



NUCLEAR SECURITY



A FORTNIGHTLY NEWSLETTER ON NUCLEAR DEFENCE, ENERGY AND PROLIFERATION FROM CENTRE FOR AIR POWER STUDIES

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OPINION – R. Rajaraman

To the Brink and Back

Less than a year ago, North Korea scored a 'nuclear double'. In July 2017, it launched two intercontinental ballistic missiles, the first capable of reaching Alaska, and the second, the Hwasong-14, capable of reaching California. In November, it detonated its most powerful nuclear weapon — a 120 kiloton-boosted fission device.

For long, North Korea had been considered as an impoverished state, run by a megalomaniac dictator, trying to punch way above its weight by defying the United Nations and the U.S. Yet, last year, it was very close to establishing a viable nuclear deterrent against the world's biggest superpower. True, it was still perfecting the weapon's miniaturisation and ensuring the missile's accuracy and safe re-entry. That might take a little more time but the US has already felt deterred from taking pre-emptive military action.

By late 2017, these developments had brought the world closer to a potential nuclear exchange than perhaps at any time since the Cuban Missile Crisis of 1962. It was not clear at that juncture whether the U.S. would attempt a strike on North Korea and how the latter would respond. Nor was it clear whether North Korea would up the ante

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further by firing its missiles closer to Guam or the U.S. mainland, albeit without a nuclear payload. Meanwhile, both North Korean leader Kim Jong-un and U.S. President Donald Trump kept exchanging threats and barbs.

Fortunately, matters have greatly improved since, aided by some statesman-like initiatives by South Korean President Moon Jae-in. ...When North Korea pulled out of the Non-Proliferation Treaty in 2003

and intensified its nuclear programme, the UN imposed sanctions. However, the North Korean regime continued to conduct missile and nuclear weapon tests, provoking the UN and the U.S. to impose more severe sanctions in the hope that

North Korea would abandon its nuclear programme. Nevertheless, that did not happen.

The prolonged sanctions have had a very serious impact on the North Korean economy. Monthly exports from the country plunged from about \$240 million in 2016 to less than \$50 million by the end of 2017. Exports even to China, its main trading partner, slumped last year by 81.6% year-on-year to \$54.34 million.

However, the resulting hardship has not caused any internal protests or revolt in North Korea, threatening Mr Kim's rule. The North Korean people have lived through much worse deprivation, particularly during the famine years from 1994 to 1998. The regime survived those years through a combination of a brutal internal security apparatus, political indoctrination, and tight media control.

The situation is much better today. The per capita income of about \$1,300 is not much lower than that of

some South Asian nations. Russian, Chinese and South Korean colleagues who have visited Pyongyang in recent times tell me that the atmosphere there is not one of gloom and doom. Movie theatres are open, taxis could be seen plying the streets, and shelves in shops are reasonably well stocked. The price of rice has remained nearly constant over the past five years at around 5,000-6,000 Won (about 60 U.S. cents in the open currency market). Corn, a cheaper staple, is being sold under just 24 cents per kg. The regime has also tacitly loosened its control on the marketplace, letting private production and sale of essential consumables to go on.

Although North Korea has found the sanctions manageable and continued with its nuclear programme, it would certainly like to have the sanctions eased. Mr Kim had offered to negotiate this with the U.S. directly. Mr Trump had dismissed such offers, both during his campaign and during his Presidency, categorically insisting that he would not even consider negotiating with the "little

rocket man" unless the latter first got rid of his nuclear assets. Such a precondition for talks was clearly not acceptable to North Korea. The U.S. had built its nuclear assets to address its long-standing fear of regime change attempts. There has been a deep-rooted conviction in the successive Kim regimes that only a nuclear deterrent can keep the U.S. at bay — a view that has only been reinforced by the downfall and eventual assassination of Libya's Muammar Qaddafi after he gave up his nuclear programme.

South Korea's Role: Fortunately, 2018 saw some 'Olympics diplomacy' coming to the rescue. President Moon, who originally hails from North Korea and had always shown a conciliatory approach towards the North Koreans, invited the country to participate in the Winter Olympics in South Korea in February. The North Koreans responded positively. This provided the diplomatic opportunity for the two Koreas to address the more

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serious bilateral issues as well as the standoff with the U.S. A North-South summit was scheduled for April and, more importantly, a message was conveyed to the U.S. that Mr Kim had expressed his "eagerness to meet President Trump as soon as possible", that he is "committed to denuclearisation", and that North Korea would "refrain" from any further nuclear or missile tests.

In turn, Mr Trump climbed down from his demand that Mr Kim first dismantle his nuclear arsenal, and immediately accepted the invitation for a summit. These moves have rightly hailed the world over as acts of statesmanship on both sides. Mr Moon also deserved a large part of the credit. The Kim-Trump talks were announced without the usual groundwork and lower-level discussions. Lack of coordination also led to some wrong signalling, with U.S. Vice President Mike Pence and National Security Adviser John Bolton referring to the 'Libyan model' for the talks. Mentioning Libya was akin to waving a red flag to the North Koreans, who angrily denounced Mr Pence and Mr Bolton, causing Mr

Trump to cancel the summit in retaliation. Once again, Mr Moon stepped into the breach as an intermediary and the meeting have been restored. To Mr Trump's credit, he has further softened his earlier demand for "the complete, verifiable, and irreversible denuclearisation of the Korean Peninsula" before any lifting of sanctions and has instead settled for "credible steps" by North Korea towards that goal.

The North is extremely unlikely to give up its entire nuclear deterrent, no matter what the inducement. Instead, it might, in stages, offer to suspend further weapon and missile tests, desist from producing more fissile materials and from non-deployment of shorter-range missiles that could threaten Japan or South Korea, and perhaps work towards partial disarmament. This will enable both sides to claim success by invoking the convenient ambiguities of the word "denuclearisation", even as the negotiations drag on until the U.S. congressional elections in November.

Source: <http://www.a-pln.org>, 12 June 2018.

OPINION – Anthony Kleven

China's Nuclear Energy Gambit

China, the world's biggest climate polluter, recently released a comprehensive three-year action plan on how to clean up its air and soil. The country intends to employ a number of tactics to cut down on its emissions, from developing green forms of transport to making industries more efficient to instituting a nationwide cap-and-trade program. Despite these initiatives by policymakers, however, China's need to decarbonize is so acute — the

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China's coal consumption will peak between 2020 and 2040, though some have argued that the peak may have already occurred and that from now on, China's economic growth will be decoupled from its coal usage. Some statistics seem to back this up — though national energy consumption increased by 1.4 percent in 2016, coal's share of consumption fell from 64 percent in 2015 to 62 percent the following year.

country faces around 1.6 million premature deaths a year due to pollution — that further efforts will be critical for China to meet its climate commitments. One of the options Beijing has been turning to is nuclear energy.

The State Council has repeatedly affirmed this need for further initiatives to control air pollution and ensure that the air quality continues to improve. "[China] should further markedly reduce the density of fine particulate matter and the number of days of heavy pollution within three years," read a statement released following last month's executive meeting, identifying the Beijing-Tianjin-Hebei region as the "main battlefield" in the fight against air pollution.

One essential element of this war on smog is finding a new source of baseload power to replace coal, which still provides over 60 percent of China's energy mix. Analysts have projected that China's coal consumption will peak between 2020 and 2040, though some have argued that the peak may have already occurred and that from now on, China's economic growth will be decoupled from its coal usage. Some statistics seem to back this up — though national energy consumption increased by 1.4 percent in 2016, coal's share of consumption fell from 64 percent in 2015 to 62 percent the following year.

In most countries, emissions have yet to peak. Global carbon dioxide emissions from energy use shot up 1.6 percent in 2017, a climb fed by both emerging and developed countries. In India, greenhouse gas output increased by a full 4.4 percent. In the EU, the world's largest carbon market, energy emissions increased by 1.5

percent. At present, few countries have concrete plans compatible with the Paris Agreement's goals — even Germany, for example, has admitted that it will miss its 2020 climate targets by a wide margin. While China traditionally hasn't been known as an environmental champion, it now seems determined to be at the forefront of reversing the trend of rising emissions.

In order to wean itself off coal and reduce environmental pollution while continuing to grow its economy, Beijing is increasingly turning to nuclear energy to feed the country's hunger for power in a more sustainable way. China currently has 39 nuclear power reactors in operation, with another 20 currently under construction, and plans for still more reactors. According to the 13th Five-Year Plan for power production released by the National Energy Administration (NEA), nuclear is expected to provide 8 percent to 10 percent of China's electricity needs by 2030.

Despite the administration's zeal for advancing its nuclear capabilities, however, China's domestic industry is struggling to find the deep expertise needed to reach these targets.

As a result, China has been looking for nuclear know-how from abroad. Russia has emerged as one viable supplier of nuclear technology, particularly now that many countries — including Japan, Germany, and Switzerland — have abandoned nuclear in the wake of the Fukushima disaster, while others, such as the United States, are decidedly refocusing on fossil fuels. Earlier in June, China National Nuclear Power Co. Ltd. and Russia's Rosatom inked a multibillion dollar agreement, the biggest nuclear energy deal between the two giants over the last decade.

Under the deal, Russia is set to build four generation three-plus VVER-1200 reactors: two at

the Xudabao power plant in China's Liaoning province, and two others at Tianwan in Jiangsu province. Given that the latter location has already been pegged as a testing ground for Russian nuclear technology, the latest deal confirms China's ongoing commitment to a bilateral energy partnership in which Russian technology provides a springboard for a state-of-the-art nuclear industry in China.

One potential reason why China has chosen to enter into closer cooperation with Russia rather than other exporters of nuclear technology is its past experiences with European and American-run projects, which have been characterized by persistent delays, technical problems and cost overruns. For example, China's first third-generation AP1000 reactor designed by U.S.-based Westinghouse is projected to be completed by November this year — more than four years behind schedule, after being beset by safety concerns and

design changes.

In a similar vein, the EPR in China's Taishan, partly managed by French state utility EDF, finally carried out its first nuclear chain reaction earlier this month. This was a world first for the technology; a similar reactor in Finland, built by a consortium between Areva and Siemens, is now on target to be completed a full 10 years late, while the Flamanville EPR project in France is running more than six years behind schedule, despite its cost ballooning to more than three times its initial budget.

Given this pattern of delays and bloated budgets, it's not surprising that China is looking to Russia instead to provide the technology it is hoping will slash its carbon emissions. A variety of factors, however, including China's desperate need to provide low-carbon baseload power to underpin

A variety of factors, however, including China's desperate need to provide low-carbon baseload power to underpin the large amounts of renewable capacity it is bringing on board, mean that the Chinese market has ample demand for Russian-built nuclear projects as well as those from other international partners. In fact, gaining experience with a variety of countries' latest-generation technologies could be a strategic move for China's domestic nuclear industry, which could then incorporate the best of each into its own designs.

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In fact, gaining experience with a variety of countries' latest-generation technologies could be a strategic move for China's domestic nuclear industry, which could then incorporate the best of each into its own designs. China's huge population and high rate of economic growth will always be a challenge as it seeks to keep its skies blue, but the recent nuclear deal and the release of its three-year-plan are encouraging signs that China is trying to do its part to transition to a cleaner, low-carbon future.

Source: <https://thediplomat.com>, 29 June 2018.

No other cities have been destroyed by a nuclear weapon. No nuclear wars have been fought. Only nine countries now possess nuclear arsenals, not dozens. The absence of nuclear catastrophes has multiple causes, among them: sober national leadership, wise crisis management, military professionalism, technical expertise and a remarkable amount of good luck. The NPT and the guiding spirit behind it also deserve a prominent place on that list.

OPINION – Eric Schlosser

Ban the Bomb: How the Treaty on the Non-Proliferation of Nuclear Weapons Helped Prevent Annihilation

At first, the destruction of Hiroshima and Nagasaki by atomic bombs in August 1945 was celebrated in the United States. The new weapon had seemingly ended the war with Japan, eliminating the need for a protracted and bloody invasion. However, the celebratory feeling was short-lived. That same month, General Henry H. Arnold, commander of the United States Army Air Forces, publicly warned that nuclear weapons might soon be placed atop missiles and aimed at American cities. Once launched, such weapons would be impossible to stop and “destructive beyond the wildest nightmares of the imagination.” Nuclear proliferation – the spread of this lethal technology to other countries – could lead to nuclear wars that threatened the survival of humanity.

A few months later, J. Robert Oppenheimer, the “father of the atomic bomb,” gave a farewell

speech to his fellow Los Alamos scientists that described how easily proliferation might occur. Nuclear weapons “are going to be very cheap if anyone wants to make them,” he said, “they are not too hard to make ... they will be universal if people wish to make them universal.” The invention of the atomic bomb, Oppenheimer thought, marked no less than “a change in the nature of the world.”

Almost 73 years have passed since Oppenheimer's speech – and a great many apocalyptic predictions have proven wrong. No other cities have been destroyed by a nuclear weapon. No nuclear wars have been fought. Only nine countries now possess nuclear arsenals, not dozens. The absence of nuclear catastrophes has multiple causes, among them: sober national leadership, wise crisis

management, military professionalism, technical expertise and a remarkable amount of good luck. The NPT and the guiding spirit behind it also deserve a prominent place on that list. The NPT is essentially a bargain struck between nations that have nuclear weapons and those that do not. Former president Barack Obama once explained its three pillars: “Countries with nuclear weapons will move toward disarmament, countries without nuclear weapons will not acquire them and all countries can access peaceful nuclear energy.”

Nevertheless, as the NPT approaches its 50th anniversary next month, the treaty faces unprecedented assaults and the prospect of nuclear arms races in Asia and the Middle East. Of the 190 countries that have signed the NPT, North Korea is the only one that's withdrawn from it and developed nuclear weapons. The summit between President Kim Jong-un and President Donald Trump will help determine the fate of a decades-long international effort to stop the spread of nuclear weapons – and prevent the sort of nuclear annihilation that the inventors of the

atomic bomb greatly feared.

The NPT began as a 1958 push by Ireland to dissuade the United States from sharing nuclear weapons with its NATO allies, especially West Germany. At the time, four countries had nuclear weapons: the United States, the Soviet Union, Britain and France. After a slow, uneven start, the non-proliferation movement gained momentum in 1964 when China detonated its first nuclear device. U.S. intelligence estimates had warned the previous year that eight other countries – Australia, Egypt, West Germany, India, Israel, Japan, South Africa and Sweden – could produce nuclear weapons within a decade.

An additional six – Argentina, Brazil, Bulgaria, Hungary, Romania and Yugoslavia – might have them by the early 1980s. The Cuban Missile Crisis had demonstrated that a confrontation between two nuclear powers could inadvertently start a nuclear war. And numerous nuclear-weapon accidents suggested that disasters could be caused by simple mistakes and

and miscalculations. It seemed obvious that if more countries possessed nuclear weapons, the danger would increase. Working closely with the Soviet Union, the United States played a large role in drafting the NPT. On July 1, 1968, the first day that the treaty was open for signature, 66 countries signed it, and less than two years later, the NPT went into effect. It seemed a triumph of international co-operation on behalf of world peace.

During the next quarter-century, the NPT was more successful at preventing the spread of nuclear weapons than at achieving disarmament. The five nuclear-weapon states recognized by the treaty had promised to seek “cessation of the nuclear arms race at an early date ... and complete disarmament under strict and effective international control.” And yet, none of those things happened during the 1970s and ‘80s.

Meanwhile, the other NPT signatories had kept their side of the bargain and forsworn nuclear weapons. The four additional countries that eventually did obtain them – Israel, India, Pakistan and South Africa – had never signed the treaty.

During the early 1990s, the threat of nuclear war finally seemed to be diminishing. South Africa not only gave up its nuclear weapons but also signed the NPT. After the collapse of the Soviet Union, the Ukraine had the world’s third-largest nuclear arsenal. Nevertheless, it surrendered the weapons, as did Belarus and Kazakhstan, two other former Soviet republics with nuclear

stockpiles, and all three signed the NPT. The end of the Cold War led the United States and Russia to make enormous cuts in their nuclear arsenals, reducing the number of weapons by about 80 per cent. However, grand hopes that the 21st century would see the end of the nuclear threat were illusory.

One of the compromises that made the NPT possible now threatens to make it irrelevant. Article IV of the treaty guarantees its

signatories “the inalienable right” to obtain nuclear technology for peaceful uses. Without strict monitoring and enforcement, however, the possession of civilian nuclear-power facilities can enable the development of military nuclear technology. Weapons-grade uranium and plutonium can be made at enrichment and reprocessing plants ostensibly built to make fuel for nuclear reactors. India developed its atomic bomb with civilian nuclear technology obtained from Canada and the United States; Israel got its bomb with civilian technology from France. Despite having signed the NPT, Iran, Iraq, Libya, North Korea and Syria secretly launched nuclear-weapon programs under the guise of seeking the peaceful use of nuclear energy.

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Today, all three pillars of the NPT are in grave jeopardy. Instead of disarming, the five nuclear states recognized by the treaty are modernizing their arsenals. The renewed arms race between the United States and Russia is especially dangerous. Thanks to the “inalienable right” to civilian nuclear power, perhaps 20 to 30 NPT signatories have the latent ability to develop nuclear weapons. Japan has stockpiled about 10 tonnes of plutonium, enough to produce thousands of nuclear warheads.

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Last year, an opinion poll found that about 60 per cent of South Koreans would like their country to have its own nuclear weapons. Henry Sokolski, executive director of the Non-proliferation Policy Education Centre in Washington, thinks that the Middle East now stands on the brink of a volatile and chaotic nuclear arms race. “If Iran resumes its nuclear weapons program,” Mr. Sokolski recently wrote in *Foreign Policy*, “the Saudis will certainly pursue their own – and Algeria, Egypt and Turkey might well follow.” Given the large petroleum and natural-gas supplies in Saudi Arabia, as well as the ample sunlight available there for solar power, the current Saudi proposal to spend more than \$80-billion on nuclear technology suggests that future energy needs are not the sole reason for the investment.

To ensure that a treaty written to halt the proliferation of nuclear weapons is not transformed into one that facilitates their spread, a number of important steps can still be taken. The United States and Russia possess about 90 per cent of the world’s nuclear weapons, and those two countries must be pressured to reduce the size of their arsenals and minimize the risk of nuclear war. Frustrated with the slow pace of disarmament by the NPT’s five nuclear states, a few years ago the ICAN began to seek a treaty to ban nuclear weapons. The United Nations adopted the Treaty on the Prohibition of Nuclear Weapons last year, and ICAN was subsequently awarded the Nobel Peace Prize. Ray Acheson, a Canadian who serves on ICAN’s steering committee, supports the goal of non-proliferation but strongly defends the group’s strategy of

focusing their criticism on the NPT’s five nuclear states. “The nuclear weapons that already exist are more dangerous,” she says, “than the ones that don’t.”

As for the other NPT signatories, Scott Sagan, a nuclear-weapon expert who’s a professor of political science at Stanford University, thinks that an “unalienable right” to the peaceful use of nuclear energy doesn’t mean the right to hedge your bets and develop a latent nuclear-weapon capability. The NPT allows a country to leave the treaty simply by giving 90 days’ notice. Prof. Sagan argues that violating the treaty should lead to much stronger punishments by the United Nations and that leaving the treaty should be made more difficult. Contracts for the sale of civilian nuclear facilities and technology should have a “return to sender” clause – a requirement that any country that leaves the NPT must return all the nuclear equipment it bought.

The issue of nuclear proliferation is hardly inconsequential for Canada. Although Canada has never formally been a nuclear weapon state, its deployment of American weapons during the Cold War was precisely the sort of arrangement that inspired Ireland to seek a non-proliferation treaty. Between 1963 and 1984, hundreds of American nuclear weapons were assigned to Canadian forces. Two squadrons of BOMARC anti-aircraft missiles, carrying 56 warheads, were based at North Bay, Ont., and La Macaza, Que. About 100 Genie anti-aircraft rockets with nuclear warheads were stationed at Royal Canadian Air Force bases, and Canadian fighter planes assigned to NATO carried low-yield Mark 28 hydrogen bombs. The weapons were technically in the custody of the United States, but Canadian officers were granted the authority to turn one of the two keys that launched the BOMARC missiles – and sole control over firing the Genies and dropping the Mark 28s. A Soviet bomber attack on the United States would have prompted nuclear warfare in the skies over Canada, as BOMARCS and Genies sought their targets.

In addition, the three nuclear-weapon systems operated by Canadian forces had serious safety

defects that could have caused accidental nuclear detonations. Canada, like the United States, was fortunate to survive the Cold War without nuclear devastation. The effects of nuclear blasts, the electromagnetic pulses and deadly fallout, show little regard for national borders. Even if you do not have nuclear weapons, having a neighbour who does can pose a considerable threat.

Some academics have argued nuclear proliferation might make the world safer, suggesting that countries with nuclear weapons are less likely to fight one another. That argument makes about as much sense as the contention that having more guns will reduce the number of people killed by gunfire. A single switch prevented the accidental detonation of an American hydrogen bomb in North Carolina during January 1961.

The following year the vote of a single officer on a Soviet submarine prevented the launch of a nuclear torpedo that would have turned the Cuban Missile Crisis into a thermonuclear war. The number of narrow escapes during the arms race between the United States and the Soviet Union is terrifying. Multiply that number by multiple arms races and, short of divine intervention, you have a recipe for disaster. ... If North Korea can be persuaded to give up its nuclear weapons, it will be a tremendous victory for the cause of non-proliferation.

But lasting success will never be attained by the kind of unilateral American action that has lately started a trade war with longstanding allies, pulled out of the Iran deal and withdrawn from the Paris agreement on climate change. "I alone can fix it," Mr Trump declared two summers ago at the Republican National Convention. Applied to nuclear weapons, that belief is delusional and potentially catastrophic. International co-

operation, through mechanisms like the NPT, offers the only real hope of survival. Robert Oppenheimer recognized that fact in his farewell speech to the Los Alamos scientists, at the dawn of the nuclear age. He told them: "I think it is true to say that atomic weapons are a peril which affect everyone in the world, and in that sense a completely common problem."

Source: *The Globe and Mail*, 08 June 2018.

OPINION – Craig Richard

US Coal, Nuclear Subsidy Plans Go Against the Grain

The DoE plans to "purchase or arrange the purchase of electric energy or electric generation capacity" for two years and delay coal and nuclear plant retirements, according to a memo made public on 1 June. In picking winners in the energy sector, the government would also be selecting losers. The proposal goes against energy market trends, against previous rulings on similar bailout plans, and against Trump's protectionist justification for its steel and aluminium trade war.

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A coalition of energy industry organisations, including the American Wind Energy Association (AWEA), condemned the proposals, claiming it would hurt consumers and businesses alike. Large corporations such as Facebook, Google, General Motors, and Walmart have in increasing numbers and regularity, directly bought wind power through corporate power purchase agreements, as highlighted by AWEA figures released at the start of May. Power purchase agreements (PPAs) were signed for more than 3.5GW of wind power in the first quarter of the year – the highest volume of deals in any quarter since AWEA started tracking them. Further, utilities such as Ameren, MidAmerican Energy, and Rocky Mountain Power (PacifiCorp's unit in Idaho) have all cited economic

reasons behind their decisions to source or build wind power in recent months as costs fall.

The DoE justifies its proposal to revive a Cold War-era protectionist law – the Defence Production Act of 1950 – and buy power from a list of designated coal and nuclear power plants on the grounds of national security. It argues there are “growing threats of multi-point attacks...or other disruptions to the energy sector”, and that recent and announced retirements of “fuel-secure electric generation capacity” had undermined the security of the US’ electric power system. It further argues that such resources include “nuclear power, coal infrastructure, and pipeline infrastructure”, and describes them as “basic components of the nation’s domestic industrial base”. Further, a Federal Energy Regulatory Commission (FERC) ruling in January rejected a similar DoE proposal to subsidise coal and nuclear. When, in September, the DoE proposed paying “traditional base load resources, such as coal and nuclear” to continue to meet a minimum demand for energy, its suggestion was unceremoniously rejected.

FERC commissioner Richard Glick argued that the retirement of coal and nuclear generators had not diminished the grid’s reliability or resilience. Whether the FERC will deliver a similarly withering judgement on the latest plans for a coal and nuclear bailout remains to be seen. Of course, a fundamental irony in this proposed intervention in the energy market comes as the Trump administration wages a trade war in the name of “fair trade”. Trump has proposed slapping a 25% tariff on imported steel and a 10% tax on foreign aluminium. Bailing out coal and

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nuclear and selecting winners in its energy market may be consistent with Trump picking favourites, imposing tariffs, and erecting barriers to foreign manufacturers without US-based factories. However, it is not consistent with Trump’s justification for the trade war, tweeted the day the DoE memo was released to financial newswire Bloomberg: “FAIR TRADE!” his account roared on 31 May.

Source: <https://www.windpowermonthly.com>, 05 June 2018.

OPINION – Nur Azha Putra, Philip Andrews-Speed

Prospects for Nuclear Power in ASEAN

Last April, the ASEAN Center for Energy (ACE) published a “Pre-Feasibility Study on the Establishment of Nuclear Power Plant in ASEAN.” The report was prepared by ACE with the support of the government of Canada under the Nuclear and Radiological Program Administrative Support (NPRAS) program.

Half of the 10 ASEAN member states – Indonesia, Malaysia, Vietnam, Thailand and the Philippines – have been identified as frontrunners to establish civilian nuclear power programs in the region. These five states are considered frontrunners due to their more advanced legal and regulatory frameworks, nuclear energy infrastructures, and developed organization and human resources.

This study may be the first official report produced by the ASEAN in recent years to provide a comprehensive account of the state of play of civilian nuclear power development in the region in the mid- to long-term period. Previous accounts of civilian nuclear power development in ASEAN were published as research reports or articles by think tanks and academics.

The new report highlights three interesting developments. First, half of the 10 ASEAN member states – Indonesia, Malaysia, Vietnam, Thailand and the Philippines – have been identified as frontrunners to establish civilian nuclear power

programs in the region. These five states are considered frontrunners due to their more advanced legal and regulatory frameworks, nuclear energy infrastructures, and developed organization and human resources. These criteria are among the 19 nuclear infrastructure issues that are outlined in the IAEA Milestones Approach to nuclear infrastructure development.

Second, based on the current developments and progress that these five states have made, it appears that the region may have its first operational civilian nuclear power plant by 2030 and perhaps two more by 2035. Indonesia is expected to commercialize its first experimental nuclear power plant by 2030 while Malaysia and Thailand plan to introduce nuclear electricity into their respective national power mixes by 2035. The remaining two frontrunners, the Philippines and Vietnam, are committed to introducing nuclear energy in their long-term energy mixes.

Third, the report highlights Malaysia as having the most accomplished approach given the good progress that its nuclear energy program implementation office (NEPIO) has made. Malaysia's NEPIO, the Malaysian Nuclear Power Corporation, was formed by the government in 2011. The role of MNPC specifically and any NEPIO, in general, is to plan, coordinate and lead the implementation of the country's nuclear power program.

Of the remaining ASEAN member states, Laos, Cambodia, and Myanmar have not ruled out the use of nuclear power but they have not committed to any specific infrastructure development plans

and implementation timelines. However, all three have signed bilateral agreements with Russia on nuclear power cooperation. Brunei and Singapore do not have any plans for nuclear power projects at the moment but Singapore's government has committed significant resources to developing local capabilities in the areas of nuclear safety and science through the Nuclear Safety and Research and Education Program.

What Do These Findings Mean for The Region?

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Civilian nuclear power development in Southeast Asia is not new. Initial development in the field began right after the end of World War II, through the United States' Atoms for Peace program, which opened up civilian nuclear research and technology to

non-nuclear states. As a consequence of that program and with the assistance of the United States, several TRIGA-class nuclear research reactors were constructed in Indonesia, the Philippines, Vietnam, Malaysia, and Thailand. These research reactors were built for medical and research purposes.

India's nuclear history disproves the linear model of nuclear weapons proliferation where insecurity vis-à-vis a bigger and hostile nuclear power is the principal source of a state's motivation to pursue nuclear weapons as was the case with the Soviet Union, China and to a certain extent both the United Kingdom and France.

However, the development of a commercial civilian nuclear power plant is costly and it takes a long time. The average timeline is at least 10 to 15 years and the average cost is between \$6 and 9 billion per unit. The costs could grow exponentially if there are construction delays, which is not uncommon in

the industry. However, given strong political will and careful planning backed with the right technical support from established industrial players, the construction of a civilian nuclear power plant can be completed according to schedule with a minimal cost overrun.

One potential example is the construction of the

United Arab Emirates' \$25 billion Barakah nuclear power station, which will have four nuclear reactor units, each with a generating capacity of 1,400 MW. The Barakah Nuclear Power Plant is expected to deliver up to 25 percent of the country's total electricity needs. The construction of the first unit began in 2012 and was completed in March this year while the remaining three units are expected to be completed in 2019 and 2020. Therefore, the UAE government took just 10 years, from the initial publication of the White Paper in 2008, to complete the construction of the country's first nuclear power plant and reactor unit, which is a remarkable feat for a nuclear newcomer.

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On that note, it remains probable that among the five ASEAN frontrunner states, Indonesia, Malaysia, and Thailand could be operating their first nuclear power plants by 2030 and 2035 — or earlier if certain conditions are in place.

While the ASEAN frontrunners have shown progress in their nuclear power infrastructure development, they should continue to meet the global safety, security, and safeguard standards that are expected of any nuclear newcomer. While it is the sovereign right of every state to construct civilian nuclear power plants, they are obliged to do so as a responsible and cooperative member of the international nuclear community.

First, one of the biggest obstacles to nuclear newcomer states is public perception and acceptance. Indonesia is an exception, but public perceptions and acceptance in Malaysia and Thailand remain low. The Fukushima Daichi nuclear power accident in Japan in 2011, which raised the issue of nuclear power safety, remains the biggest bugbear for the general public in both states and the region in general. These states should continue to educate, engage, and consult the public and non-state actors. However, another Fukushima-like accident in the near future will

clearly further erode public perception and confidence.

Second, a push toward nuclear power will hinge on whether these states can continue to justify the use of nuclear power as an alternative fuel option. Nuclear power makes economic sense if the alternative fuel options are too costly or unreliable to provide baseload electricity demands during peak periods. Vietnam, for example, halted its plan to construct its first nuclear power plant for economic reasons, given that there

are cheaper fuel options and projected lower energy demands in the future. However, it should be noted that the recent resurgence of interest in nuclear power in the region came just after the global energy and financial crises between 2007 and 2008. Another such crisis would provide the impetus for the ASEAN frontrunners to prioritize nuclear power compared to other fuel alternatives.

Finally, while the ASEAN frontrunners have shown progress in their nuclear power infrastructure development, they should continue to meet the global safety, security, and safeguard standards that are expected of any nuclear newcomer. While it is the sovereign right of every

state to construct civilian nuclear power plants, they are obliged to do so as a responsible and cooperative member of the international nuclear community. Among other things, this means that nuclear newcomer states are expected to continue working toward implementing the relevant international legal instruments and standards,

host regular peer reviews missions from IAEA, and conduct their affairs with transparency.

Civilian nuclear power development is an expensive endeavor, requiring a long-term commitment from the government, and nuclear power plants pose risks that could be managed through good governance. The ASEAN Center for Energy's report itself is an indication that the ASEAN member states are working together and are open and transparent about their aspirations and state of nuclear power infrastructure development, which augurs well for the region.

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

NUCLEAR STRATEGY

INDIA–PAKISTAN

Pakistan may continue to remain slightly ahead of India in terms of the number of nuclear warheads, with China having double the quantity, but the Indian defence establishment believes its deterrence capability is "robust", designed to ensure "survivability" for retaliatory strikes and firmly on track for further modernization.

Pakistan now has 140-150 nuclear warheads as compared to 130-140 of India, with China hovering around 280, as per the latest assessment of the SIPRI. The US and Russia are in a different league altogether with 6,450 and 6,850 nuclear warheads respectively, together accounting for 92 per cent of the 14,465 nuclear weapons around the globe. Arsenals of the other seven nuclear-armed countries are considerably smaller, but all are either developing or deploying new nuclear weapon systems. "India and Pakistan are both expanding their nuclear weapon stockpiles as well as developing new land, sea and air-based missile delivery systems. China continues to modernize its nuclear weapon delivery systems and is slowly increasing the size of its nuclear arsenal," said SIPRI.

Defence establishment sources here say India, confronted with the collusive threat from China and Pakistan, has no other option but to systematically build nuclear deterrence that is "credible" and capable of inflicting massive damage in a retaliatory strike to any first strike by an adversary. "The number of warheads do not really matter. With a declared NFU nuclear policy, India is keen to ensure survivability and credibility of our assets and NC3 (nuclear command, control and communication) systems for assured second-strike capabilities.... We have achieved this to a large extent," said a source.

Pakistan, of course, has deliberately kept its nuclear policy ambiguous to deter India from undertaking any conventional military action despite repeated provocations, even as it fast supplements its enriched uranium-based nuclear

programme with a weapons-grade plutonium one through the four heavy water reactors at the Khushab nuclear complex with help from China.

Islamabad also often brandishes its 70-km range Nasr (Hatf-IX) nuclear missiles as an effective battlefield counter to India's "Cold Start"

strategy of swift, high-voltage conventional strikes into enemy territory. "For India, nuclear weapons are not war-fighting weapons. But we need credible minimum deterrence, with the certainty of massive retaliation against adversaries," said the source.

China, with its rapid military modernization and expanding nuclear and missile arsenals, of course remains a major worry. Towards this end, it's estimated that India, which has a largely plutonium-based nuclear weapons programme, would like to achieve a stockpile of around 200 warheads in the decade ahead. The tri-Services SFC is now in the process of inducting India's first intercontinental ballistic missile, the over 5,000-km range Agni-V missile, which can hit even the

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northernmost region of China.

But the continuing lack of an adequate number of nuclear-powered submarines armed with long-range nuclear-tipped missiles, which can silently stay underwater for extended periods, needs to be plugged to achieve a credible nuclear weapons triad. "Projects are underway to achieve this," said the source.

Source: Rajat Pandit, The Times of India, 19 June 2018.

NORTH KOREA

North Korea has Increased Nuclear Fuel Production at Secret Sites

North Korea has increased its production of fuel for nuclear weapons in recent months, US intelligence agencies believe, despite Donald Trump's claims "there is no longer a nuclear threat" from the secretive state. Pyongyang may be trying to hide its activities at multiple secret sites while seeking concessions in nuclear talks with the US, NBC News quoted US officials as saying. It comes after Mr Trump claimed success in his unprecedented 12 June meeting with Kim Jong-un, the North Korean dictator, over denuclearisation.

In a report, NBC said what it described as the latest US intelligence assessment appeared to go counter to sentiments expressed by Mr Trump. The network quoted five unidentified US officials as saying that in recent months North Korea had stepped up production of enriched uranium for nuclear weapons, even as it engaged in diplomacy with the US.

It cited US officials as saying that the intelligence

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saying.

The CIA declined to comment on the report. The State Department said it could not confirm the report and did not comment on matters of intelligence. The White House did not respond to a request for comment. The report raises further questions about North Korea's readiness to enter serious negotiations about giving up a weapons programme that now threatens the US, in spite of Mr Trump's enthusiastic portrayal of the summit outcome.

NBC quoted one senior US intelligence official as saying that North Korea's decision ahead of the summit to suspend nuclear and missile tests was unexpected and the fact that the two sides were

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assessment concludes that North Korea has more than one secret nuclear site in addition to its known nuclear fuel production facility at Yongbyon. "There is absolutely unequivocal evidence that they are trying to deceive the US," NBC quoted one official as

talking was a positive step. However, he added: "Work is ongoing to deceive us on the number of facilities, the number of weapons, the number of missiles.... We are watching closely." Jeffrey Lewis, director of the East Asia nonproliferation programme at California's Middlebury Institute of International Studies, said

there were two "bombshells" in the NBC report.

He said it had long been understood that North Korea had at least one undeclared facility to enrich nuclear fuel aside from Yongbyon. "This assessment says there is more than one secret site. That means there are at least three, if not more sites," he said. Mr Lewis said the report also implied that US intelligence had reporting to suggest North Korea did not intend to disclose

one or more of the enrichment sites. "Together, these two things would imply that North Korea intended to disclose some sites as part of the denuclearisation process, while retaining others," he said.

Source: <https://www.independent.co.uk>, 30 June 2018.

The newly developed hypersonic rocket with - which reportedly has an "unlimited range" - is now among others being readied for battle by the Kremlin. They include a nuclear-powered cruise missile and a nuclear-powered underwater drone -which can spark 300ft tsunamis. "A number of our weapons systems are years, and, perhaps, decades ahead of foreign analogs," Putin told young military officers.

RUSSIA

Russian President Vladimir Putin boasts his nuclear weapons are DECADES more advanced than his rivals

Vladimir Putin has boasted Russia is now decades ahead when it comes to developing state-of-the-art NUKES. Bragging to Russian military cadets, he said his army's new weapons represent a quantum leap in the nation's military capabilities. His claims comes after the Sun online revealed how Russia was already developing an "unstoppable" intercontinental ballistic missile which cannot be intercepted by any anti-missile system on earth.

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The tough statement comes as Putin is preparing for a summit with US President Donald Trump set

for July 16 in Helsinki, Finland. Russia-US relations have plunged to post-Cold War lows over the war in Syria, allegations of Russian meddling in the 2016 US presidential election and differences over nuclear arms control issues. "We have achieved a real breakthrough thanks to the colossal efforts by science and design bureaus and industries, a real feat by

workers, engineers and scientists," claimed Putin.

The Russian leader singled out the new Avangard hypersonic vehicle and the new Sarmat ICBM, which are both set to enter service in the next few years. Putin also mentioned the Kinzhal hypersonic missile that has already been put on duty with the units of Russia's Southern Military District.

Putin said the Avangard has an intercontinental range and can fly in the atmosphere at a speed 20 times the speed of sound. The Russian leader added that the weapon can change both its course and its altitude en-route to a target, making it "absolutely invulnerable to any air or missile defence means." He said Avangard has been designed using new composite materials to withstand temperatures of up to 2,000 Celsius resulting from a flight through the atmosphere at hypersonic speeds.

The Sarmat is intended to one day replace the Soviet-designed Voyevoda, the world's heaviest ICBM, which is known as "Satan" in the West and which carries 10 nuclear warheads. Putin said Sarmat weighs 200 metric tons and has a higher range than Satan, allowing it to fly over the North or the South Poles and strike targets anywhere in the world.

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more powerful than the ones on the Satan.

Source: Jon Lockett, <https://www.thesun.co.uk>, 29 June 2018.

USA

Nuclear Gravity Bomb Completes First Qual Tests on B-2 Bomber

The B61-12 guided nuclear gravity bomb has gone through its first series of tests on the B-2 Spirit stealth bomber. The Air Force, together with the Department of Energy's National Nuclear Security Administration, earlier in June released a B61-12 non-nuclear test assembly from the Spirit. The kit included a NNSA-designed bomb assembly and the Air Force's acquired tail-kit to be used on the B61-12 variant of the bomb, according to a Department of Energy release.

"These qualification flight tests demonstrate the B61-12 design meets system requirements and illustrate the continued progress of the B61-12 life extension program to meet national security requirements," said Brig. Gen. Michael Lutton, NNSA's principal assistant deputy administrator for military application. "The achievement is also a testament to the dedication of our workforce and the enduring partnership between NNSA and the U.S. Air Force," he added in the release.

The two non-nuclear system qualification flight tests of the B61-12 took place on June 9 at Tonopah Test Range in Nevada, officials said. They were conducted by the 419th Test & Evaluation Squadron at Edwards Air Force Base, California. The exercises marked first such "end-to-end qualification tests on a B-2A Spirit Bomber for the B61-12," the release

said. "The tests are part of a series of joint tests to demonstrate both the aircraft's capability to deliver the weapon and the weapon's non-nuclear functions."

Part of the system's hardware is designed by Sandia National Laboratories and Los Alamos National Laboratory and manufactured by the Nuclear Security Enterprise plants. Meanwhile, Boeing Co. has designed and manufactured the

tail-kit assembly under contract with the Air Force Nuclear Weapons Center, officials said. Using the B61-12 will help consolidate and replace the existing B61 bomb variants in the U.S.'s nuclear stockpile, the release said. The first completed bomb kits are scheduled to debut sometime in fiscal 2020.

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In May, top Air Force officials announced trials with the B61-12 were progressing successfully. "We've already conducted 26 engineering, development and guided flight tests," said Lt. Gen. Jack Weinstein, deputy chief of staff for strategic deterrence and nuclear integration. "The program's doing extremely well."

The B61-12 modification program, which has been in the works for at least seven years, is slated to be carried by the B-2, as well as the future B-21 Long Range Strategic Bomber, known as the Raider. The F-35 Lightning II Joint Program Office has also been working on integrating the latest modification into its weapons arsenal. The F-35 was designed with a requirement to carry a nuclear payload. In 2015, an F-35 flew with the B61-12 to measure its vibration in the

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aircraft's weapons bay. Both of the fourth-gen fighters will be able to deploy the B61-12 bomb. The B61-12 also conducted its third and final developmental test flight aboard an F-15E in 2015.

Source: <https://www.military.com>, 30 June 2018.

BALLISTIC MISSILE DEFENCE

USA

Is Ballistic Missile Defence a Waste of the US Navy's Ships?

The United States employs a three-tier missile defence apparatus that allows it to cover as much territory as possible while providing an overlapping blanket of capability in the event the first or even second layer of defence were to fail to intercept an aggressor's incoming ballistic missile. However, with the U.S. Navy in the Pacific lamenting their high operational tempo, some senior officials have begun calling on the U.S. Defence apparatus to find shore based solutions that free up naval assets for growing threats like Chinese and Russian naval efforts.

Adm. John Richardson, Chief of Naval Operations, made it clear in his statements that he would like to see the Navy transition away from operating ballistic missile defence patrols, indicating that the use of the Navy's surface combatants for this role is a waste of capabilities and resources. Richardson said, right now...I have six multi-mission, very sophisticated, dynamic cruisers and destroyers — six of them are on ballistic missile defence duty at sea and if you know a little bit about this business, you know that geometry is a tyrant. You have to be in a tiny little box to have a chance at intercepting that incoming missile. So, we have six ships that could go anywhere in the world, at flank speed, in a tiny little box, defending land."

Richardson did acknowledge that the Navy's value as a part of ballistic missile defence is truly there, and even acknowledged that continuing to use the Navy for these purposes in future emergencies makes perfect sense. However, he contended building and equipping Navy warships for such a singular purpose (as many have been used during heightening tensions on the Korean peninsula) keeps these ships from serving as a deterrent force for naval threats posed by competing nations. Instead, Richardson would like to see land

based assets deployed in regions of the world that require persistent missile defence capabilities. He said,

It is a good capability and if there is an emergent need to provide ballistic missile defence, we are there but 10 years down the road, it is time to build something on land to defend the land. Whether that's AEGIS ashore or whatever, I want to get out of the long-term missile defence business

and move to dynamic missile defence."

Naval vessels tasked with ballistic missile defence have to maintain a presence in very specific places, steaming in figure-eight patterns for weeks on end, waiting for a launch that will hopefully never come. Once satellites detect a missile launch, these Aegis ships along with other regional assets work quickly to assess the trajectory of the missile and determine the level of threat it poses. If that threat exceeds a certain parameter, the decision to attempt an intercept is made, and the naval asset in the region with launches kinetic interceptors. The fact is that these standoffs usually entail a great deal more waiting than anything else, and with Russia's Navy claiming to have infiltrated the waters surrounding American East Coast naval bases with submarines and China rapidly expanding their naval presence in places like the hotly contested South China Sea, many like Richardson are

If that threat exceeds a certain parameter, the decision to attempt an intercept is made, and the naval asset in the region with launches kinetic interceptors. The fact is that these standoffs usually entail a great deal more waiting than anything else, and with Russia's Navy claiming to have infiltrated the waters surrounding American East Coast naval bases with submarines and China rapidly expanding their naval presence in places like the hotly contested South China Sea.

beginning to believe that America's Cruisers and Destroyers might be better suited for the naval combat they were built for, rather than as a floating platform for missile interceptors.

Some have even argued that the operational tempo mandated by these missile defence patrols has led to the recent issues with readiness — prompted by the number of ships required for patrol rotations and the Navy's inability to provide the necessary training to sailors tasked with accomplishing these missions. Last year, a number of high-profile incidents involving U.S. Navy ships, including two deadly collisions with merchant vessels, led many to question the way in which the Navy is engaging in Pacific Defence. There can be no question that these missile defence patrols have played a role in the strained scheduling of Navy assets. "Over time this is one of the places the Navy has made sacrifices in training and readiness," Bryan Clark, a retired submariner and analyst with the Centre for Strategic and Budgetary Assessments told Defence News. "Because of the high demand, when the [cruisers and destroyers] go into their training cycles they've had to do abbreviated versions of the work-ups that focus specifically on missile defence instead of training for the full range of missions those ships are capable of performing."

Source: <https://sofrep.com>, 19 June 2018.

USA-IRAN

Trump should Enhance Multilateral Missile Defence Cooperation with Gulf States

In May, President Trump announced that the United States was withdrawing from the JCPOA with Iran. One of the key reasons he cited was that the JCPOA did not address Iran's continuing development and deployment of ballistic missiles.

Many experts, including myself (and several of

my Brookings colleagues), disagreed with the Trump administration's decision to withdraw from the JCPOA. However, most agree that Iran's ballistic missiles represent a serious threat to the security of U.S. deployed forces and partners in the region and need to be addressed. Unfortunately, since taking office in January 2017, the Trump administration has done very little to advance one of the best options available for addressing the Iranian ballistic missile threat: enhancing multilateral missile defence cooperation with the Gulf States.

The GCC States and Missile Defence: One of the

key lessons that the United States and the Gulf states learned from the first Gulf War in 1991 was the importance of developing effective ballistic missile defence capabilities. This was driven by Iraq's ballistic missile attacks on Saudi Arabia and Bahrain. Since the 1990s, every Gulf state, with the exception of Oman, has purchased missile defence capabilities. For example,

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Saudi Arabia, Bahrain, Kuwait, Qatar, and the United Arab Emirates all possess Patriot PAC-2 and PAC-3 missile defence systems. Additionally, Saudi Arabia and the United Arab Emirates have purchased the THAAD system. Indeed, the Gulf States possess some of the world's most advanced missile defence capabilities. Having said that, one major problem remains. There has been very little integration of these various national systems. While there are some technical challenges standing in the way of greater missile defence integration among the Gulf States, the primary problem is political.

Previous Steps to Enhance Missile Defence Integration with the Gulf States: The United States

had long understood the need to promote greater missile defence integration with the Gulf States, especially through the multilateral GCC. The rationale for greater integration is simple: By

sharing radar data and other information, we can improve the probability of intercepting ballistic missile and enabling a more efficient use of limited interceptors and minimizing waste—that is, firing more than the necessary number of interceptors at a threat missile.

However, prior to 2012, little political effort had been expended to advance more robust forms of multilateral cooperation in the region. This began to change with the inaugural meeting of the U.S.-Gulf Security Forum, held in Riyadh, Saudi Arabia on March 31, 2012. At the forum, U.S. Secretary of State Hillary Clinton noted the “rock-solid commitment of the United States to the people and nations of the Gulf,” and that “furthering ballistic missile defence for the region” was a key priority. At the Manama dialogue in Bahrain the following year, U.S. Secretary of Defence Chuck Hagel echoed Clinton’s call for increased missile defence integration. Hagel stated:

“DoD will work with the GCC on better integration of its members’ missile defence capabilities. We applaud the efforts of many Gulf States to acquire new and enhanced missile defence capabilities in the face of the growing regional missile threat. But the United States continues to believe that a multilateral framework is the best way to develop interoperable and integrated regional missile defence.”

With that senior-level guidance from the secretaries of defence and state, the U.S. government launched a major interagency effort to improve missile defence integration with the GCC states. These efforts culminated at the Camp David Summit on May 14, 2015. At the summit, GCC members announced their commitment “to develop a region-wide ballistic missile capability, including through the development of a ballistic missile warning system” and to participate in a “senior leader table top exercise to examine improved regional ballistic missile defence cooperation.”

These summit missile defence commitments were largely completed by the fall of 2016. The senior leadership tabletop exercise, which brought together officials and military officers, was held

in Kuwait in April 2016, and the ballistic missile early warning study was completed and provided to the GCC in August 2016. The United States had also designated the GCC eligible to make multilateral purchases through the U.S. Foreign Military Sales program. Therefore, by the end of the Obama administration, all the necessary building blocks were in place to achieve greater missile defence integration with the GCC.

Source: <https://www.brookings.edu>, 20 June 2018.

NUCLEAR ENERGY

INDIA

India’s Quest to Find a Trillion-Dollar Nuclear Fuel on the Moon

India’s space programme wants to go where no nation has gone before – to the south side of the moon. And once it gets there, it will study the potential for mining a source of waste-free nuclear energy that could be worth trillions of dollars.

The nation’s equivalent of NASA will launch a rover in October to explore virgin territory on the lunar surface and analyse crust samples for signs of water and helium-3. That isotope is limited on Earth yet so abundant on the moon that it theoretically could meet global energy demands for 250 years if harnessed. “The countries which have the capacity to bring that source from the moon to Earth will dictate the process,” said K Sivan, chairman of the ISRO....

The mission would solidify India’s place among the fleet of explorers racing to the moon, Mars and beyond for scientific, commercial or military gains. The governments of the US, China, India, Japan and Russia are competing with startups and billionaires Elon Musk, Jeff Bezos and Richard Branson to launch satellites, robotic landers, astronauts and tourists into the cosmos.

The rover landing is one step in an envisioned series for ISRO that includes putting a space station in orbit and, potentially, an Indian crew on the moon. The government has yet to set a timeframe.

... ISRO's estimated budget is less than a 10th of that – about USD 1.7 billion – but accomplishing feats on the cheap has been a hallmark of the agency since the 1960s. The upcoming mission will cost about USD 125 million – or less than a quarter of Snap Inc. co-founder Evan Spiegel's compensation last year, the highest for an executive of a publicly traded company, according to the Bloomberg Pay Index.

... The upcoming launch of Chandrayaan-2 includes an orbiter, lander and a rectangular rover. The six-wheeled vehicle, powered by solar energy, will collect information for at least 14 days and cover an area with a 400-meter radius. The rover will send images to the lander, and the lander will transmit those back to ISRO for analysis.

A primary objective, though, is to search for deposits of helium-3. Solar winds have bombarded the moon with immense quantities of helium-3 because it's not protected by a magnetic field like Earth is. The presence of helium-3 was confirmed in moon samples returned by the Apollo missions, and Apollo 17 astronaut Harrison Schmitt, a geologist who walked on the moon in December 1972, is an avid proponent of mining helium-3.

"It is thought that this isotope could provide safer nuclear energy in a fusion reactor, since it is not radioactive and would not produce dangerous waste products," the European Space Agency said. There are an estimated 1 million metric tons of helium-3 embedded in the moon, though only about a quarter of that realistically could be brought to Earth, said Gerald Kulcinski, director of the Fusion Technology Institute at the University of Wisconsin-Madison and a former member of the NASA Advisory Council. That's still enough to meet the world's current energy demands for at least two, and possibly as many as five, centuries, Kulcinski said. He estimated helium-3's value at about USD 5 billion a ton, meaning 2,50,000 tons

would be worth in the trillions of dollars.

To be sure, there are numerous obstacles to overcome before the material can be used – including the logistics of collection and delivery back to Earth and building fusion power plants to convert the material into energy. Those costs

would be stratospheric. ... Plus, it won't be easy to mine the moon. Only the US and Luxembourg have passed legislation allowing commercial entities to hold onto what they have mined from space, said David Todd, head of space content at Northampton, England-based Seradata Ltd. There isn't any international

treaty on the issue. ...

Source: <https://www.deccanchronicle.com>, 30 June 2018.

India Signs MoU with Companies to Construct Six Nuclear Reactors in Maharashtra

An agreement has been signed, for construction of 6 EPR type nuclear reactors at Maharashtra's Jaitapur, between French state-run power utility EDF and American conglomerate GE, the companies said in a joint announcement on 26 June. The EPR is a third generation PWR design whose earlier versions are in use in some nuclear plants in the country. State-run NPCIL will be the builder and operator of the Jaitapur plant." This agreement is for a long term partnership for the construction of the conventional island on each of the 6 reactor units. GE Power will design the conventional island for the Jaitapur nuclear plant and supply its main components," the statement said.

"EDF will be responsible for engineering integration covering the entire project (nuclear island, conventional island and auxiliary systems) and will provide all the requisite input data." EDF and GE Power will move forward with the work currently being performed to freeze the project" technical options, fine-tune industrial

arrangements between both companies and finalise the design-engineering and procurement schedule,” it added. Under the terms of the agreement signed with NPCIL, EDF will supply EPR technology and will be responsible for building and coordinating industrial partners for this project.

EDF Group Senior Executive Vice President Xavier Ursat said in a statement: “This strategic agreement marks the beginning of a new phase in the implementation of the world’s biggest nuclear project at Jaitapur.” “This agreement represents 60 years of nuclear partnership between our two companies. GE Power also has a long history of helping India produce power and we’re pleased that our ARABELLE steam turbines will be part of the solution to ensure reliable, CO2-free power for its growing economy,” said GE Power President Andreas Lusch.

Source: <https://www.firstpost.com>, 26 June 2018.

US Backs India’s Membership in NSG: Haley

US Ambassador to United Nations Nikki Haley, who is on a three-day visit to India on 28 June, said the United States supports India’s membership in NSG. Addressing a press gathering, Haley said, “India, a nuclear state, is respected widely because it is a responsible democracy. US also supports India’s membership in Nuclear Suppliers Group.”

... In 2010, former U.S. President Barack Obama also announced U.S. support for India’s

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participation in the NSG. ... Haley also hailed Prime Minister Narendra Modi’s views at the Shangri-la Dialogue and said, “At the Shangri-la Dialogue, Prime Minister Modi spoke about free and open Indo-Pacific region. US President Donald Trump believes in this vision. India’s vision is aspirational and realistic.” ...

Source: <https://www.business-standard.com>, 28 June 2018.

GENERAL

Towards Greater Efficiency in Energy Production and Water Management

Non-electric applications powered by nuclear energy offer increased energy efficiency and

There is growing interest in increasing nuclear energy efficiency by using heat and other forms of energy generated by nuclear power plants as a by-product for seawater desalination, hydrogen production, district heating and various industrial applications. At a meeting at the IAEA, experts reviewed the status of harnessing this energy that would otherwise go to waste and dissipate as heat.

“Cogeneration could increase the overall thermal efficiency of a nuclear power plant by more than 30% by reusing waste heat and could decrease the environmental impact of heating and transport by up to 35%”

represent sustainable solutions for a number of energy challenges current and future generations will have to face. There is growing interest in increasing nuclear energy efficiency by using heat and other forms of energy generated by nuclear power plants as a by-product for seawater desalination, hydrogen production, district heating and various industrial applications. At a meeting at the IAEA, experts reviewed the status of harnessing this energy that would otherwise go to

waste and dissipate as heat.

“Cogeneration could increase the overall thermal efficiency of a nuclear power plant by more than 30% by reusing waste heat and could decrease the environmental impact of heating and transport by up to 35%,” said IAEA Senior Nuclear Engineer

Ibrahim Khamis.

Nuclear power plants produce a large amount of both electricity and heat. Cogeneration merges the production of usable heat and electricity into a single process that can substantially reduce carbon emissions and energy costs. It is a more efficient use of fuel because otherwise wasted heat from electricity generation is put to productive use in district heating, desalination or hydrogen production.

Currently there are more than 70 nuclear power plants operating in cogeneration mode and the potential for applying this technology more widely appears promising, Khamis said.

Cogeneration benefits include:

Efficiency: Cogeneration requires less fuel than separate heat and power generation, to produce a given energy output. Cogeneration also avoids transmission and distribution losses that occur when electricity travels over power lines from central generating units.

Reliability: Cogeneration can provide high-quality electricity and thermal energy to a site regardless of what might occur on the power grid, decreasing the impact of outages and improving power quality for sensitive equipment.

Environmental Impact: Because less fuel is burned to produce each unit of energy output, cogeneration reduces emissions of greenhouse gases and other air pollutants.

Economic benefits: Cogeneration can save facilities considerable money on their energy bills due to its high efficiency, and it can provide a hedge against unstable energy costs.

Water Management: For more than two decades, the support for seawater desalination using nuclear energy has been repeatedly stressed at

the IAEA General Conference and supported by many Member States. Nuclear desalination has been demonstrated to be a viable option to meet the growing demand for drinking water around the globe, including areas in arid and semi-arid zones that face acute water shortages, Khamis said.

Reactors in Japan, India and Kazakhstan have gathered over 200 reactor years of experience in desalination, and have demonstrated it as a viable option.

Better water management not only means introducing nuclear desalination applications, but also more efficient practices in the use of the water supply needed to run power plants.

Cogeneration can save facilities considerable money on their energy bills due to its high efficiency, and it can provide a hedge against unstable energy costs. Nuclear desalination has been demonstrated to be a viable option to meet the growing demand for drinking water around the globe, including areas in arid and semi-arid zones that face acute water shortages.

“Economizing water and the efficient use of water resources in Jordan is a challenge for the success of the Jordanian nuclear power plant project,” said Sameh

Melhem, engineer at the Jordan Atomic Energy Commission. “The proposed site for the plant is located far away from any sea or river. Therefore, it is important for us to discuss technical, economic, and environmental aspects of water management, in forums such as IAEA technical meetings.”

In Support of the SDGs: “The technological advances and interest in non-electric applications not only fulfil our IAEA mandate but such activities are in line with United Nations Sustainable Development Goals (SDGs),” said Mikhail Chudakov, IAEA Deputy Director General and Head of the Department of Nuclear Energy. Cogeneration is relevant for the following SDGs:

SDG 6: Ensuring access to water and sanitation for all

SDG 7: Ensuring access to affordable, reliable, sustainable and modern energy for all

SDG 13: Taking urgent action to combat climate change

SDG 14: Conserving and sustainably using the oceans, seas and marine resources for sustainable development

Source: Shant Krikorian, <https://www.iaea.org>, 28 June 2018.

JAPAN

Japan's Nuclear Energy Policy at Crossroads

The Economy, Trade and Industry Ministry have compiled a draft revision of the nation's Basic Energy Plan. The revised plan will serve as the new guidelines for long-term energy policies. In the plan, nuclear power is defined as "an important mainstay energy source," but the plan does not specifically call for construction of new and additional nuclear power reactors.

If the situation is left as it is, Japan will move slowly toward zero nuclear energy over the long term. How can the people's understanding of nuclear power deepen? Japan's nuclear power policy is at a crossroads.

Mainstay Energy Source:

The draft revision of the Basic Energy Plan presented on May 16 laid out a policy aiming to make solar power and other renewable energy the nation's key energy sources. At the same time, it also listed technical issues such as fluctuations in energy output according to weather conditions and time of day.

In the draft revision, the ministry maintained its policy of using nuclear power as a mainstay source of consistent power supply. Since no carbon dioxide is emitted by nuclear power

generation, the draft also recognizes this power source as a contributor to decarbonisation.

While the revised plan does highlight renewable energy, it seems more concerned with the importance of nuclear power overall.

In order to achieve the plan's goal of nuclear power accounting for 20 per cent to 22 per cent of the nation's overall power supply in fiscal 2030, about

30 reactors will need to be put back into operation. Only eight are active currently, and many doubt the country will achieve this goal.

"If we extend the operating period of our existing nuclear power reactors to the maximum 60 years allowed in the regulations, we'll just barely be able to reach our goal," a senior ministry official said.

However, unless new and additional reactors are built or existing ones are replaced with new ones, which will take over 20 years to become operable, there will be more decommissioned reactors after

2030 and nuclear power as a share of the nation's energy supply will rapidly decline.

Economy, Trade and Industry Minister Hiroshige Seko continues to insist he does not envision building or replacing reactors. "We couldn't write about building new and additional reactors in this political environment where we're concerned about public opposition to nuclear

power," a senior ministry official said. On the other hand, the official also confessed, "Not writing it in the basic plan doesn't mean we can't actually build new and additional plants."

Along with these revisions in the basic plan, the

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While the revised plan does highlight renewable energy, it seems more concerned with the importance of nuclear power overall. In order to achieve the plan's goal of nuclear power accounting for 20 per cent to 22 per cent of the nation's overall power supply in fiscal 2030, about 30 reactors will need to be put back into operation. Only eight are active currently, and many doubt the country will achieve this goal.

ministry is actually secretly encouraging major electric power companies to consider building plants and replacing reactors. Interpreting the ministry's intentions, a major power company executive said, "It's hard for the government to take the lead in building new and additional reactors, so they're trying to develop an environment [in which that can happen] by encouraging the private sector to take independent action."

Growing Costs: However, major power companies have to overcome high hurdles to independently build new plants or replace current reactors with new ones.

The total cost of Hitachi, Ltd.'s nuclear power business in Britain has ballooned to more than ¥3 trillion with two reactors. The project is likely to receive financial support from the British government, but negotiations are still under way for the prices of electricity the government guarantees to purchase and no conclusions have been reached.

Nuclear safety standards have been ramped up worldwide, and construction costs have soared. TEPCO has spent a total of ¥700 billion on safety measures for the Nos. 6 and 7 reactors at the Kashiwazaki-Kariwa plant. Even if companies build new plants at tremendous cost, a good return on the investment seems unlikely, and it is difficult to procure funds.

The cost of building the Nos. 6 and 7 reactors at Tokyo Electric Power Company Holdings, Inc.'s Kashiwazaki-Kariwa nuclear power plant in Niigata Prefecture, which began operating in the 1990s, was about ¥400 billion per reactor. TEPCO was a blue chip company before its nuclear accident in 2011, and it was able to procure low-interest funding. Its interest burden for the construction funds of the reactors was only ¥10 billion in total.

However, the situation has changed completely since the nuclear accident. Nuclear safety standards have been ramped up worldwide, and construction costs have soared. TEPCO has spent a total of ¥700 billion on safety measures for the Nos. 6 and 7 reactors at the Kashiwazaki-Kariwa plant. Even if companies build new plants at tremendous cost, a good return on the investment seems unlikely, and it is difficult to procure funds.

"Costs for Hitachi's nuclear project in Britain seem to be expanding not only because of safety measures, but also for labour costs and fund procurement costs," an executive of a major electric power company said. "The private sector alone cannot make a decision on building or replacing reactors."

"Some sorts of government support, such as guaranteeing the purchase of nuclear-generated electricity at a certain price, or a guarantee of an operating ratio, are needed," an executive of a leading bank, said.

Public Resistance: Another hurdle is how to promote public understanding of nuclear power.

On June 14, TEPCO announced the decommissioning of the Fukushima No. 2 nuclear power plant. It judged it would be difficult to restart the plant after having been unable to obtain the understanding of local people who suffered because of the 2011 nuclear accident. Now that TEPCO has limited income sources, the importance of being able to restart the Kashiwazaki-Kariwa plant has increased for TEPCO.

Backed by the ruling Liberal Democratic Party and its coalition partner Komeito, Hideyo Hanazumi was elected Niigata prefectural governor this month. Hanazumi plans to continue the prefectural government's own examinations of the nuclear disaster, and the new governor maintains that discussions on a restart cannot begin until the examination has produced results.

Many residents in Niigata Prefecture are opposed to nuclear power. ... Not only those living in the vicinity of nuclear power plants, but Japanese citizens in general have negative views on nuclear power generation. International Environment and Economy Institute senior researcher Sumiko Takeuchi points out the significance of utilizing nuclear power generation. ... The government has

positioned nuclear power as a mainstay power source, but it avoids discussions of building and replacing reactors. Unless this situation is resolved, a stable power supply may falter in the future.

Source: The Yomiuri Shimbun, 16 June 2018.

Appreciating India's effort to partner with the US on nuclear power, Mr Perry said the US needs to take steps to have the latest technology and efficient methods to produce nuclear power otherwise it will be conveyed to countries like India and Saudi Arabia that America is not committed to nuclear power.

NUCLEAR COOPERATION

INDIA-USA

US Must have Latest N-Tech for Atomic Cooperation with India: Rick Perry

The US must acquire the latest technology and efficient methods to produce nuclear power to be a major player in the sector and assure countries like India that America is committed to bilateral atomic energy cooperation, Energy Secretary Rick Perry has said.

Mr Perry, who visited India in April this year as part of Donald Trump administration's move to enhance bilateral energy cooperation, told reporters during a media round table that he had "very good conversations" with Petroleum and Natural Gas Minister Dharmendra Pradhan on nuclear energy, clean coal and carbon capture utilisation.

This cooperation will include the development of a nuclear infrastructure in the African country. It will also include the creation of public awareness programmes regarding nuclear technologies and their uses, as well as the role of radioisotopes and radiation technologies in agriculture, healthcare and manufacturing. Rwanda and Rosatom will set up joint working groups, which will identify specific cooperation projects.

Appreciating India's effort to partner with the US on nuclear power, Mr Perry said the US needs to take steps to have the latest technology and efficient methods to produce nuclear power otherwise it will be conveyed to countries like India and Saudi Arabia that America is not committed to nuclear power. "If we don't keep our ability to be a player in a technological sense, whether it's building reactors as Westinghouse Electric Co does or whether it's the pipeline of young people moving into nuclear energy because they see a future there. If we were to lose our

ability to be a player in the nuclear power business, it's going to have a long-term impact," he said.

It sends a short-term message to the Saudi Arabia, with which the US is currently in the process of negotiating a 123 Agreement, he said. "It

sends a short-term message to the Indian leadership that America is really not committed to nuclear power, so why should we go into a partnership with them and it appears that they're not even going to support their industry in the United States," Mr Perry explained.

So, this is a really important conversation to have, he noted. "If we're going to go sit down with India, if we're going to sit down with Saudi Arabia, we're going to have conversations about nuclear power

going forward, yet we let our industry collapse for whatever reason, then it puts the future of nuclear power in the US in jeopardy," Mr Perry said in response to a question. ...

Source: <https://www.ndtv.com>, 27 June 2018.

RUSSIA-RWANDA

Bilateral Nuclear Agreement Signed between Russians and

Rwandans

Russian State-owned nuclear group Rosatom has announced that it has signed a MoU with the Ministry of Infrastructure of Rwanda. The MoU covers cooperation in the peaceful uses of nuclear energy. This is the first agreement between the two countries regarding the peaceful uses of atomic energy. Rosatom deputy director-general and International Affairs Department director Nikolay Spasskiy and Rwandan Ambassador to Russia Jeanne d'Arc Mujawamariya signed it.

The MoU sets out the legal foundations for the institution of nuclear cooperation between the two parties. This cooperation will include the development of a nuclear infrastructure in the African country. It will also include the creation of public awareness programmes regarding nuclear technologies and their uses, as well as the role of radioisotopes and radiation technologies in agriculture, healthcare and manufacturing. Rwanda and Rosatom will set up joint working groups, which will identify specific cooperation projects. The next step in this bilateral cooperation is expected to be the drawing up of a framework Russia-Rwanda Intergovernmental Agreement.

Source: <http://engineeringnews.co.za>, 25 June 2018.

Unfavourable economic conditions and the stagnant spot price of uranium have kept shovels from breaking ground; however, in order to combat the country's growing energy needs uranium mining may begin sooner than later. In fact, Tanzania plans to use uranium to produce electricity in accordance with the 2003 Energy Act, which allows the use of uranium as a supplier of energy.

measures that comply with international requirements," he explained.

Unfavourable economic conditions and the stagnant spot price of uranium have kept shovels from breaking ground; however, in order to combat the country's growing energy needs uranium mining may begin sooner than later. In fact, Tanzania plans to use uranium to produce electricity in accordance with the 2003 Energy Act, which allows the use of uranium as a supplier of energy.

The progress made by the African country and other uranium producers will be top of mind at the upcoming IAEA International Symposium on Uranium Raw Material for the Nuclear Fuel Cycle,

beginning June 25 in Vienna. To date, the Tanzanian government has completed the first construction phase of the TAEC laboratory complex, which will play a key role in the country's uranium-mining future. The lab will provide radio analytical and calibration services to support regulatory oversight of uranium mining in the country, as well as the wider region as a whole.

"Introducing uranium mining requires long-term planning, which includes surveys of the selected exploration sites, soil assessments, building public awareness and capacity building," Mwalongo added. "To achieve this, the IAEA UPSAT mission set the platform by providing a comprehensive assessment on uranium mining possibilities in Tanzania."

... Earlier this year, Tanzania established a mining commission to regulate the effective implementation of the provisions of its mining act. The newly formed commission will also be tasked with the granting of mineral rights such as mining licenses. The issuing of new mining licenses was suspended in July 2017 as the government began examining the country's mining legislation in an effort to better monetize and promote the mineral

URANIUM PRODUCTION

TANZANIA

Tanzania Ready to Begin Uranium Mining

Five years after the African nation announced its first-ever uranium-mining program, the country is ready to begin mining for uranium — as soon as the economic conditions are right. In 2013, with the support of the IAEA, Tanzania launched a robust uranium-mining program in an effort to entice mining companies and learn how much of the valued energy mineral is in the ground. Following a series of exploration and surveying programs, Tanzania is on the cusp of extracting uranium from its first approved mine.

"Five years on, a lot of progress has taken place," Dennis Mwalongo, head of the department of ionizing radiation at the Tanzania Atomic Energy Commission (TAEC), told the IAEA. "The government has worked actively to implement the IAEA Uranium Production Site Appraisal Team (UPSAT) recommendations, which include developing appropriate legal and regulatory

sector.

Presently, the most advanced uranium project in Tanzania, the Mkuju River site, has a measured and indicated resource of 36,000 tonnes of uranium and an inferred resource of 10,000 tonnes. Uranium one plans to operate the site and produce 1,400 tonnes of uranium annually. Mwalongo added, "Uranium mining will contribute to successful and sustainable socio economic development for Tanzania." The spot price of uranium was up US\$0.05 on June 18 and closed at US\$23.40.

Source: <https://investingnews.com>, 18 June 2018.

NUCLEAR DISARMAMENT

NORTH KOREA

US would Like to See 'Major' North Korea Nuclear Disarmament in Next Two Years, Mike Pompeo Says

The statement follows on the heels of the historic meeting between Kim Jong-un and Donald Trump. US Secretary of State Mike Pompeo says that the Trump administration would like to see "major" North Korean nuclear disarmament in the next two and a half years, following the historic meeting between President Donald Trump and North Korean leader Kim Jong-un in Singapore.

Mr Pompeo made the statement during a trip to South Korea, saying that the US goal is to see major headway by the end of Mr Trump's first term. The US secretary of state was visiting Seoul to brief South Korean leaders on the negotiations between the US and North Korea that had occurred in Singapore.

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"I am ... confident that there will be in-depth verification," Mr Pompeo said of how any denuclearisation effort would be monitored, adding that the initial document signed by the two

leaders at the summit had not encompassed the entire range of discussions held behind the scenes. "Not all of that work appeared in the final document. But lots of other places where there were understandings reached, we couldn't reduce them to writing, so that means

there's still some work to do, but there was a great deal of work done that is beyond what was seen in the final document that will be the place that we will begin when we return to our conversations," Mr Pompeo, who had flown to Seoul from Singapore, told a group of reporters. While Mr Trump hailed the negotiations with North Korea as a strategic success of historic proportions, saying that there was "no longer a nuclear threat from North Korea", critics said that the joint statement between the US and North Korea at the end of the Singapore summit was short on details, and that Mr Trump appeared to offer too many concessions compared to the commitments that North Korea put on paper.

Mr Trump would resume military exercises with South Korea if North stops negotiating in good faith. The secretary of state indicated that he is not sure yet when the US and North Korea might reassume negotiations over the country's nuclear programme, but indicated that talks were likely to begin again in short order.

Among those concessions was a promise to suspend joint military exercises between the US and South Korea on the Korean peninsula, which Mr Trump has criticised as being too costly and "provocative". Mr Pompeo said Mr Trump would resume military exercises with South Korea

if North stops negotiating in good faith. The secretary of state indicated that he is not sure yet when the US and North Korea might reassume negotiations over the country's nuclear programme, but indicated that talks were likely to begin again in short order.

"I don't know exactly what the timing will be for our next conversation with the North Koreans. I would anticipate it will be fairly quickly after we return to our home countries," Mr Pompeo said. "I don't know exactly what form that will take, but I'm very confident that by sometime in the next week or so we will begin the engagement," Mr Pompeo said.

Pyongyang state media, the Korean Central News Agency (KNCA), said Mr Trump had expressed his intention to offer security guarantees to North Korea and lift sanctions "over a period of good-will dialogue" between the two countries. It said Mr Kim had said the North could take unspecified "additional good-will measures of next stage commensurate with them" if the US takes genuine measures to build trust.

The North Korean report quoted Mr Trump as crediting Mr Kim's "proactive peace-loving measures" for having created the atmosphere of peace this year. It also suggested Mr Trump had adopted North Korea's preferred phased approach towards any denuclearisation process, saying the two men had agreed to the "principle of step-by-step and simultaneous action". Mr Trump, upon landing back in Washington on Wednesday morning, said that his summit with Mr Kim makes the world safer.

"Just landed – a long trip, but everybody can now feel much safer than the day I took office. There is no longer a Nuclear Threat from North Korea. Meeting with Kim Jong Un was an interesting and very positive experience. North Korea has great potential for the future!" Mr Trump wrote on Twitter in between congratulatory notes to Republicans who had won their primary races the night before, and just an hour after an attack on Robert De Niro, whom he claimed has a low IQ. Nevertheless, critics of the president, including Senate Minority Leader Chuck Schumer, said that they see the Singapore meeting as little more than a photo opportunity for Mr Trump and Mr Kim.

"The emphasis on showmanship as opposed to substance at the North Korea Summit will not serve America or the prospects for peace well in the long run," Mr Schumer wrote on Twitter.

Source: <https://www.independent.co.uk>, 13 June 2018.

NUCLEAR PROLIFERATION

NORTH KOREA

US Intelligence Officials: North Korea will Sell Nuclear Tech to Iran

While the Trump administration is still touting its supposedly successful summit with North Korea — even claiming that Pyongyang is "no longer a nuclear threat" — senior U.S. intelligence officials worry that a new security challenge is emerging: that the Kim regime could sell advanced, long-range ICBM missile technology to rogue states like Iran.

There is a growing concern that while the immediate threat of armed conflict with North Korea has diminished, Pyongyang could utilize the lull in tensions to its advantage, selling the expertise behind its most advanced weapons systems to Tehran.

According to two intelligence officials, speaking to me on background, there is a growing concern that while the immediate threat of armed conflict with North Korea has diminished, Pyongyang could utilize the lull in tensions to its advantage, selling the expertise behind its most advanced weapons systems to Tehran. The officials, unauthorized to speak on the matter, asked for their identities to be protected. "We know for a fact that North Korea will sell almost any of its military hardware if the price is right — and Iran has paid that price time and time again. In the past, there is ample evidence — even in the public domain — that proves North Korea will sell conventional weapons, all different types of missile technology, and even nuclear tech and expertise if you have the funds to pay for it," explained a senior U.S. intelligence official.

The official continued:

What terrifies many of us is that we might not even know that Pyongyang has even sold such

technology until it's too late to do anything about it. Think about how much information you can store on just a flash drive today. All it would take is one North Korean agent, selling a 256-gig USB stick to an Iranian operative filled with blueprints, design specs and advanced warhead shielding technology to make a massive difference.

"Just that amount of information on ICBM technology alone would be a game changer for Tehran — and we would not even know about it until the new designs were included in their missile tests."

History shows the intelligence officials' fears could very well be realized — and soon. North Korea has sold arms to some of the world's most anti-U.S. regimes and fuelled conflicts around the world. For example, Pyongyang has reportedly helped Syria with its chemical weapons and missile programs. North Korea even started building a nuclear reactor for the Assad regime, only to see it be destroyed by an Israeli air strike in 2007. There is strong evidence to suggest North Korea is selling conventional arms to the regime now and possibly even fighting alongside Assad's forces, fuelling a civil war that has claimed countless lives to this day.

It gets worse. The Kim family has sold multiple classes of missile platforms to Iran. In addition, now that the Kim family has missiles that can at least range the U.S. homeland, combined with biting sanctions that are damaging the regime's ability to raise vital revenue, Pyongyang might just be desperate enough to sell its best weaponry, even if it were to damage its budding détente with Washington.

Another senior intelligence official, also speaking on background, had another assessment: "It will be just a matter of time before North Korea sells this stuff (ICBM technology) to Iran. We need to prepare for this as it might even already have happened. I want to stress I have no proof of that,

but what would you do if your nation was being hurt by sanctions and you can cause America and its allies some pain?"

There is ample reason to think Iran would indeed love to acquire such technology. If the Iran Nuclear Deal does completely fall apart, or even if Tehran abides by its provisions with willing non-U.S. partners, acquiring such advanced missile technology, which is not prohibited under the terms of the deal — would be a smart strategic move.

Iran would be able to spend the next several years designing, testing and perfecting such missile technology. Knowing that it could take an

Iran would be able to spend the next several years designing, testing and perfecting such missile technology. Knowing that it could take an expensive, long-term effort, Tehran could honour its nuclear agreement with Europe, Russia and China until 2025 — when Iran could legally leave the agreement — and use those years to perfect a working ICBM that it could then use as the delivery system for a nuclear weapon

expensive, long-term effort, Tehran could honour its nuclear agreement with Europe, Russia and China until 2025 — when Iran could legally leave the agreement — and use those years to perfect a working ICBM that it could then use as the delivery system for a nuclear weapon. Considering even the sheer possibility, of such a nightmare scenario the Trump administration in

whatever deal it is trying to craft with North Korea to give up its nuclear weapons, should include a provision that Pyongyang would not be able to sell any missile technology, know-how or allow its scientists to work on other nations' missile programs — at a bare minimum. Washington also should demand a full accounting of any missile sales to foreign powers like Iran, so we can gain a better understanding of what other problems Pyongyang might have created. Nevertheless, such thoughts might be just dreaming. Considering that U.S. intelligence officials believe North Korea will never give up its nuclear weapons anyway, we might very well face the Kim regime's most terrifying weapons of war in a future conflict — but they might be fired by someone else.

Source: Harry J. Kazianis, <http://thehill.com>, 19 June 2018.

North Korea has ‘at least Three’ Secret Nuclear Weapons Sites, US Intelligence Says

North Korea has reportedly increased production of fuel for nuclear weapons at multiple secret sites in recent months and may try to hide these while seeking concessions in nuclear talks. These claims have surfaces as the North is seeking to assure the international community that they are in the process of denuclearisation.

The assessment conflicts sentiments expressed by President Donald Trump, who tweeted after an unprecedented June 12 summit with North Korean leader Kim Jong-un that ‘there is no longer a nuclear threat from North Korea.’ NBC quoted five unidentified U.S. officials as saying that in recent months North Korea had stepped up production of enriched uranium for nuclear weapons, even as it engaged in diplomacy with the United States. The network cited U.S. officials as saying that the intelligence assessment concludes that North Korea has more than one secret nuclear site in addition to its known nuclear fuel production facility at Yongbyon.

‘There is absolutely unequivocal evidence that they are trying to deceive the U.S.,’ one official is quoted as saying. The CIA has declined to comment. The State Department said it could not confirm it and did not comment on matters of intelligence. The White House did not respond to a request for comment.

The report raises further questions about North Korea’s readiness to enter serious negotiations about giving up a weapons program in spite of Trump’s enthusiastic portrayal of the summit outcome. Jeffrey Lewis, director of the East Asia Nonproliferation Program at California’s Middlebury Institute of International Studies, said there were two ‘bombshells’ in the report. He said it had long been understood that North Korea had at least one undeclared facility to enrich nuclear fuel aside from Yongbyon. ‘This assessment says there is more than one secret site. That means

there are at least three, if not more sites,’ he said. North Korea agreed at the summit to ‘work toward denuclearisation of the Korean Peninsula,’ but the joint statement signed by Kim and Trump gave no details on how or when Pyongyang might surrender its nuclear weapons.

U.S. Secretary of State Mike Pompeo said he would likely go back to North Korea before long to try to flesh out commitments made at the Trump-Kim meeting. The *Financial Times* quoted U.S. officials as saying that Pompeo plans to travel to North Korea, but the State Department has declined to confirm this. Ahead of the summit, North Korea rejected unilaterally abandoning an arsenal it has called an essential deterrent against U.S.

aggression. Trump said North Korea was blowing up four of its big test sites and that a process of ‘total denuclearisation ... has already started,’ but officials said there had been no such evidence since the summit. Washington-based North Korean monitoring project 38 North said recent satellite imagery showed North Korea had made rapid improvements to facilities at Yongbyon since May 6, but it could not say if such work had continued after June 12.

Source: Kate Buck, <https://metro.co.uk>, 30 Jun 2018.

Speaking of the need for diplomacy to avert the prospect of nuclear terrorism, The Luxembourg Forum President Dr Viatcheslav Moshe Kantor, warned, “The question is not whether such a terrorist attack will occur, but rather when.

NUCLEAR NON-PROLIFERATION

GENERAL

More than 20 Nuclear Experts Met in Geneva for the Luxembourg Forum

Speaking of the need for diplomacy to avert the prospect of nuclear terrorism, The Luxembourg Forum President Dr Viatcheslav Moshe Kantor, warned, “The question is not whether such a terrorist attack will occur, but rather when”

Leading international experts on nuclear non-proliferation met in Geneva for the International Luxembourg Forum on Preventing Nuclear

Catastrophe (“The Luxembourg Forum”), with the main theme being the need for a co-ordinated international political response to prevent impending nuclear disaster.

On the eve of the US-North Korea summit in Singapore, more than 20 political scientists, nuclear physicists and military strategists, met in Geneva to discuss fresh approaches and practical proposals for dealing with nuclear non-proliferation. In particular, discussions centred on how world leaders should approach Iran and North Korea, and how to defuse dangerous tensions between the U.S., UK and Russia.

... Speaking at the opening of the two-day conference, Dr Viatcheslav Moshe Kantor, President of the Luxembourg Forum, highlighted that tensions between the U.S. and Russia are undermining regional stability and driving a renewed nuclear arms race. “One of our tasks must be to try and convince political leaders as soon as possible of the need to work together, despite all their disagreements, in order to prevent a nuclear catastrophe,” he argued.

Participants advocated for a balanced and coordinated international approach to resuscitate the ailing Iran deal, without which, Dr Kantor warned, “It would take Iran only a couple of years to build a nuclear warhead for its missiles.” Dr. Kantor argued that a shared interest in tackling the threat of nuclear terrorism must override other regional and strategic disagreements. The real threat of a nuclear terrorist attack is a direct consequence of “More nuclear countries and a reduction in efforts to safeguard nuclear materials,” he said.

Reflecting on the U.S.-North Korea summit, Dr. Kantor cautioned that lessons must be learned from the Iran deal, as he observed, “The progressive stiffening of sanctions by the UN Security Council and individual states proved most pivotal in bringing about a nuclear agreement with

Iran and making Kim Jong Un amenable to a ‘sporting reconciliation’ and then to state-level meeting.” The meeting also featured sessions on Russia-U.S. strategic dynamics, as experts discussed the need for cooperation between the U.S. and Russia at the highest level in order to ensure global nuclear stability.

About the International Luxembourg Forum on Preventing Nuclear Catastrophe: The International Luxembourg Forum on Preventing Nuclear Catastrophe was established in Luxembourg on the 24-25th of May 2007 by decision of the International Conference on Preventing Nuclear Catastrophe. The Forum is one of the most representative non-governmental organizations to bring together leading international experts on the non-proliferation of nuclear weapons and arms reduction and limitation. The Advisory Council comprises more than 50 of the most authoritative and best-known international experts from 14 different countries. The President of

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the Forum is Dr Viatcheslav Moshe Kantor who oversees the International Advisory Council and the Supervisory Board.

The Main Tasks of the Forum are: To analyse threats of proliferation of nuclear weaponry and to draw up specific proposals and recommendations as to further ways of reducing nuclear weapons, strengthening nuclear and missile non-proliferation regimes, preventing attempts to acquire nuclear weapons and technologies by unstable regimes and terrorist organizations and of resolving regional nuclear crises.

To facilitate the process of arms limitation and reduction and to counteract growing threats to the non-proliferation regime and the erosion of the fundamental tenets of the NPT. To strengthen global peace and security through fresh approaches and practical proposals for political leaders on key nuclear non-proliferation and arms-control issues.

Source: *International Luxembourg Forum on Preventing Nuclear Catastrophe*, 11 June 2018.

SAUDI ARABIA

Israel Opposes Easing US Nuclear Non-Proliferation Standards for Saudi

Israel's energy minister says Saudi Arabia should not be allowed to enrich uranium domestically. After meeting with officials of US President Donald Trump's administration, Israel's energy minister expressed confidence that the United States will not relax non-proliferation standards in any nuclear power deal it agrees with Saudi Arabia.

Israel vehemently opposes any effort by Saudi Arabia to relax "gold standard" non-proliferation limits on enriching uranium or reprocessing nuclear fuel in any deal between the two countries, Yuval Steinitz, Israel's energy minister, told Reuters in an interview.

"Once you allow one country to enrich uranium or reprocess fuel, it will be extremely difficult to tell other countries in this vicinity or elsewhere in the world not to do so," he said.

Saudi Crown Prince Mohammed bin Salman has threatened to pursue nuclear weapons if Iran acquires them. "Saudi Arabia does not want to acquire any nuclear bomb, but without a doubt, if Iran developed a nuclear bomb, we will follow suit as soon as possible," he told CBS in March.

Steinitz, in Washington for the World Gas Conference, met with people in the Trump administration about Saudi Arabia's quest to build at least two nuclear power stations with the help of US technology. He did not identify whom he met with. Israel is the only country in the Middle

After meeting with officials of US President Donald Trump's administration, Israel's energy minister expressed confidence that the United States will not relax non-proliferation standards in any nuclear power deal it agrees with Saudi Arabia. Israel vehemently opposes any effort by Saudi Arabia to relax "gold standard" non-proliferation limits on enriching uranium or reprocessing nuclear fuel in any deal between the two countries, Yuval Steinitz, Israel's energy minister

East that possesses nuclear bombs although it has acted coy about acknowledging its military nuclear capabilities.

US Energy Secretary Rick Perry has been working with Saudi Arabia on a civilian nuclear agreement that could allow the kingdom to enrich uranium and reprocess plutonium, practices that non-proliferation advocates worry could one day be

covertly altered to produce fissile material for nuclear weapons.

Israel and Saudi Arabia do not have formal diplomatic relations, but they have become de-facto allies against Iran. If the United States allows Saudi to relax the standards, "then you deteriorate the non-proliferation effort, so I am confident the Americans would listen to our concern," Steinitz said. Steinitz said Israel would support Saudi Arabia's development of nuclear power only if it included the gold standard protections and if the

kingdom purchases uranium from the United States. By adhering to the Gold Standard, countries forego the right to domestically enrich uranium or reprocess fuel to purchase nuclear technology from US companies. Saudi Arabia's neighbour and close ally,

the UAE, has voluntarily submitted to the Gold Standard in its nuclear programme. The UAE acquires its nuclear capabilities from the US in a deal known as the 123 Agreement. Saudi Arabia has said if it does not get US, assistance to build reactors it could turn to other international partners. The kingdom is also in talks with companies from Russia, China, South Korea and other countries on nuclear power.

Source: <http://www.middleeasteye.net>, 26 June 2018.

NUCLEAR SECURITY

MALAYASIA–LEBANON–OMAN

Malaysia Helps Lebanon and Oman in Development of Integrated Nuclear Security

Under a cooperation facilitated by the IAEA, the Malaysian Atomic Energy Licensing Board has hosted a technical visit for Lebanese and Omani atomic energy authorities to help strengthen their nuclear security practices. Malaysian experts exchanged information with their colleagues from the two countries and shared best practices and lessons learned in the development of a regulatory body responsible for nuclear security. The visit helped Lebanon and Oman consider steps involved in setting up a Nuclear Security Support Centre (NSSC), which serves as a domestic hub for training, technical, and scientific support. NSSCs also foster nuclear security culture and enhance national coordination among various national authorities. The IAEA helps countries improve capacity to sustain effective national nuclear security regimes, including through NSSCs and various other measures.

In Malaysia, the regulatory frameworks for nuclear safety and nuclear security are well coordinated with one another, resulting in a harmonized system that has proven effective, said Muzna Assi, a technical advisor at the Lebanese Atomic Energy Commission. Over years of cooperation with the IAEA, many countries have identified the need to take integrated approaches to regulatory development in order to build capacity while also optimizing efficiency. This has been especially true for developing countries that may not already have infrastructure or expertise established.

“The safety-security interface could be one of the best options during the regulatory work in our country,” said Assi. “Many representatives from developing countries are interested in this approach.”

Effective coordination among all national stakeholders is a cornerstone of Lebanon’s Integrated Nuclear Security Support Plan (INSSP), which is a tailored approach to planning for nuclear security improvements that Member States can work with the IAEA to develop. This approach, which harmonizes all aspects of planning and operation of domestic nuclear security infrastructure, helps reduce redundancy and increase efficiency throughout the entire process. The support from Malaysia was a response to Lebanon and Oman’s request to the IAEA for assistance with further implementation

of their INSSPs. Such support from one developing country to another is often referred to as south-south cooperation, a framework of collaboration in the political, economic, social, cultural, environmental and technical domains. Developing countries share

knowledge, skills, expertise and resources to meet their development goals through concerted efforts.

... Over the years, cooperation between Malaysia and the IAEA has led to a number of similar technical visits, beginning in 2012. While they initially focused primarily on sharing information about domestic nuclear security infrastructure in Malaysia, they quickly realized that the information exchange and experience sharing goes both ways among the countries involved. For cooperation with countries that are still developing their nuclear security infrastructure, Malaysia has become a common host country due to its mature programme and well-developed nuclear security infrastructure. “It’s a good example of a country that has gone through the experience of having to develop nuclear security infrastructure and now is in a more mature place, voluntarily working with us to share that experience and contributing to nuclear security worldwide,” said James Conner, an IAEA nuclear security officer.

Source: <https://www.iaea.org>, 15 June 2018.

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SPAIN

Nuclear Security Skills Strengthened at IAEA Course in Spain

Professionals from Spanish-speaking countries enhanced their nuclear security skills during a course that ended earlier this month in Valdemoro, Spain. The course, which targeted early career professionals, consisted of both lectures and practical exercises covering a range of nuclear security topics, including transport security for nuclear and other radioactive material and threat and risk assessment. Participants also visited the Trillo Nuclear Power Plant where they attended presentations on how nuclear security is implemented.

Instead of banning software with a connection to China or other U.S. cyber adversaries, government tech shops should focus on installing safeguards that mitigate any risk the software poses for foreign spying or sabotage, said Wayne Jones, chief information officer at the National Nuclear Security Administration.

“This course, offered for the first time in Spanish, was part of the IAEA’s International School on Nuclear Security, which includes courses designed to offer a comprehensive introduction to nuclear security to young professionals,” said Dmitriy Nikonov, Education Officer at the IAEA’s Division of Nuclear Security.

Participant Rosbell Bosch Robaina, a nuclear engineer with Cuba’s National Centre for Nuclear Safety, said he found the training useful. “This course bolstered my previous knowledge and helped me understand some of the nuances of nuclear security procedures,” he said. “I learned about IAEA recommendations for nuclear security and how they are implemented.”

The course included several exercises that simulated activities that take place as part of a nuclear security regime. These included detecting and identifying radioactive sources using equipment such as personal radiation detectors and radiation isotope identification devices as well as characterizing an ‘insider threat’, which is a threat posed by someone working for a facility containing nuclear material.

“The exercises helped reinforce the concepts we

were taught during the lectures,” said Rosemari Galotto Amado, a strategic information analyst at Uruguay’s Ministry of Defense. “They emphasized the importance of adopting common criteria for nuclear security practices internationally and highlighted best practices in the area.” In her role with the Ministry of Defense, Galotto Amado has worked together with Uruguay’s National Committee for Nuclear Security to develop a nuclear security framework within Uruguay.

The course, which took place from 21 May to 1 June, was jointly organized by the IAEA and the Spanish Nuclear Safety Council. It was part of a series of IAEA’s Schools on Nuclear Security. It had 37 participants from 15 countries. ...

Source: <https://www.iaea.org>, 19 June 2018.

USA

Banning Software Isn’t the Route to Cybersecurity

The federal government can’t legislate or mandate its way out of the risk of foreign hackers compromising its networks, the top tech official in the government’s nuclear security agency said. Instead of banning software with a connection to China or other U.S. cyber adversaries, government tech shops should focus on installing safeguards that mitigate any risk the software poses for foreign spying or sabotage, said Wayne Jones, chief information officer at the National Nuclear Security Administration.

“You can’t think about it: ‘Well, I’m not going to use that product because it came from China.’ You have to figure out: ‘How do I use that product so it’s going to protect my information,’” Jones said during a panel discussion hosted by the Armed Forces Communications and Electronics Association, a professional association. “How do you build an environment ... that you can have these tools or products in to ensure that you’re

not giving away the farm,” he said.

Jones declined to specifically discuss a government wide ban that Congress approved in December for anti-virus from the Moscow-based Kaspersky Lab or congressional bans that are likely to become law aimed at the Chinese companies Huawei and ZTE. “I’m not going to say whether Congress has gone too far or not, because I do like my job,” he said.

Jones did note, though, that it would be exceedingly difficult to restrict the government to only hardware and software with no questionable foreign ties. “We’re in a global economy whether we want to believe it or not,” Jones said. He later added: “When we start pulling the onion back on all of the products and services that you have, you’re going to find a chip somewhere—let’s just be honest about it—from one of the nations we’re not happy about using.”

Even with the government wide ban in place, Jones noted, tech and cyber officials must still deal with Kaspersky’s risks. “I know that, in my environment, I have scientists from other countries who come in to do work for us that have [Kaspersky]. So how am I protecting myself from that?” Jones asked. “Kaspersky is not one of the tools I use in my environment today, but there are people who connect to my guest networks that do have it. So how do I protect myself?”

Donald Purdy Jr., the chief security officer at Huawei’s U.S. division, made a similar argument in a Tuesday op-ed published in *Fortune*. By banning particular software from specific countries, Congress fundamentally misunderstands the nature of cyber threats, Purdy, a former top government cyber official during the George W. Bush administration, argued. “Members of Congress may sincerely believe that barring one or two Chinese companies from the U.S. market will significantly protect the country’s networks,” Purdy writes. “But today’s telecommunications industry is transnational and borderless. All of its leading players already use

equipment developed or manufactured in China.”

Instead of “selectively banning one or two foreign companies from the U.S. market,” Purdy writes, the government should focus on improving cyber resilience and “implementing a comprehensive cybersecurity strategy.” Purdy’s op-ed, while it discusses congressional efforts to ban Huawei from government networks, is focused largely on a Federal Communications Commission regulatory action that would restrict Huawei in U.S. telecommunications networks on a much broader scale.

The government wide Huawei and ZTE ban is included in both the House and Senate version of a must-pass annual defense policy bill. Those bills have passed both chambers and are now with a conference committee. The Homeland Security Department, which has not yet taken any action against Huawei and ZTE, instituted a governmentwide Kaspersky ban in October, two months before the congressional ban.

Kaspersky is challenging both of those bans now in the U.S. Court of Appeals for the District of Columbia. Both Kaspersky bans cited a Russian law that officials believe could compel Kaspersky to help the Kremlin spy on U.S. government agencies.

Source: Joseph Marks, <https://www.nextgov.com>, 28 June 2018.

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NUCLEAR SAFETY

UK

‘Vague Assurances’ on Post-Brexit Nuclear Safety ‘Not Worth Much’

Britain’s energy minister has written personally to Minister for Environment Denis Naughten offering “significant assurances” there would be no threat to Ireland from any changes in nuclear safety standards after Brexit.

The UK is planning to pull out of Euratom, the body which regulates the nuclear industry across Europe, including the safe transport of radioactive

materials across borders, after it leaves the EU next March. Although the watchdog is legally separate from the bloc, membership requires being subject to the jurisdiction of the European Court of Justice, which British Prime Minister Theresa May's government is opposed to.

Leaked documents show Britain is missing deadlines for putting post-Brexit nuclear safeguards in place, including the delivery of an IT system to track nuclear material and the recruitment of qualified inspectors. The UK's Office for Nuclear Regulation has identified five "high-level risks" – categorised as "red" on a red, amber, green alert scale – that remain outstanding. Mr Naughten said Greg Clark, Britain's Minister for Energy and Industry wrote to him about planned future arrangements on civil nuclear power. "This letter provided significant assurances in relation to nuclear safety standards," he said in response to a parliamentary question.

Constructive Relationship: "I have welcomed this information from my UK counterpart which is indicative of the constructive relationship Ireland enjoys with the UK in this area." "There are currently no safety or security concerns for Ireland arising from the UK withdrawal from the Euratom Treaty. "In the first instance, the UK remains a member of Euratom, and the UK nuclear industry remains subject to oversight by the EU institutions, until such time as their withdrawal from the EU is finalised."

However, Timmy Dooley, Fianna Fail's environment spokesperson, said Mr Naughten should not be satisfied with "vague assurances" from London. "I have grave concerns about the capacity of the British administration to maintain standards, absent from a European context. "This is something we should be concerned about. "In light of everything that is now happening, in terms of the Brexit negotiations, the minister needs to engage much more comprehensively on the issue

and not be guided by vague assurances that he is getting from his British counterpart. "They are not really worth very much."

Mutual Interest: Mr Naughten said the exit from Euratom was discussed at a recent gathering in Dublin Castle of the UK-Ireland Contact Group, which meets twice a year, to deal with radiological matters of mutual interest to both countries. "The on-going Brexit negotiations, including matters relating to the UK's decision to leave the Euratom Treaty, are being conducted bilaterally between the European Union, represented by the European Commission, and the UK," he added. "Ireland contributes to the process through its representation at the European Council Article 50 Working Party which meets regularly to discuss Brexit related issues, including Euratom."

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Earlier this year, Environmental Pillar, a coalition of 26 environmental organisations in Ireland, warned of "alarming deficiencies" in the UK's approach to assessing impacts of plans to expand its nuclear power programme. Particular risks linked to the £20 billion Hinkley Point C power station being built in Somerset have not been properly evaluated, it said.

Source: <https://www.irishtimes.com>, 18 June 2018.

NUCLEAR WASTE MANAGEMENT

GENERAL

Nuclear Waste Management Market Witness Exponential Growth – 2024

The value chain of the global nuclear waste management market consists of numerous global players. The vendor landscape of this market is therefore highly competitive, with companies such as Areva SA, Veolia Environment Services, Bechtel Corporation, US Ecology, Inc., and Auegan Plc., emerging as the most prominent players. These companies exhibit a wide nuclear waste

management services portfolio.

Among the aforementioned companies, Areva SA emerged dominant in the market because of generating more revenue in the nuclear waste management business than its competitors. Bechtel Corporation and Veolia Environmental Services emerged as the second and third leading companies in the market, respectively. The top three companies together held a share of nearly 75% in the global market in 2014, finds Transparency Market Research (TMR).

Mounting HLW Waste Makes Nuclear Waste Management Necessary:

By waste type, these companies are mainly engaged in efficiently disposing high-level waste (HLW) generated in nuclear power stations. The segment accounted for a share of 35.9% in the global nuclear waste management market in 2015. Nuclear waste refers to residues or materials left after nuclear fuel is burnt in reactors.

These residues mainly include radioactive materials, known to cause radiation sickness. The increasing population and the subsequently rising demand for electricity, the growing dependence on fossil fuel, and the rising awareness regarding the benefits of energy derived from alternative sources are primary factors boosting demand for nuclear waste management services.

On the other side, the high initial investment required for these services and their high payback time are inhibiting the growth trajectory of nuclear waste management to an extent. Nevertheless, TMR projects the market to considerably benefit from the implementation of stringent emission control norms.

Increasing Installation of PWR to Fuel Demand for Nuclear Waste Management: Among the nuclear reactor types, the market is expected to witness the highest demand from the pressurized water reactors segment. Demand from the boiling water reactors segment is expected to be the

second in line. As per TMR analysis, the pressurized water reactors segment held the dominant share of 69.3% in the market in 2015. “Demand for nuclear waste management services is expected to increase at a robust pace in the near future,” revealed an analyst at TMR. “Since these reactors can operate in lower fuel temperature and require lower pressure, their installations are expected to increase, thus boosting demand for nuclear waste management at the highest pace,” he added.

Prospects for the Market to be Most Lucrative in Europe and Asia Pacific:

Regionally, Europe, Asia Pacific, North America, and Rest of the World are the key segments of the global nuclear waste management market. Of these, Europe is currently exhibiting the most attractive opportunities for nuclear waste management, followed by Asia Pacific. These regions together account for the largest number of nuclear

reactors in the world, which makes them the most lucrative regions for vendors offering nuclear waste management services. In 2015, the market for nuclear waste management in Europe accounted for a share of 41.3% in the global market, states TMR.

The investments in nuclear power projects in Europe are expected to surge exponentially in the forthcoming years, thus bolstering opportunities for nuclear waste management. North America however is expected to report moderate prospects for the market due to the shale gas boom in the region. Nevertheless, Asia Pacific is expected to emerge as the fastest growing market for nuclear waste management with China planning to double its existing nuclear capacity by 2020. As per TMR growth opportunities for the market reported by Asia Pacific is expected to surpass that of Europe’s by 2024.

Source: <https://financialreporting24.com>, 26 June 2018.

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SWEDEN

Sweden Nuclear Waste Firm Revamping Storage Plan, Sees Decision by Mid-2020

Sweden's nuclear fuel and waste management company (SKB) will meet a January deadline to submit new information in support of its application to build a permanent radioactive refuse store, and expects a decision by mid-2020, it told Reuters. SKB's application for the nuclear waste repository, needed to replace an interim storage facility it is currently using, was dealt a blow earlier this year when an environmental court said it was not sure of the proposed plan's safety.

The company is working on additional requested research and will submit it by Jan. 7, 2019, a deadline set by Sweden's environment and energy ministry, which will in turn rule on the application, said SKB spokesperson Simon Hoff. "We have just received the request by the ministry to continue with the application and submit the additional documents by January 7. We are doing the research needed and will produce what is needed by then," he said. The court's objections to SKB's

application, otherwise supported by Sweden's radiation safety authority, were due to concerns over the ability of the designed capsules to contain the nuclear waste in the long term. "After we hand the documentation, the ministry should decide on the application by the first half of 2020," said Hoff.

The permanent repository, designed to store up to 12,000 tonnes of spent fuel from Sweden's nuclear plants, could take 10 years to complete and the country's nuclear plant operators have raised concerns about the delays in authorising it. "It is important that we get a solution in place for the permanent storage of nuclear waste as soon as

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possible Expediting this matter must be prioritised to prevent the process from becoming drawn-out and costly," Vattenfall chief executive Magnus Hall said in April. Of Sweden's eight nuclear reactors in operation, Vattenfall controls seven. The eighth belongs to OKG, a unit of Germany's Uniper. Six power reactors and two research units are being decommissioned in Sweden, with a third research unit already dismantled.

Source: <https://www.reuters.com>, 12 June 2018.



Centre for Air Power Studies

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