatom specialists had made experimental samples of unique accident-tolerant nuclear fuel for nuclear power plants and in the near future will load it into the research reactor MIR.

Defence Department of deception over claims the site is unsuitable. Senator Patrick said he would question Defence officials at Senate estimates hearings over why the department dismissed Woomera as a potential site because of an “intolerable risk” and its “impracticability” — a position since backed by Resources Minister Matt Canavan. The 122,000sq km Woomera Prohibited Area, located in the South Australian outback 450km northwest of Adelaide, is a military testing range under federal government control.

Senator Patrick said significant nuclear waste materials had been stored there since 1994, including 10,000 drums of low and intermediate-level waste from a CSIRO research facility at Fishermans Bend in Melbourne. In a report published on its website last week, the CSIRO said tests had found the material posed no threat to health or the environment. Tests in May found radiation levels adjacent to the storage had “natural background values” for Australia, as would be found in typical soil and rock.

“The report findings make a mockery of Defence claims there’s no way a national radio-active waste management facility could be located anywhere in the enormous expanse of the WPA,” Senator Patrick said. “The reality is radioactive waste has been safely stored at Woomera for a quarter of a -century. Defence can expect considerable scrutiny in the new year over the bureaucratic obfuscation and deception on this issue. It seems Defence is never stronger in defending territory than when it comes to defending its own.” Senator Canavan has short-listed two sites near Kimba, 465km northwest of Adelaide, and one site near Hawker, in South Australia’s mid-north, for the waste facility.

The process, which has divided both communities, stalled after a Kimba ballot scheduled for August 20 was delayed by court action from an Aboriginal

group that believes traditional owners should vote, despite not living within the shire’s boundaries. In a similar move, traditional owners at Hawker last week lodged an Australian Human Rights Commission complaint, prepared by Maurice Blackburn Lawyers, that alleged a “fundamentally flawed process”. Labor has not said how it would proceed should it form government after the election, which must be held by mid-May.

Source: Luke Griffiths, <https://www.theaustralian.com.au>, 27 December 2018.

USA

US Must Start from Scratch with a New Nuclear Waste Strategy

The US 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 defence programs are stored 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, non-profit, utility-owned and -funded nuclear waste management organization.

“No single group, institution or governmental organization is incentivized to find a solution,” said

Rod Ewing, co-director of Stanford’s Centre for International Security and Cooperation and a professor of geological sciences. The three-year study, led by Ewing, makes a series of recommendations focused on the back-end of the nuclear fuel cycle. The report, *Reset of America’s Nuclear Waste Management Strategy and Policy*, was released.

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

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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, and 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 which are all focused around a 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 defence 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).

Centre for Air Power Studies

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