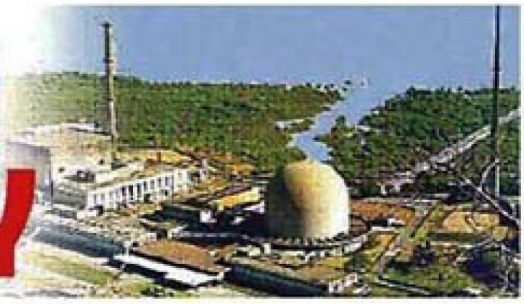
NUCLEAR SECURITY



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

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OPINION – Paul Dorfman

Why is the UAE, where Solar Energy is Abundant, about to Open Four Nuclear Reactors?

The UAE is building the world's largest concentrated solar power plant, capable of generating 700 megawatts. During daylight, solar power will provide cheap electricity, and at night the UAE will use stored solar heat to generate electricity. But at the same time, four nuclear reactors are nearing completion in the UAE, built by the South Korean Electric Power Corporation, KEPCO. The nuclear power plant is named Barakah - Arabic for divine blessing. The UAE's investment in these four nuclear reactors risks further destabilising the volatile Gulf region, damaging the environment and raising the possibility of nuclear proliferation.

Safety Flaws: The UAE nuclear contract remains South Korea's one and only export order, despite attempts by KEPCO to win contracts in Lithuania, Turkey, Vietnam and the UK. Barakah, construction of which began in 2011, is in the Gharbiya region of Abu Dhabi, on the coast. Although nuclear reactor design has evolved over time, key safety features haven't been included at Barakah. This is important, since these reactors might not be able to defend against an accidental or deliberate airplane crash, or military attack.

Four nuclear reactors are nearing completion in the UAE, built by the South Korean Electric Power Corporation, KEPCO. The nuclear power plant is named Barakah - Arabic for divine blessing. The UAE's investment in these four nuclear reactors risks further destabilising the volatile Gulf region, damaging the environment and raising the possibility of nuclear proliferation.

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Particularly worrying is the lack of a "core-catcher" which, if the emergency reactor core cooling system fails, works to keep in the hot nuclear fuel if it breaches the reactor pressure vessel. Concrete cracking in all four reactor containment buildings hasn't helped, nor has the installation of faulty safety relief valves. All this is further complicated by large-scale falsification of KEPCO quality control documents, which ended up in a far-reaching criminal investigation and convictions in 2013.

Proliferation Risks*:* The tense Gulf strategic geopolitical situation makes new civil nuclear

construction in the region even more controversial than elsewhere, as it can mean moves towards nuclear weapon capability, as experience with Iran has shown. Following military strikes against Saudi oil refineries in late 2019, nuclear energy safety in the region increasingly revolves around the broader issue of security. This is especially the case since some armed groups may view the UAE's military operations in Yemen as a reason to target nuclear installations, or intercept enriched uranium fuel or waste transfers.

Following military strikes against Saudi oil refineries in late 2019, nuclear energy safety in the region increasingly revolves around the broader issue of security. This is especially the case since some armed groups may view the UAE's military operations in Yemen as a reason to target nuclear installations, or intercept enriched uranium fuel or waste transfers.

Such spillover from foreign policy – and politics more generally – will increasingly dovetail with nuclear safety considerations in the region. Perhaps disconcertingly, Yemeni rebels already claim to have fired a missile at the Barakah nuclear power plant site in 2017. Although UAE denied the claim, saying it had an air defence system capable of dealing with any threat, protection of Barakah won't be an easy task.

Time to scramble fighter aircraft or fire surface-to-air missiles may be limited, as the attacks in Saudi Arabia indicated. Not only that, but the increase in transport of radioactive materials into and through the Gulf once the reactors at Barakah start up will, unfortunately, present a major maritime risk.

Environmental Concerns: The Gulf is one of the most water-scarce regions in the world, and Gulf states rely on desalination. Radioactive release to the marine environment following an accident or deliberate incident at Barakah would have significant pollution consequences for desalination and drinking water in the region. And the UAE coast is a vulnerable environment, critically important for a very large range of marine life. Extensive mangrove habitats grow on and in coastal fine sediments and mudflats, notable for their ability to sequester radioactivity. Acting as a "sink" and concentrating radioactivity over time, normal operational nuclear discharge from Barakah will inevitably lead to human inhalation and ingestion.

The debate over nuclear power and climate is hotting up, with some scientists suggesting new nuclear can help. Yet, the International Panel on Climate Change recently reported that extreme sea-level events will significantly increase, whether emissions are curbed or not. All coastal nuclear plants, including Barakah, will be increasingly vulnerable to sea-level rise, storm surges, flooding of reactor and spent fuel stores. The UAE's governmental environmental assessment of global heating's impact on Barakah is conspicuous by its absence.

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Since not all energy policy choices are equal, the case for nuclear power in the Middle East has never been strong. While lower CO, emissions and improvement in renewable technology is one explanation for the dynamic global ramp in new renewable generation and the fall in new nuclear – the main driver seems to be the plummeting costs of the former and the increasing costs of the latter.

So it's strange that the UAE has cast significant resources at nuclear power, when other viable options already exist. Since new nuclear seems to make little economic

sense in the Gulf, which has some of the best solar energy resources in the world, the nature of Emirate interest in nuclear may lie hidden in plain sight - nuclear weapon proliferation.

Source: Paul Dorfman is Honorary Senior Research Associate, Energy Institute, UCL. The Conversation. https://theconversation.com/why-is-the-uae-where-solar-energy-is-abundant-about-to-open-four-nuclear-reactors-130248, 11 March 2020.

OPINION – Thomas Cynkin

What Happens in North Korea might not Stay in North Korea

The world has long been focusing on the threat to international peace and security posed by North Korea's missile and weapons of mass destruction programs, in particular its development of nuclear weapons. The threat posed by Pyongyang's increasing reliance on cybercrime and blockchain exploitation has also rightly drawn global attention and concern.

The COVID-19 epidemic, however, presents a new and invidious threat that has the potential to emanate from North Korea and threaten global security. Given its proximity to countries with major outbreaks of the new coronavirus, its virtually nonexistent medical infrastructure outside Pyongyang, and its political culture of secrecy and deception, North Korea represents a human petri dish that could prove a source for major international infections.

Ironically, repeated missile tests by North Korea have seemingly desensitized world opinion, despite multiple violations of UNSC resolutions. Recent photos of Kim Jong Un published in the official newspaper of the North's ruling Workers Party, showing him viewing a missile launch, have drawn attention primarily because the senior military officials accompanying him were wearing black face masks. This image, strangely evocative of Hollywood Western movie portrayals of villains, demonstrated strikingly how North Korea is taking extreme precautions to contend with the COVID-19 infections.

Recent photos of Kim Jong Un published in the official newspaper of the North's ruling Workers Party, showing him viewing a missile launch, have drawn attention primarily because the senior military officials accompanying him were wearing black face masks. This image, strangely evocative of Hollywood Western movie portrayals of villains, demonstrated strikingly how North Korea is taking extreme precautions to contend with the COVID-19 infections.

Despite North Korea's official statements that there have been zero cases of COVID-19 infections within its borders, such assurances fly in the face of reality, given the dramatic and tragic coronavirus outbreaks in neighboring countries, particularly China — Ground Zero for the epidemic. North Korea shares a long and, in segments, highly porous border with China, which it depends on for 90 percent of its trade and, until recently, a flood of Chinese tourists — estimated conservatively at over 350,000 in 2019.

Moreover, numerous North Korean indentured workers in China — estimated at around 50,000 — were obliged by U.N. sanctions to return to North Korea at the end of 2019. It is highly dubious that all complied, given lax Chinese enforcement. That said, China has asserted that it is in full compliance with U.N. sanctions, and any workers returning to North Korea represent another potential source of contagion. Moreover, North Korean workers in China are reportedly not required to get a work permit if they stay under 90 days, compounding the potential contagion problem through frequent turnover.

An additional reason for skepticism about North Korea's claims about zero COVID-19 cases is the pattern of Pyongyang's public deception as to other outbreaks in the past. During the 2009 swine flu (H1N1) outbreak, Pyongyang initially denied that there were any cases within its borders, despite reports from international relief officials to the contrary. Now, various South Korean media sources have reported numerous coronavirus cases in North Korea, with estimates running as high as hundreds dead and thousands more in

quarantine, despite Pyongyang's insistent denial.

Irrespective of how far COVID-19 has advanced in North Korea up to this point, there is very real concern that an outbreak could not be contained. North Korea has little or no medical infrastructure or medical supplies anywhere in the country, particularly beyond Pyongyang. Some hospitals reportedly even lack water and electricity.

In fact, according to Johns Hopkins University's 2019 Global Health Security Index, North Korea was rated 193rd out of 195 countries globally — almost dead last — in preparedness for managing outbreak of a disease. North Korea basically pulled zeroes in terms of biosecurity, biosafety, emergency preparedness and response planning, exercising response plans, emergency response operations, risk communication, medical countermeasures and personnel deployment, infection control practices and availability of equipment.

In practice, this means North Korea largely lacks the health infrastructure even to test those potentially infected, let alone treat them. A new coronavirus outbreak in North Korea would quickly spread. Moreover, the generally weakened health and malnourishment of most of the North Korean people would render most susceptible to COVID-19 contagion, with dire consequences.

It is clear that Pyongyang is at least aware of the new coronavirus contagion risks it faces given both its dependency on China and its appalling medical infrastructure, prompting a draconian response by the North Korean leadership. Pyongyang declared a national emergency and closed its 1,400 km border with China (and its 17 km border with Russia). North Korean official media stated that roughly 3,000 people in North Pyongan province, which borders China, are being monitoring in case they display possible coronavirus symptoms.

According to the North's Korean Central News Agency, North Korean officials are also educating North Korean residents along the Chinese border in the west about COVID-19 preventive measures and sending medicine and disinfectants to the region. Pyongyang meanwhile shut down flights and railway transport from China and Russia, curtailed foreign tourism, and canceled both the annual parade in honor of North Korea's military as well as the annual Pyongyang Marathon, with its many international participants. North Korea is quarantining for 30 days all foreigners entering the country — more than twice the new coronavirus incubation period — and strengthening customs measures, including by isolating all foreign goods being imported for 10 days. The North has imposed restrictions even on international aid workers and health agencies that are there to help, and has quarantined nearly 400 international workers, including diplomats.

The net result has effectively been de facto self-sanctioning by the North Korean regime. Severing physical and economic ties with China, on which North Korea is so economically dependent, is no doubt dealing a severe blow to the official North Korean economy. The impact can only be similarly grave for North Korea's "gray economy" in the form of cross-border traders and outright smugglers, and the private markets that Pyongyang has allowed to blossom under Kim's regime.

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Not only that, North Korea's plans to step up its hard currency earnings from Chinese tourists — not subject to international sanctions — appear to be in the deep freeze. For example, the mountain spa and ski resort in Samjiyon and the beach resort being developed at Wonsan, which

have been aimed at attracting Chinese tourists, have apparently been slammed by Pyongyang's stringent anti-coronavirus measures.

From the perspective of the international community, North Korea's COVID-19 containment effort has had the effect of tightening sanctions vis-a-vis China more effectively than could otherwise have been imagined. The effective stranglehold North Korea is placing on its own lifeline to China cannot help but put severe strain on the North Korean economy.

At first blush, this should strengthen the hand of the United States and its allies, as international sanctions relief should be even more vital to the North. However, the leverage afforded may be less than meets the eye. Even if North Korea were to decide today to dismantle its nuclear program and meet all conditions necessary for lifting the sanctions, the effectiveness of sanctions relief would be circumscribed by what are, after all, Pyongyang's self-imposed restrictive measures. And it is unclear whether South Korea or Japan, grappling with their own COVID-19 problems, would be focused on providing assistance to North Korea at this juncture.

At the same time, while the hermit kingdom understandably appears to be turning inward, it may also feel compelled to lash out internationally — both to project an image of strength and to provide a useful domestic distraction from its coronavirus crackdown. North Korea may be down, but it is not out, and the international community should continue to observe it with caution.

Despite the challenges involved, the international community, led by the U.S., should also be alert for any opening to provide North Korea with assistance in contending with the COVID-19 outbreak. This could help keep channels of communication open with Pyongyang and mitigate the possibility that an unchecked North Korean coronavirus outbreak could spill over and pose a further threat to global health.

Source: Thomas Cynkin is a former U.S. charge d'affaires to the CD in Geneva. https://www.japantimes.co.jp/opinion/2020/03/10/commentary/world-commentary/happens-north-korea-might-not-stay-north-korea/#.XmoPLqgzY2w, 10 March 2020.

OPINION – M.V. Ramana, Suvrat Raju

Pushing the Wrong Energy Buttons

Meeting between an Indian Prime Minister and a U.S. President has passed without a ritual reference to India's promise made in 2008 to purchase American nuclear reactors. This was the case in the latest joint statement issued during U.S. President Donald Trump's first official two-day visit to India (February 24-25), which stated that "Prime Minister Modi and President Trump encouraged the NPCIL and Westinghouse Electric Company to finalize the techno-commercial offer for the construction of six nuclear reactors in India at the earliest date".

So why has UAE cast significant resources at nuclear power, a quintessentially late-twentieth-century technology, when other more efficient, less risky, technically and economically viable options already exist? Since new nuclear makes little apparent sense in the Gulf, which has some of the best solar energy resources in the world, the nature of the interest in nuclear may lie hidden in plain sight.

Red Flags in the U.S. Deal: Because of serious concerns about cost and safety, the two organisations should have been told to abandon, not finalise, the proposal. Indeed, it has been clear for years that electricity from American reactors would be more expensive than competing sources of energy. Moreover, nuclear reactors can undergo serious accidents, as shown by the 2011 Fukushima disaster. Westinghouse has insisted on a prior assurance that India would not hold it responsible for the consequences of a nuclear disaster, which is effectively an admission that it is unable to guarantee the safety of its reactors.

The main beneficiaries from India's import of reactors would be Westinghouse and India's atomic energy establishment that is struggling to

retain its relevance given the rapid growth of renewables. But Mr. Trump has reasons to press for the sale too. His re-election campaign for the U.S. presidential election in November, centrally involves the revival of U.S. manufacturing and he has been lobbied by several nuclear reactor vendors, including Westinghouse, reportedly to "highlight the role U.S. nuclear developers can play in providing power to other countries". Finally, he also has a conflict-of-interest, thanks to his son-in-law and adviser, Jared Kushner, who accompanied him during the India visit.

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In 2018, the Kushner family's real-estate business was bailed out by a Canadian company that invested at least $1.1-billion in a highly unprofitable building in New York. Earlier that year, Brookfield Business Partners, a subsidiary of that Canadian company, acquired Westinghouse Electric Company. It violates all norms of propriety for Mr. Kushner to be anywhere near a multi-billion dollar sale that would profit Brookfield enormously.

What Renewables can Offer: Analysts estimate that each of the two AP1000 units being constructed in the U.S. state of Georgia may cost about $13.8 billion. At these rates, the six reactors being offered to India by Westinghouse would cost almost ₹6 lakh crore. If India purchases these reactors, the economic burden will fall upon consumers and taxpayers. In 2013, we estimated that even after reducing these prices by 30%, to account for lower construction costs in India, the first year tariff for electricity would be about ₹25 per unit. On the other hand, recent solar energy bids in India are around ₹3 per unit. Lazard, the Wall Street firm, estimates that wind and solar energy costs have declined by around 70% to 90% in just the last 10 years and may decline further in the future.

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How Safe? Nuclear power can also impose long-term costs. Large areas continue to be contaminated with radioactive materials from the 1986 Chernobyl accident and thousands of square kilometres remain closed off for human inhabitation. Nearly a decade after the 2011 disaster, the Fukushima prefecture retains radioactive hotspots and the cost of clean-up has been variously estimated to range from $200-billion to over $600-billion.

The Fukushima accident was partly caused by weaknesses in the General Electric company's Mark I nuclear reactor design. But that company paid nothing towards clean-up costs, or as compensation to the victims, due to an indemnity clause in Japanese law. Westinghouse wants a similar arrangement with India. Although the Indian liability law is heavily skewed towards manufacturers, it still does not completely indemnify them. So nuclear vendors have tried to chip away at the law. Instead of resisting foreign suppliers, the Indian government has tacitly supported this process.

Starting with the Tarapur 1 and 2 reactors, in Maharashtra, India's experiences with imported reactors have been poor. The Kudankulam 1 and 2 reactors, in Tamil Nadu, the only ones to have been imported and commissioned in the last decade, have been repeatedly shut down. In 2018-19, these reactors produced just 32% and 38%, respectively, of the electricity they were designed to produce. These difficulties are illustrative of the dismal history of India's nuclear establishment. In spite of its tall claims, the fraction of electricity generated by nuclear power

in India has remained stagnant at about 3% for decades.

The idea of importing nuclear reactors is a "zombie idea" that, from a rational viewpoint, should have been dead long ago. In fact an earlier plan to install AP1000s in Mithi Virdi, Gujarat was cancelled because of strong local opposition. In 2018, Gujarat Chief Minister Vijay Rupani declared that the reactors "will never come up" in Gujarat. The Prime Minister should take a cue from his own State and make a similar announcement for the rest of the country.

Source: M.V. Ramana and Suvrat Raju are physicists with the Coalition for Nuclear Disarmament and Peace. The Hindu, https://www.thehindu.com/opinion/op-ed/pushing-the-wrong-energy-buttons/article30965454.ece, 03 March 2020.

OPINION – David Axe

Can we Trust China's Promise to Never Use Nuclear Weapons First?

China has reaffirmed its policy of never being the first in a conflict to use nuclear weapons. Experts refer to this policy as "no first use," or NFU. The NFU policy reaffirmation, contained in Beijing's July 2019 strategic white paper, surprised some observers who expected a more expansive and aggressive nuclear posture from the rising power.

Notably, the United States does *not* have a no-first-use policy. "Retaining a degree of ambiguity and refraining from a no first use policy creates uncertainty in the mind of potential adversaries and reinforces deterrence of aggression by ensuring adversaries cannot predict what specific actions will lead to a U.S. nuclear response," the Pentagon stated.

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Chinese state media posted the government's white paper in its entirety. "Nuclear capability is the strategic cornerstone to safeguarding national sovereignty and security," the paper asserts. "This is standard language," explained David Santoro, a nuclear expert with the nonprofit Pacific Forum. "China's nukes serve to prevent nuclear coercion and deter nuclear attack." Then the surprise. "China is always committed to a nuclear policy of no first use of nuclear weapons at any time and under any circumstances, and not using or threatening to use nuclear weapons against non-nuclear-weapon states or nuclear-weapon-free zones unconditionally," the white paper adds.

This NFU clause surprised Gregory Kulacki, a nuclear expert with the nonprofit Union of Concerned Scientists. "Ever since I took this job 17 years ago, U.S. colleagues of all political and intellectual persuasions have been telling me that sooner or later China would alter, adjust, amend or qualify the policy that China will never, under any circumstances, use nuclear weapons first," Kulacki wrote.

It would be difficult to compose a more emphatic rejection of claims that China's no-first-use policy is changing. The statement also indicates it is not Chinese policy to use nuclear weapons first to forestall defeat in a conventional military conflict with the United States. China does not have an "escalate to de-escalate" nuclear strategy.

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China is not preparing to fight a nuclear war with the United States. It does not have "battlefield" or

"tactical" or "non-strategic" nuclear weapons. Chinese nuclear strategists don't think a nuclear war with the United States is likely to happen. And they seem sure it won't happen as long as the U.S. president believes China can retaliate if the United States strikes first. That's not a high bar to meet, which is why China's nuclear arsenal remains small and, for the time being, off alert.

Chinese nuclear planners might be willing to slow or scale back their nuclear modernization efforts if the United States were willing to assure China's leaders it would never use nuclear weapons first in a military conflict with China. Chinese experts and officials have been asking the United States to offer that assurance for decades. U.S. experts and officials consistently refuse.

China sees its comparatively modest nuclear modernization program as a means to convince U.S. leaders that a few Chinese ICBMs can survive a U.S. first strike and that these survivors can penetrate U.S. missile defenses. Chinese nuclear planners might be willing to slow or scale back their nuclear modernization efforts if the United States were willing to assure China's leaders it would never use nuclear weapons first in a military conflict with China. Chinese experts and officials have been asking the United States to offer that assurance for decades. U.S. experts and officials consistently refuse.

While China has not adopted a more aggressive nuclear policy, it *does* continue to upgrade its small nuclear arsenal and its command systems. Kulacki explained that modernization in the context of America's own refusal to commit to no-first-use. "In the absence of a no-first-use commitment from the United States, Chinese nuclear strategists believe continued improvements to their nuclear arsenal are needed to assure China's leaders their U.S. counterparts won't take the risk of attacking China with nuclear weapons" Kulacki wrote.

Chinese experts know U.S. efforts to develop a working ballistic missile defense system are not going well, but they still feel the need to hedge against continued U.S. investment in the system with incremental improvements in the quality and quantity of China's small nuclear force. Given the impassioned attack on constructive U.S.-China relations currently sweeping U.S. elites off their feet, along with the continued proliferation of misinformation about Chinese nuclear capabilities and intentions, many U.S. commentators are likely to brush aside the new white paper's reiteration of China's longstanding nuclear no-first-use policy. It doesn't fit in the emerging U.S. story about a new Cold War. That's unfortunate, especially as the U.S. Congress threatens to ramp up a new nuclear arms race its supposed adversary has no intention to run.

United Nations Secretary General António Guterres was glowing enough in congratulation: "Throughout the past half century, the NPT has served as an essential pillar of international peace and security, and the heart of the nuclear disarmament and non-proliferation regime. It has conferred tangible security benefits on all States parties.

Source: David Axe serves as Defense Editor of the National Interest. He is the author of the graphic novels War Fix, War Is Boring and Machete Squad. https://nationalinterest.org/blog/buzz/can-we-trust-chinas-promise-never-use-nuclear-weapons-first-129497, 05 March 2020.

OPINION – Binoy Kampmark

Golden Anniversaries for Flawed Treaties: The NPT Turns Fifty

In an era where agreements have been abandoned as "bad", to use that favourite word of US President Donald Trump, the Treaty on the Non-Proliferation of Nuclear Weapons continues to feature on the books of diplomacy. But age seems to be wearying it and decoding sober readings from hype-filled that has been a testing task.

United Nations Secretary General António Guterres was glowing enough in congratulation: "Throughout the past half century, the NPT has served as an essential pillar of international peace and security, and the heart of the nuclear disarmament and non-proliferation regime. It has conferred tangible security benefits on all States parties." Very ceremonial, very proper. In 2003, the NPT was deemed by US ambassador Thomas Graham Sr. "the centrepiece of international efforts to control the spread of nuclear weapons".

Commemorative praise for the NPT on its golden anniversary have sounded like the musings of madness. Michael O'Hanlon, Director of Research and Senior Fellow in the Foreign Policy program at the Brookings Institute, says that, "Current arsenals are big, but they are only as one-fifth the size of what they were a half-century ago." Only slightly less existentially murderous, then. O'Hanlon also has room for praising the Additional Protocol, enabling inspectors "to go places where they suspect monkey business, even if those sites are not officially declared by the country in question."

Robert Einhorn, Senior Fellow in the Arms Control and Non-Proliferation Initiative was warmed by the treaty's instilling of norms against nuclear proliferation, backed by the IAEA's monitoring system, a threat of sanctions for those violating non-proliferating obligations and controls on the export of particular technologies. The group of five nuclear states were obligated, by the spirit and substance of the treaty, to also "make 'good faith' efforts to reduce and ultimately eliminate their nuclear arsenals." Well, in a fashion.

For all the praise (O'Hanlon gives it a respectable 2.5 cheers) the NPT continues to be characterised by the aristocratic haves and the proletarian have nots: the traditional nuclear-weapon states (NWS) and non-nuclear-weapon states (NNWS). Only South Sudan, India, Israel and Pakistan remain outside the treaty, due to a combination of accident and design. To accede to the regime, these countries would have to dismantle their nuclear arsenals and place relevant nuclear material under international safeguards. Nuclear-weapons status is intended as exclusive, reserved for those who "manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967."

The NPT also propounds a mix of charity and weapons puritanism. Non-nuclear weapons states would, under Article V, be able to access the research gained from nuclear explosions conducted by the aristos. But these same aristos would undertake not to assist any states not in the club to develop or acquire nuclear weapons. Commitments to the NPT, notably by non-nuclear weapon states, would be verifiable through the inspection powers of International Atomic Energy.

As Leonard Weiss has observed, the NPT remained "a flawed institution that requires considerable tending to, including constant efforts to obtain consensus of its parties concerning evolving interpretations of its provisions in order to maintain its effectiveness as a non-proliferation tool if not its survival altogether." Problems with consensus can be demonstrated by the fact that five of the nine quinquennial treaty review conferences have yielded a satisfactory, agreed upon final document on the status of implementation.

The case of evolving interpretations was demonstrated in sharp terms on April 26, 1968 at a meeting of 124 delegations at the 22nd session of the United Nations General Assembly. The subject: drafting a viable nuclear non-proliferation instrument. US ambassador to the UN Arthur Goldberg envisaged "three major purposes": reducing the chances of nuclear weapons falling into the wrong hands; building a global system led by the International Atomic Energy Agency overseeing equitable and fair access "to the peaceful blessings of nuclear energy" and globalise nuclear and general disarmament.

The Soviet position, less light on the hill in its realisation, was fronted by UN Ambassador Vasili Kuznetsov, and privileged non-proliferation as a fundamental objective. The closure of "all channels, both direct and indirect" that would lead "to the possession of mass destruction weapons" had to be the main aim of any international system

of nuclear governance. Kuznetsov was mindful that "some States not yet in possession of nuclear weapons are approaching a level of industrial, scientific and technological development such as will enable them to quickly embark on the road to manufacturing weapons of mass destruction." He proved less than oblique on which States these might be – namely, those "which are pursuing or have pursued in the recent past an aggressive policy that strive to enter the nuclear arms race." The sceptre of Western Germany and historical enemies, in other words, loomed large.

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Jonathan R. Hunt suggests that current views of NPT arrangements centre on US-Russian insistence against an enlargement of the nuclear club with the rest of the nuclear family firming up on the traditional "three pillars". Amidst this lie such conceptual tangles as a Nuclear Weapons Free Zone in the Middle East, a point that riles rather than encourages consensus. The gulf between nuclear and non-nuclear states over the NPT's implementation has, observed a well-grounded Sérgio Duarte, president of the 2005 Non-proliferation Treaty Review Conference, "widened considerably over the decades and still prevents meaningful dialogue." The NPT, after five decades, has certainly proved to be stubbornly durable ahead of the 2020 Review Conference. Other instruments of control have gone by the wayside, withered by expediency and self-interest; the 1972 Anti-Ballistic Missile Treaty and the 1987 Intermediate-range Nuclear Forces Treaty are now documents of history.

The Treaty for the Prohibition of Nuclear Weapons has also been edging its way into prominence as a prizing rival, but the NPT retains a traditional mix, permitting the club to remain exclusive to the clubbable, and to discourage others from joining it. It's central point – that states with nuclear weapons will pursue general and complete disarmament – remains the stuff of hope, the aspiration of doddering types indifferent to certain timelines and programs.

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Source: Binoy Kampmark was a Commonwealth Scholar at Selwyn College, Cambridge. He lectures at RMIT University, Melbourne. https://www.eurasiareview.com/11032020-golden-anniversaries-for-flawed-treaties-the-npt-turns-fifty-oped/, 11 March 2020.

NUCLEAR STRATEGY

CHINA

How China is Rapidly Expanding its Missile Arsenal

One of the martial strengths of the PLA is its missile arsenal, which is advanced and contains

a multitude of more than 40 types that can be used to carry either conventional or nuclear warheads. One key type is the DF-26 IRBM, which is being introduced in greater numbers. Indeed, China fired more than 100 ballistic missiles during testing and exercises in 2019, according to sources close to the US military. Such a figure greatly exceeded what the USA and Russia launched, and it illustrates that China is not decelerating in any way its development of missiles for the PLA Rocket Force (PLARF).

Among the missiles that China fired last year, a large number were DF-21D MRBM and DF-26 IRBMs. The latter has a range of up to 4,000km and it can reach military targets in Guam when fired from Mainland China. These two missiles illustrate Chinese efforts to keep US and allied warships far from China's coast.

Most missiles are test-fired in northwest China, where the USA and others have poor radar coverage. The USA must, therefore, use satellites to detect the heat signatures of missile launches. Among the missiles that China fired last year, a large number were DF-21D MRBM and DF-26 IRBMs. The latter has a range of up to 4,000km and it can reach military targets in Guam when fired from Mainland China. These two missiles illustrate Chinese efforts to keep US and allied warships far from China's coast.

Part of the reason for Washington's August 2019 withdrawal from the 1987 INF with Russia is China's proliferation of land-based missiles in the 500-5,500km range, a segment that both Russia and the USA voluntarily gave up. China has gained a distinct advantage in MRBMs and IRBMs because it was not bound by such a treaty.

A similar level of launch activity was witnessed in 2019. US Sources noted "China launched more ballistic missiles for testing and training than the rest of the world combined" in 2019. Part of the reason for Washington's August 2019 withdrawal from the 1987 INF with Russia is China's proliferation of land-based missiles in the 500-5,500km range, a segment that both Russia and the USA voluntarily gave up. China has gained a distinct advantage in MRBMs and IRBMs because it was not bound by such a treaty.

Quite apart from its range, sufficient to reach Guam and hence its nickname the "Guam killer", the DF-26 is dangerous in that it is dual-capable since it can either a nuclear or high-explosive warhead. The PLA is believed to have fielded the DF-26 within an operational unit for the first time in 2016, and the latest assessment by US sources on the PLA listed an estimated inventory of 80 DF-26 launchers and up to 160 missiles, whereby each launcher might have one missile reload available.

DF-26 missiles are manufactured at a facility in Fangshan in the western part of Beijing. The same factory also seems to make DF-21 and air defense missiles. The very first DF-26 showed up in satellite imagery there in March 2009. By September 2019, a total of 51 launchers were visible there, of which 38 appeared to be finished and the rest were in various stages of assembly.

The first DF-26 missile unit to be identified was 666 Brigade, which is located in the town of Xinyang in southeastern Henan Province. This unit was formally stood up in April 2018, at which time imagery showed 18 DF-26 TELs. Xinyang is about 3,750 km from Guam, compared to 4,350km for Mumbai. DF-26s could thus target locations in India that are closer than this.

The second confirmed DF-26 unit was 624 Brigade located at Qingyuan, just 80km from China's coast in northern Guangdong Province. This brigade was a former DF-21 operator. Qingyuan is believed to be currently hosting 626 Brigade as well, before the latter transfers to a new base being established on Hainan Island. At this point, it is too early to say which of 624 or 626 Brigades will be a DF-26 or a DF-21D unit.

Another assumed DF-26 unit still being developed is 654Brigade at Dengshahe near Dalian in Liaoning Province. Interestingly, photos of TELs

at a field training site near there were circulating as early as January 2018. Missiles have also appeared at Korla in Xinjiang (with 646 Brigade in April and August 2019), possibly at Jinhua in Anhui Province, and at the Jilantai training area in Inner Mongolia. Satellite imagery confirmed that DF-26s were training there alongside DF-41, DF-31AG and DF-17 missiles in April-May 2019, including actual launches. These TELs later appeared in the Beijing parade on 1 October 2019.

US Sources commented about numerous DF-26 missiles turning up at a training base 9km south of Qingzhouin Shandong Province (coordinates 36.6011°N 118.4818°E) recently. Sources stated, "This is the first time the DF-26 has been seen operating in the area and marks a new phase in the integration of the missile into the Chinese military." Qingzhou contains a nearby PLARF missile support base, with different missile types appearing there over the years.

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At the above training location, sources spotted a dozen launchers there in November 2019 imagery. December pictures then showed 18 DF-26 launchers plus many support vehicles at this location. Sources predicted, "The DF-26 launchers are probably at the site as part of their integration into a new brigade."

If there are 18 launchers in each DF-26 brigade, the estimate of 80 TELs could mean enough weapons for up to four brigades, even if not all are operational yet and units are still being equipped. Sources further estimated that 2-3 DF-26 units existed a year ago, with each brigade having 6-12 TELs. Extrapolating, if each DF-26 brigade has 12 or fewer TELs (instead of 18), then this appearance of 18 TELs at Qingzhou could indicate more than one unit was training together.

Sources noted four important points of concern relating to China's multiplication of the DF-26 arsenal. "The first reason is the growing size and diversity of the Chinese nuclear arsenal. China officially maintains what it calls a minimum deterrent focused on ensuring it has a secure retaliatory capability to respond to a nuclear attack." China will soon overtake France with the world's third-largest nuclear arsenal, and its stocks have doubled over the past 15 years. Nonetheless, Beijing is still far behind nuclear weapon numbers in Russia and the USA.

Concerning the angst that Beijing's expansion of its nuclear weapons creates, the sources pointed out: "China's rejection of such concerns as well known but counterproductive, because it will fuel the development and deployment of military capabilities that China will see as growing threats to its national security. The Chinese government could help alleviate concerns and worst-case response by issuing factual statements about the status and future plans for its nuclear arsenal. This would not require disclosing everything, but as a growing military power, the days are over when China could hide behind the larger nuclear powers."

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Sources also made a second point is the dual-capable nuclear/conventional nature of the DF-26. "The inability to clearly distinguish the two creates significant challenges for crisis stability and escalation scenarios. In a tense crisis or a war, Chinese readying of conventionally armed DF-26 launchers could easily be misinterpreted as preparations to employ nuclear weapons, and cause an adversary to ready its nuclear weapons unnecessarily and precipitately. If China launched a conventionally armed DF-26, the target country

might assume the worst and prematurely escalate to nuclear use."

A third factor is that the DF-26's payload section is guided and is, therefore "capable of near-precision strike capability" against land targets, according to the US Sources. Why is this important? "Retaliatory nuclear deterrence does not require near-precision, but warfighting could. As such, Chinese deployment of highly accurate, quick-strike, dual-capable weapons could further deepen uncertainty and speculations about Chinese nuclear strategy."

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China continues to shroud nearly all its missile systems in a bubble of secrecy. It is yet to explain how or when it would use its dual-use DF-26, for instance. Other than that, China's 2019 Defense White Paper listed the aim of enhancing…nuclear deterrence and counterattack [and] strengthening intermediate and long-range precision strike forces". It is doing precisely that with mounting numbers of the DF-26.

Source: The Economic Times, https://economictimes.indiatimes.com/news/defence/how-china-is-rapidly-expanding-its-missile-arsenal/articleshow/74548346.cms, 09 March 2020.

BALLISTIC MISSILE DEFENCE

USA

US to Deploy Air Defence Systems in Iraq over Fears of more Iran Attacks

The US CENTCOM has announced it will deploy missile defence systems in Iraq over fears of further Iranian retaliatory attacks following the assassination by America of Iranian Major General Qassem Soleimani earlier in the year. CENTCOM head, US Marine General Kenneth McKenzie said during a House Armed Services Committee hearing: "We are also in the process of bringing air defence systems, ballistic missile defence systems, into Iraq in particular, to protect ourselves against another potential Iranian attack."

On 8 January, Iran's Islamic Revolutionary Guards Corp (IRGC) carried out a series of ballistic missile strikes against the Ain Al-Assad Airbase which hosts mostly US forces located in the western Anbar province, and another US base in the northern Iraqi Kurdistan region. This came days after the US targeted Soleimani in a drone strike near Baghdad airport.

Last month, the US Defence Department revealed that over 100 US forces had been diagnosed with traumatic brain injuries following the attack on the bases. A spokesman for the IRGC said last month that what Washington claims to be related to brain injuries from the strikes was actually "a metaphor for dead US troops." US President Donald Trump was accused of downplaying the seriousness having initially denied there were any injured US personnel. … Iranian media has consistently asserted that there were US fatalities following the attack, with the IRGC claiming at least 80 US servicemen had died and 200 were injured, not long after details of the attack were reported.

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Since the Iranian missile strikes, the US has been negotiating with Baghdad to bring air defence systems – such as the Patriot – into the country. According to *Stars and Stripes*, Pentagon officials have cited turmoil within the Iraqi government and logistical challenges as a reason for the delayed move. McKenzie was not asked by US lawmakers to elaborate further on his announcement and he did not provide specific information as to when or

where the missile systems would be placed in Iraq.

However, according to Army General Mark Milley, chairman of the Joint Chiefs of Staff, even if such weapons were present at the time of the Iranian attack, they would not have guaranteed the protection of the base, "That's what they're designed to do. Can't say for certain, obviously [that they would have succeeded]". Notably the Patriot defence systems failed to protect Saudi Arabian oil facilities during the 14 September attack last year, claimed by Yemen's Houthis but blamed on Iran. *Foreign Policy* described the Patriot as "a lemon of a missile defense system" over the incident.

Source: Middle East Monitor, https://www.middleeastmonitor.com/20200311-us-to-deploy-air-defence-systems-in-iraq-over-fears-of-more-iran-attacks/, 11 March 2020.

NUCLEAR ENERGY

INDIA

Revenue Cuts to DAE could Hit Nuclear Fuel Import, Payment to KKNPP Vendors: Official to Par Panel

Budgetary cuts to the Department of Atomic Energy could affect nuclear fuel imports, payments to vendors of the Kudankulam Nuclear Power Plant and other critical projects, according to a top official's response to a parliamentary panel that has termed the shortfall in financial allocation as a "cause for grave concern". The parliamentary standing committee on Science & Technology, Environment, Forests and Climate Change, which tabled its report in the Rajya Sabha on 06 March, looked into the Demands of Grant of the DAE. The DAE had made a projected demand of Rs 40,259.05 crore but was allocated Rs 26,691.70 crore, a reduction of 33.70 per cent.

The parliamentary standing committee on Science & Technology, Environment, Forests and Climate Change, which tabled its report in the Rajya Sabha on 06 March, looked into the Demands of Grant of the DAE. The DAE had made a projected demand of Rs 40,259.05 crore but was allocated Rs 26,691.70 crore, a reduction of 33.70 per cent.

"The Committee was informed that the DAE had made a projected demand of Rs 40,259.05 crore for budgetary estimate 2020-21 against which an amount of Rs 26,691.70 crore has been allocated, registering an overall reduction of Rs 13,567.35 crore i.e., 33.70 per cent less than the projected demand of the department," the panel said, observing that the insufficient budgetary allocation for DAE was a "cause for a grave concern". It further said, "Approximately, 41 per cent of this shortfall amount of Rs 13,567.35 crore is the revenue expenditure and 59 per cent affects the projected capital expenditure." The panel, headed by former Environment and Forests Minister Jairam Ramesh, asked the DAE about the impact on account of shortfall in budgetary allocation.

In response, the DAE secretary said revenue expenditure shortfall will mainly affect fuel imports from M/s Kazatomprom, M/s Cameco, producers and sellers of uranium based in Kazakhstan and Canada respectively. India imports uranium from Kazakhstan and Canada for domestic reactors under the IAEA safeguards. The revenue expenditure also includes India's contribution to the international ITER project that involves 35 countries for nuclear fusion research and related engineering works.

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The official added that the capital expenditure shortfall of Rs 7988.49 crore will affect payment to vendors of the KKNPP units 5 and 6 and the PWHR programme under which 10 more 700 MW power reactors are being built.

This also includes the ambitious PFBR and capital projects like the National Fuel Complex in Kota, Russian state credit and different research and development activities.

Source: https://www.outlookindia.com/newsscroll/revenue-cuts-to-dae-could-hit-nuclear-fuel-import-payment-to-kknpp-vendors-official-to-par-panel/1754204, 06 March 2020.

USA

Pentagon Awards Contracts to Design Mobile Nuclear Reactor

The Pentagon issued three contracts to start design work on mobile, small nuclear reactors, as part of a two-step plan towards achieving nuclear power for American forces at home and abroad. The department awarded contracts to BWX Technologies, Inc. of Virginia, for $13.5 million; Westinghouse Government Services of Washington, D.C. for $11.9 million; and X-energy, LLC of Maryland, for $14.3 million, to begin a two-year engineering design competition for a small nuclear microreactor designed to potentially be forward deployed with forces outside the continental United States.

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The combined $39.7 million in contracts are from "Project Pele," a project run through the Strategic Capabilities Office (SCO), located within the department's research and engineering side. The prototype is looking at a 1-5 MWe power range. The Department of Energy has been supporting the project at its Idaho National Laboratory.

Pele "involves the development of a safe, mobile and advanced nuclear microreactor to support a variety of Department of Defense missions such as generating power for remote operating bases," said Lt. Col. Robert Carver, a department spokesman. "After a two-year design-maturation period, one of the companies funded to begin design work may be selected to build and demonstrate a prototype."

"The Pele Program's uniqueness lies in the reactor's mobility and safety," said Jeff Waksman, Project Pele program manager, in a department statement. ... However, Pele is not the only attempt at introducing small nuclear reactors to the Pentagon's inventory. A second effort is being run through the office of the undersecretary of acquisition and sustainment. That effort, ordered in the 2019 National Defense Authorization Act, involves a pilot program aiming to demonstrate the efficacy of a small nuclear reactor, in the 2-10 MWe range, with initial testing at a Department of Energy site in roughly the 2023 timeframe.

If the testing goes well, a commercially developed, Nuclear Regulatory Commission licensed reactor will be demonstrated on a "permanent domestic military installation by 2027," according to DoD spokesman Lt. Col. Mike Andrews. "If the full demonstration proves to be a costeffective energy resilience alternative, NRC-licensed [reactors] will provide an additional option for generating power provided to DoD through power purchase agreements."

The best way to differentiate between the programs may be to think of the A&S effort as the domestic program, built off commercial technology, as part of an effort to get off of local power grids that are seen as weak targets, either via physical or cyber espionage. Pele is focused on the prototyping a new design, with forward operations in mind — and may never actually produce a reactor, if the prototype work proves too difficult.

According to an Oct. 2018 technical report by the Nuclear Energy Institute, 90 percent of military installations have "an average annual energy use that can be met by an installed capacity of nuclear power of 40 MWe or less." Replacing all local power with a nuclear reactor isn't necessary

for the department's goals, but one or more reactors in the 2 to 10 MWe range, located on base, would ensure that if the local power grid goes down, critical functions will still be able to operate. ...

Commercial Availability: This isn't the first time the DoD has looked into small nuclear reactors. The 2010 NDAA directed the department to study the feasibility of nuclear power for military installations, but a study concluded that the reactors available at the time were simply too big. However, new developments in the commercial sector are opening up more options. According to Dr. Jonathan Cobb, a spokesman for the World Nuclear Association, small nuclear reactors come in three flavors. The first, small modular reactors, sit in the 20-300 MWe range and are approaching the point they will appear on market.

A procurement and manufacturing cycle could take "between 3 and 5 years from the order of long lead materials to the delivery of the largest component, with a nominal target of 4 years. Most of the components will need to arrive on-site at least 6 months prior to startup in order to support the achievement of construction milestones.

The second category sits from 10-100 megawatts, and have been used in transports such as icebreakers. According to Cobb, a pair of 32 MWe reactors, based on icebreaker technology, are being used aboard the Akademik Lomonosov, a Russian "floating power plant."

The third category, covering what the Pentagon appears most interested in, is a category known as microreactors. The challenge, Cobb said, is that this group is the furthest behind technologically, with demonstrations of commercial systems targeted for "the second half of the 2020s," putting them in the "ballpark" of what DoD is looking for with its A&S effort. According to the NEI study, the reduced size and increased simplicity of microreactors mean a procurement and manufacturing cycle could take "between 3 and 5 years from the order of long lead materials to the delivery of the largest component, with a nominal target of 4 years. Most of the components will need to arrive on-site at least 6 months prior to startup in order to support the achievement of construction milestones."

"How they then would be developed to commercial applications may depend not only on industry developments, but also on establishing an effective regulatory environment. Most likely though we would be looking at microreactors coming into a commercial basis in the 2030s," Cobb explained.

"While more recent large-scale plants have made greater use of modular construction, for microreactors in particular we'd expect them to be produced as virtually finished factory-built units. There's every possibility that as microreactors move towards commercialism the companies developing them may choose to collaborate with existing players in the nuclear industry."

Edwin Lyman, director of the Nuclear Safety Project at the Union of Concerned Scientists, has concerns about the availability of fuel to power a proliferation of small nuclear reactors. He noted, "there are no clear plans for manufacturing the quantity of high-assay low enriched uranium, much less the production of high-quality TRISO [TRi-structural ISOtropic particle] fuel, that would be able to meet timelines this decade.

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American companies Westinghouse (0.2-5 MWe), NuScale (1-10 MWe), and UltraSafe Nuclear (5 MWe) are all developing reactors with less than 10 MWe output, while Sweden's LeadCold (3-10

MW3) and a U.K. consortium led by Urenco (4 MWe) are also working on developing similar systems.

Lord, for her part, would not rule out working with foreign allies on the nuclear program in some way, saying "We always talk with our partners and allies about collaboration. We have many umbrella vehicles, if you will, to do that, particularly with [National Technology and Industrial Base] countries — U.K., Canada, Australia. We have a little bit of an easy button there for working back and forth with technical information."

While the nuclear material likely to be used in these reactors is "highly impractical" for a pure nuclear weapon, Lyman warned that an enemy could still seek the material and use it in some form of dirty bomb scenario which could deny American forces access to a specific area; additionally, security protocols would need to be put in place to deal with the transfer of the reactors.

Safety Concerns: As complicated as the A&S domestic effort may be, the idea of developing a mobile reactor for use abroad will likely be significantly more complex — and not just from a technological perspective. Lyman believes that the department's past efforts have "consistently underestimated" the "spectrum of mission risks posed by these microreactors," mostly around the technical challenges of keeping the radioactive fuel safe and operational in battlefield conditions. "Fielding these reactors without commanders fully understanding the radiological consequences and developing robust response plans to cope with the aftermath could prove to be a disastrous miscalculation," warned Lyman.

There may be political challenges involved in deploying such systems. Some partner nations may balk at the idea of hosting a nuclear reactor, no matter how small. For instance, it is easy to picture the U.S. seeking to put a system for potential deployment, or as a power backup on a local base, in Japan, a key location for America's force posture to counter China; such a move would likely be met with strong hostility, if not from politicians than from local protesters.

Security would remain a major factor as well, with the risk of nuclear material from a reactor falling into the hands of terrorist groups needing to be accounted for. While the nuclear material likely to be used in these reactors is "highly impractical" for a pure nuclear weapon, Lyman warned that an enemy could still seek the material and use it in some form of dirty bomb scenario which could deny American forces access to a specific area; additionally, security protocols would need to be put in place to deal with the transfer of the reactors. However, Marc Nichol, NEI's Senior Director of New Reactors, believes the refueling process should be fairly simple, with the non-mobile reactors sought by A&S likely having a 10 year lifespan in between refueling needs and the mobile reactors brought back whole to the U.S. when they need a refresher.

"The idea is these would be refueled back in the United States at a centralized facility designed and equipped to do this work. No one is envisioning that these would be refueled in the field," Nichol said. "Because they would be in a specialized facility here in the United States, there would be safety and security protocols in place for that. We have a lot of experience handling used fuel for our commercial reactors."

Finally, there may be political challenges involved in deploying such systems. Some partner nations may balk at the idea of hosting a nuclear reactor, no matter how small. For instance, it is easy to picture the U.S. seeking to put a system for potential deployment, or as a power backup on a local base, in Japan, a key location for America's force posture to counter China; such a move would likely be met with strong hostility, if not from politicians than from local protesters.

... Costs, meanwhile, should not be a major factor for a while, as the dollar value associated with both the early design contracts and a potential prototype should be fairly small. NEI estimates the program needs around $140m in FY21 funds to keep everything rolling smoothly. In addition, Nichol said, DoD should begin to prepare the Army to take over the project once SCO hands it off; NEI believes $12m in FY21 funds should cover those early needs.

Source: Aaron Mehta, DefenceNews, https://www.defensenews.com/smr/nuclear-arsenal/2020/03/09/pentagon-to-award-mobile-nuclear-reactor-contracts-this-week/, 09 March 2020.

As Bipartisan Support for Nuclear Energy Grows in Congress, Progressives Should Reconsider Their Opposition

Any serious conversation about the future of America's energy production must include nuclear energy, which accounts for 20 percent of all American energy production and 55 percent of American carbon-free-energy production. Unlike wind and solar, nuclear energy can be reliably supplied on demand, not just when the wind is blowing or when the sun is shining. Nuclear-energy plants also have the advantage of using less land space than solar and wind farms.

In the past year, there has been an increased focus by both parties on global carbon output and the future of our environment. Senator Bernie Sanders (I., Vt.) has claimed that "climate change is a major national security threat and a global emergency." Yet, in his Green New Deal plan, Senator Sanders also calls nuclear energy "a false solution" to the problem. If climate change is the "major national security threat" and the "global emergency" that Sanders claims it is, why is he against our nation's best chance at reducing carbon emissions?

Not only does Sanders want to kill the largest source of carbon-free energy in the United States, he wants to kill the industry that harvests it — an industry that employs 100,000 people across our nation. These are high-wage, high-skill American jobs, and they would vanish if he had his way.

We are at a critical moment for the future of nuclear energy in the United States and worldwide. Russia and China have both surpassed the U.S. as the world's leading producers of nuclear reactors. Within the next two years, China is expected to become the second-leading global producer of nuclear energy, and if we do not change course, it will overtake the United States for the top spot on the list by 2030. That would leave us in a weak position to influence the future of nuclear-energy development, and it would mean falling behind China at the moment when we can least afford it.

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Thankfully, President Trump, unlike Senator Sanders, has supported the development and deployment of nuclear power. Under Trump's leadership, the Department of Energy has begun to work with the Nuclear Regulatory Commission to accelerate the deployment of advanced nuclear reactors, which will be safer and more versatile. In December of 2019, the NRC approved an early site permit for the Tennessee Valley Authority to build a small modular reactor at the Clinch River Site, in my district in Tennessee. In 2018, Congress passed and the president signed the Nuclear Energy Innovation Capabilities Act, which eliminated financial and technological barriers that stood in the way of American nuclear innovation.

Those steps are reflective of a bipartisan consensus growing in Congress, and of a White House willing to support it. The United States cannot afford to continue to backslide from its position as a world leader in nuclear-energy research and development, and Congress has

begun to recognize as much. In the past few years, we have made progress on nuclear innovation, and it would be a disservice to all Americans if that bipartisan work were to stop. If Sanders and other progressives want to get serious about actively reducing global carbon emissions, I'd encourage them to reconsider their opposition to the most reliable source of carbon-free energy in the United States.

Source: Chuck Fleischmann, National Review, https://www.nationalreview.com/2020/03/nuclear-power-progressives-should-reconsider-opposition/, March 10, 2020

URANIUM PRODUCTION

GENERAL

Countries Move Towards Low Enriched Uranium to Fuel their Research Reactors

Almost 3500 kg of HEU has been removed from research reactor sites worldwide over the last few decades as part of global efforts supported by the IAEA. Upon the request of Member States, the IAEA has assisted with the conversion of research reactor fuels to LEU in order to reduce the proliferation risks associated with HEU, which contains more than 20% fissile uranium-235. While most research reactors were built in the 1960s and 70s with technology that required HEU to perform experiments intended for scientific research, today much of this research can be carried out using LEU, in which the concentration of radioactive uranium-235 is below 20%.

While most research reactors were built in the 1960s and 70s with technology that required HEU to perform experiments intended for scientific research, today much of this research can be carried out using LEU, in which the concentration of radioactive uranium-235 is below 20%.

"The international community has successfully provided technological solutions for converting HEU fuel to LEU fuel in research reactors," said Thomas Hanlon, Nuclear Engineer Expert at the IAEA. "The trick is to do this without compromising the scientific research." Today, about 220 research reactors operate across 53 countries, and 171 of these reactors were constructed with an HEU core. Seventy-one HEU fuel reactors have been converted to LEU since 1978. Nuclear power reactors, which are used to generate electricity, run on LEU. The IAEA has supported HEU to LEU fuel conversions or HEU repatriations in Austria, Bulgaria, Chile, China, the Czech Republic, Georgia, Ghana, Hungary, Jamaica, Kazakhstan, Latvia, Libya, Mexico, Nigeria, Poland, Portugal, Romania, Serbia, Ukraine, Uzbekistan and Viet Nam. The IAEA has supported HEU minimization through technical cooperation projects, fact-finding missions, coordinated research projects, technical and consultancy meetings and procurement assistance.

Learning from Others: A recent case is that of Ghana, where — with IAEA support — the successful conversion of their Ghana Research Reactor-1 (GHARR-1), a miniature neutron source reactor (MNSR), in 2017 turned the country into a case study for other MNSR operators. The Ghana Atomic Energy Commission, or GAEC, has built an international MNSR training facility that allows trainees from other countries to practice extracting mock HEU from the reactor vessel.

With less enrichment, we are reducing the attraction to the material and making the world better," said Benjamin Nyarko, Director-General of GAEC, adding that the conversion from 90.2% enriched uranium to 13% was accompanied by technological change that has led to an increase in the reactor's power by over 10%.

"With less enrichment, we are reducing the attraction to the material and making the world better," said Benjamin Nyarko, Director-General of GAEC, adding that the conversion from 90.2% enriched uranium to 13% was accompanied by technological change that has led to an increase in the reactor's power by over 10%.

In 2018, Nigeria's only operating research reactor, Nigeria Research Reactor-1 (NIRR-1), underwent HEU removal and conversion to LEU. The IAEA supported in the conversion as well as in training the relevant personnel and sharing other countries' experience. To practice converting the reactor, Nigerian experts conducted a dry run of HEU removal in Ghana's training centre. After the conversion of Nigeria's reactor, there are no more HEU-fuelled research reactors in Africa.

Conversion requires highly trained personnel and equipment. The most complex step in the process is often transporting the spent HEU, using trucks, ships or planes. Once the HEU fuel reaches its destination, it is either securely stored or diluted to lower enrichment levels. "In Chile in 2010, we transported approximately 14 kg of HEU to the USA; this was the last of 3 operations that have led to the country being free of this fuel," said Rosamel Muñoz Quintana, Head of Corporate Communications at the Chilean Nuclear Energy Commission. ...

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Converting More Research Reactors to LEU: Work remains to be done. Although 71 research reactors have been converted to LEU, and 28 that were HEU-fuelled have been shut down, another 72 are still powered by HEU. In many cases this is for scientific reasons. "It takes a lot of creative engineering to figure out how to achieve a similar capacity for the reactor, using LEU in the same space initially designed for HEU," Hanlon said. "It's a bit like trying to make a cup of espresso of the same strength you're used to, using the same amount of liquid in the same container, but with fewer grains of coffee."

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Source: IAEA, https://www.iaea.org/newscenter/news/countries-move-towards-low-enriched-uranium-to-fuel-their-research-reactors, 21 February 2020.

NUCLEAR COOPERATION

UK–CANADA

Canada, UK Strengthen Nuclear Collaboration

Canadian Nuclear Laboratories and the UK's National Nuclear Laboratory have agreed an action plan to boost collaboration in energy, medical isotopes, waste management and decommissioning, while the Canadian Nuclear Association and the UK's Nuclear Industry Association have signed a Memorandum of Understanding to collaborate in promoting nuclear technologies. Canada's 19 nuclear power reactors produce 15% of the country's electricity. The UK's 15 nuclear power reactors, operating across eight sites, account for 21% of that country's generation.

CNL and NNL's action plan, announced on 4 March, includes exploring joint research projects and studies, information exchange workshops and other resource and knowledge-sharing opportunities. They have identified research related to advanced nuclear reactor fuel, targeted alpha therapy and medical isotope production and environmental remediation practices and technologies as key areas they intend to pursue in partnership.

This follows an MoU they signed in 2016 to collaborate on a variety of projects in reactor metallurgy, fuel development, waste management and medical radioisotopes. CNL President and CEO Mark Lesinski said the new action plan will enable them to share expertise, facilities, equipment and other resources to achieve public policy goals in their respective countries. "Canada and the United Kingdom have a long history of working together to tackle some of the world's most pressing challenges through

nuclear science and technology, but we still have a lot to learn from one another, and I am thrilled that this tradition of collaboration will continue through this agreement," he said.

NNL CEO Paul Howarth said the MoU had been an "excellent way" of opening links between the organisations. "However, this Action Plan takes us a big step further forward and means that we will now begin to see outputs from our collaboration which will benefit both the UK and Canada."

CNA President and CEO John Gorman said the MoU will help accelerate the wave of innovation in nuclear energy among the two organisations' member companies. "Nuclear energy already makes important contributions to combating climate change. To reach net-zero emissions, global cooperation at the government and industry level will be essential. This agreement between two world-class industries is a key step in that direction," he said.

Association Links: The new MoU signed on 3 March by the CNA and NIA at the UK Department for International Trade's *Civil Nuclear Showcase 2020* addresses the need for greater dialogue and exploration of nuclear's role in effective environmental stewardship, the two organisations said. It includes demonstrating nuclear power as a clean energy technology; advocating for more explicit and prominent inclusion of nuclear in energy and environmental policies; promoting the inclusion of nuclear technologies in bilateral dialogues and forums; and supporting the countries' shared leadership in the *Nuclear Innovation: Clean Energy (NICE) Future* initiative.

In this critical decade we must expand the suite of clean energy options to include nuclear products that are cost competitive, easier to buy, easier to deliver, present lower risk to investors and can meet a broad range of market applications.

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"International cooperation is critical to both the current success and the bright future of the nuclear industry," said NIA Chief Executive Tom Greatrex. "This MoU will further strengthen ties with our Canadian partners and assist in advancing nuclear power as an essential element of clean energy solutions to address climate issues globally."

SMR collaboration: The University of New Brunswick and Bangor University in Wales have signed a letter of intent to work together on the development of small modular reactors. The letter of intent identifies possible areas of collaboration based upon similarities between the two institutions, the University of New Brunswick said, adding that noth universities have demonstrated leadership in nuclear research and development in their respective regions.

Civil Society Declaration: A group of nuclear power advocates presented the governments of Canada and the UK with a declaration calling for a high-profile nuclear presence at the UN's climate talks in November. The presentation took place at a civil society roundtable event at the High Commission of Canada in London, which concluded that, as the second largest source of clean energy, nuclear should be represented accordingly during the upcoming COP26 meeting in Glasgow.

"In this critical decade we must expand the suite of clean energy options to include nuclear products that are cost competitive, easier to buy, easier to deliver, present lower risk to investors and can meet a broad range of market applications," they wrote in their declaration. Signatories included climate scientist James Hansen, President of African Women in Energy and Power Bertha Dlamini, National Secretary of

Prospect Union Alan Leighton, former chairman of the Energy and Climate Change Select Committee Tim Yeo, and climate author Mark Lynas, among 31 civil society leaders from nine countries. The declaration was presented to Shawn Tupper of Natural Resources Canada and Christopher Bowbrick of the Department for Business, Energy & Industrial Strategy.

Source: Eurasia Review, https://www.eurasiareview.com/ 08032020-canada-uk-strengthen- nuclear-collaboration/, 08 March 2020.

NUCLEAR PROLIFERATION

IRAN

Iran's Enriched Uranium Stocks over 5 Times over Deal Limit IAEA

Iran's stockpile of enriched uranium is more than five times the limit fixed under a landmark 2015 deal with world powers, the UN nuclear watchdog said. An IAEA report said that as of February 19, 2020 the Iranian stockpile stood at 1,510 kg, as opposed to the 300 kg limit set under the agreement. Some experts consider this level to provide sufficient material to produce a nuclear weapon. However, it would still need several more steps, including further enrichment, to make it suitable for use in a weapon.

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The report says that Iran has not been enriching uranium above 4.5 per cent.

An enrichment level of around 90 per cent would be needed for weapons use. The 2015 deal has been hanging by a thread since the US withdrew from it in May 2018 and went on to impose stinging sanctions on Iran, in particular targeting its vital oil sector.

The latest IAEA report on the deal comes just days after a meeting in Vienna of the remaining parties to the deal which ended without a clear plan to keep the accord alive.

The agreement promised Iran an easing of very damaging economic and other sanctions in return for its scaling back its nuclear programme. Tehran has been progressively reducing its commitment to the accord however in retaliation for the US move.

Source: https://www.theweek.in/wire-updates/international/2020/03/03/fgn66-iaea-iran-ld%20uranium.html, 03 March 2020.

NORTH KOREA

North Korea Fires Projectiles into Sea; U.S., China Urge Return to Talks

North Korea launched multiple projectiles into the sea on 09 March 2020 as part of firing drills, according to South Korea's military, drawing US and Chinese appeals for Pyongyang to return to talks on ending its nuclear and missile programmes.

Launched a week after North Korea resumed missile tests following a three-month break, the projectiles, including from a multiple-launch rocket system (MLRS), flew up to 200 km (124 miles) and reached 50 km in altitude, South Korea's Joint Chiefs of Staff (JCS) said. Hopes were raised for dialogue when North Korean leader Kim Jong Un met U.S. President Donald Trump for a historic summit in Singapore in June 2018. But no significant progress has been made despite two more meetings between the leaders. A US State Department spokeswoman said: "We continue to call on North Korea to avoid provocations, abide by obligations under U.N. Security Council Resolutions, and return to sustained and substantive negotiations to do its part to achieve complete denuclearisationý."

U.S. officials, who spoke on condition of anonymity, said that at least four projectiles had been

detected. One of the officials said that according to initial information that could change, there were five projectiles, three short-range missiles known as the KN-25 and the other two were KN-09.

China's foreign ministry called for all sides to use dialogue and show flexibility, saying the situation was "complex and sensitive". "We also urge parties to make positive efforts to calm the situation for talks to continue, and to realise the denuclearisation and lasting peace in this region and the peninsula" spokesman Geng Shuang told a briefing.

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The South Korean JCS expressed "strong regret" at the launches and South Korea's presidential Blue House called the drills "unhelpful" for Korean peninsula peace efforts. ... Britain, Germany, France, Estonia and Belgium raised North Korea's recent launches at the U.N. Security Council, calling them provocative actions that violated U.N. resolutions. North Korea's foreign ministry criticised the European stand as "U.S.-instigated reckless behaviour" and Kim's sister said the drills were not meant to threaten anyone.

Source: Hyonhee Shin, Sangmi Cha. Reuters India. https://in.reuters.com/article/northkorea-missiles/north-korea-fires-three-projectiles-in-into-sea-south-korea-says-idINKBN20W080, 09 March 2020.

NUCLEAR NON-PROLIFERATION

GENERAL

Nuclear Non-Proliferation Treaty an Essential Pillar for Peace and Security

António Guterres made the request in a statement issued by his Spokesperson to mark 50 years since the Non-Proliferation Treaty came into force. He congratulated the States Parties on this milestone: "Throughout the past half century, the NPT has served as an essential pillar of international peace and security, and the heart of the nuclear disarmament and non-proliferation regime. It has conferred tangible security benefits on all its States parties" the statement said.

... At the upcoming conference, countries will identify areas and means through which further progress can be made, according to the UN statement. "The Secretary-General calls on States parties to make the most of this opportunity to strengthen international peace and security through the promotion of non-proliferation of nuclear weapons and nuclear disarmament, as well as measures to strengthen implementation of the NPT and achieve its universality", it concluded.

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Source: UN News, https://news.un.org/en/story/2020/03/1058801, 05 March 2020.

NUCLEAR SAFETY

FRANCE

French President Macron Highlights Support for IAEA in Meeting with Director General Grossi

France remains a strong supporter of the IAEA and its mandate – both in deterring the spread of nuclear weapons and in facilitating the peaceful use of nuclear technologies worldwide, President Emmanuel Macron told IAEA Director General Rafael Mariano Grossi in Paris. Mr Grossi stressed the important role France has played with respect

to the 2015 agreement between world powers and Iran, known as the JCPOA, in keeping the dialogue between the parties open. President Macron and Mr Grossi agreed on the need for Iran to cooperate with the Agency in clarifying all outstanding safeguards matters and upholding its obligations. In his first official visit to France since taking office in December, Mr Grossi and his hosts discussed France's progress in the development of small modular reactors for nuclear power, the role of nuclear power in the fight against climate change and in the reduction of fossil fuel use, as well as the role of nuclear techniques in reaching development objectives, particularly in Africa.

"France is an important partner for the IAEA and your support to our technical cooperation programme goes a long way in helping African countries get access to nuclear technology and expertise in the areas of food and agriculture and cancer care," Mr Grossi said at his meeting with Minister of Foreign Affairs Jean-Yves Le Drian.

France is an important partner for the IAEA and your support to our technical cooperation programme goes a long way in helping African countries get access to nuclear technology and expertise in the areas of food and agriculture and cancer care," Mr Grossi said at his meeting with Minister of Foreign Affairs Jean-Yves Le Drian.

France, whose 58 nuclear reactors produce over 70% of the country's electricity, has a smaller per capita carbon footprint than most other developed countries, Mr Grossi said. This is largely thanks to nuclear energy, he added. "The IAEA is committed to working with any country that shares our vision that nuclear power could be part of the solution against climate change," he said. "We help them use nuclear power safely, securely and sustainably."

François Jacq, CEO of the French Atomic Energy and Alternative Energies Commission (CEA), has acknowledged the role of the IAEA in nuclear safety and security and the benefits to France of IAEA peer review missions. These missions – based on IAEA safety standards and security guidance – review the operations of nuclear power plants and provide a report identifying best practices and areas of improvement.

In his meetings with his French counterparts, Mr Grossi thanked France for its support to the IAEA's goals to reach gender parity – both among the beneficiaries of its technical cooperation activities and in its own staffing. "France has always been a key partner for the IAEA," he said. "We look forward to strong collaboration in the future."

Source: Miklos Gaspar, IAEA, https://www.iaea.org/newscenter/news/french-president-macron-highlights-support-for-iaea-in-meeting-with-director-general-grossi, 03 March 2020.

JAPAN

What's the Risk Posed by Radiation Hot Spots Near Olympic Sites in Fukushima?

Warnings of radiation hot spots in parts of Fukushima that will host the Olympic torch relay and several sporting events have made headlines, but what is the risk for athletes and spectators? Since 2011, Japan has carried out extensive decontamination in affected areas and lifted evacuation orders. It hopes the games will showcase recovery in areas devastated by the earthquake and tsunami that left over 18,500 people dead and missing, and unleashed the worst nuclear accident since Chernobyl.

But activists, including local nongovernmental organizations and Greenpeace, have been vocally critical of government efforts and made a splash with the discovery last year of multiple radioactive hot spots near the start of the Olympic torch relay route. Greenpeace nuclear campaigner Kazue Suzuki argues the government is "deceiving people" by underplaying what the NGO calls ongoing health risks.

"You don't have to be scared all the time, but you have to be aware of the risk," Suzuki said.

At issue are patches of ground where Greenpeace said they detected radiation levels of 1.7 microsieverts per hour at one meter above the surface. That compares with the nationally allowed safety standard of 0.23 microsieverts per hour and a normal reading in Tokyo of around 0.04

microsieverts per hour. The hot spots showed a reading of 71 microsieverts per hour at the surface level, Greenpeace said. "That's the tip of the iceberg, we think. There must be other hot spots," Suzuki said. "We request broader monitoring." Greenpeace argues the hot spots pose a threat less from radiation, but more if contaminated soil is inhaled in the form of dust.

After the hot spots were detected, Tokyo Electric Power Company Holdings Inc., the plant's operator, removed the contaminated topsoil, and government officials say the area is safe. "Every time we consider the possibility of lifting an evacuation order, first of all decontamination takes place and thereafter stringent monitoring is conducted.

"Chances (of adverse health effects) are very, very low, but you cannot deny the risk ... you shouldn't just say there's no problem, especially with that high contamination," Suzuki said. After the hot spots were detected, Tokyo Electric Power Company Holdings Inc., the plant's operator, removed the contaminated topsoil, and government officials say the area is safe. "Every time we consider the possibility of lifting an evacuation order, first of all decontamination takes place and thereafter stringent monitoring is conducted" Fukushima Gov. Masao Uchibori told journalists in February.

"In deciding the route for the torch relay, we conducted another round of monitoring in order to ensure the complete safety of the runners and spectators," he added. And experts on radiation and the Fukushima accident say the risks posed by the hot spots are often misunderstood. "I would not say that radiation is harmless, but it depends on the exposure dose," said Koichi Tanigawa, director of the Futaba Medical Center in Fukushima. While the hot spot readings are high, they pose no risk of "any radiation injuries or health effects," said Tanigawa, an expert on radiation emergencies who has worked in the region since the 2011 accident.

Data on cancer in the affected area is not conclusive, Tanigawa said, but overall incidence and organ-specific rates are mostly lower than national levels. Thyroid cancer levels are higher, but this may be the result of dedicated screening programs that detected small cancers that might otherwise have gone unnoticed, he added. Radiation readings should be understood in context, said Geraldine Thomas, director of the Chernobyl Tissue Bank and chair of molecular pathology at Imperial College London. "Are these readings a surprise? No they are not. Is this a significant health concern? Absolutely not," she said. She said neither radiation nor inhalation of dirt from hot spots should be a concern for people.

Source: The Japantimes, Sara Hussein, https://www.japantimes.co.jp/news/2020/03/10/national/radiation-hot-spots-olympics-fukushima/#.XmoS56gzY2w, 10 March 2020.

NUCLEAR WASTE MANAGEMENT

GENERAL

Managing Research Reactor Spent Fuel: IAEA Meeting Explores Dry Storage Options

As countries with nuclear research reactors look to optimize their spent fuel management practices, many are considering dry storage. Thirty three experts from 24 countries met at the IAEA in Vienna for a technical meeting to share experiences in spent fuel management and to improve their practices.

Dry storage involves removing the fuel from storage in water pools to a space where the fuel is surrounded by air or an inert gas. Of the 24 countries present at the meeting that currently operate research reactors, 8 utilize dry storage and another 13 countries, including Egypt, Malaysia and Romania, are considering this option.

Dry storage involves removing the fuel from storage in water pools to a space where the fuel is surrounded by air or an inert gas. Of the 24 countries present at the meeting that currently operate research reactors, 8 utilize dry storage and another 13 countries, including Egypt, Malaysia and Romania, are considering this option. Their reasons range from dwindling storage capacity in spent fuel pools to a desire

for a longer-term solution as facilities for final disposition may not be available for many years and research reactors operate longer than initially planned, producing more spent fuel.

"Dry storage offers a number of advantages, including passive cooling from air, reduced risk of fuel cladding corrosion and the ability to scale up storage space incrementally," said Frances Marshall, an IAEA nuclear engineer and scientific secretary of the meeting. "It also allows for longer interim storage periods than that afforded by wet storage." Research reactors—used for research, development, education and training—produce neutrons for use in industry, medicine, agriculture and forensics, among others. Wet storage of their spent fuel involves placing spent fuel assemblies in a pool at the reactor site for cooling and storage until the final disposition path is determined.

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While the safety and reliability of this method is well established, wet storage requires significant, ongoing maintenance. This includes recycling the pool water, which must be constantly monitored for temperature and purity, and periodic fuel inspections. Spent fuel pools also have relatively limited space, which can become an issue after many years of reactor operation.

Germany has extensive experience with dry storage dating back to the early 1990s and currently has several dual purpose casks for spent fuel from research and test reactors, with additional casks expected to be added in the near future.

For dry storage, after an initial period of cooling in the spent fuel pool, spent fuel is dried and then placed in either airtight containers or in an engineered facility which provides confinement, where natural air circulation cools the spent fuel over time. The engineered facilities could be above ground structures, near surface boreholdes, pits or pipes containing arrays of storage cavities suitable for containment of fuel assemblies.

Germany has extensive experience with dry storage dating back to the early 1990s and currently has several dual purpose casks for spent fuel from research and test reactors, with additional casks expected to be added in the near future. "Dry storage has been our primary storage method owing to its passive safety features and relatively minimal maintenance requirements," said Oliver Bartos, an expert at Gesellschaft für Anlagen- und Reaktorsicherheit (GRS), a non-profit scientific research organisation in Germany. "For countries considering a move to dry storage, deciding on a storage system and cask type based on their specific needs is important together with regulatory considerations for safety and security."

During the technical meeting, participants were divided into three working groups to review drivers for seeking dry storage solutions, identify gaps in technology options and discuss countries' needs in this area. They also considered next steps for enhancing cooperation and knowledge sharing with an eye to assisting countries new to dry storage. "Argentina has concrete silos for the dry storage of commercial spent fuel, but for now we have only utilized wet storage for spent fuel from our research reactors," said Gabriel Manrique, a technician at Argentina's Irradiated Fuels Storage Facility of Research Reactors (FACIRI). "However, FACIRI is already 38% full, and with the RA-10 research reactor scheduled to come online in about 5 years, a future storage alternative will be needed."

South Africa has used dry storage for its research reactor spent fuel for around 25 years. "Sharing knowledge and experience at technical meetings and workshops is highly useful for Member States looking to implement dry storage," said Suzan

Bvumbi, a senior physicist at South Africa's National Radioactive Waste Disposal Institute. "Countries without experience in dry storage may have a lot of questions about technical and regulatory issues, and meetings like this are great opportunities to help them answer these questions."

Participants agreed that research reactor decommissioning can begin more quickly if dry storage is in place. They also shared other lessons learned, such as the importance of projecting future spent fuel inventories and securing public acceptance before deciding on introducing a new storage method. And they said an Agency publication providing technical guidance on dry storage, such as the drying process and ageing management of storage systems, would be beneficial.

The IAEA's Back End Research Reactor Integrated Decision Making Evaluation (BRIDE) tool could potentially be adapted for this purpose, participants concluded. Periodic safety, licensing and regulatory reviews in dry storage planning would help streamline the process and avoid unnecessary implementation delays, participants said.

Source: Matt Fisher, IAEA Department of Nuclear Energy, https://www.iaea.org/newscenter/news/managing-research-reactor-spent-fuel-iaea-meeting-explores-dry-storage-options, 12 March 2020.

Centre for Air Power Studies

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

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