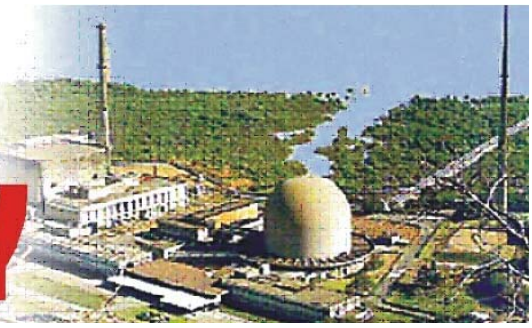
NUCLEAR SECURITY



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

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OPINION – Hina Pandey

India's Reservations about Voluntary Reporting of Civilian Plutonium Stocks

The canvas of global nuclear issues is immense, encompassing three parallel and significant subsets: deterrence, nonproliferation, and nuclear security. However, in the last year or so, most international attention has been directed towards proliferation issues and deterrence while nuclear security has largely been ignored. Though some progress was made with regard to maintaining global nuclear security through the nuclear security summits, the momentum seems to have been lost amidst a host of other nuclear concerns.

A recent proposal by Sharon Squassoni and Cindy Vestergaard has put the focus back on nuclear security in the context of reducing nuclear risks in South Asia. In "Charting Nuclear Security Progress in South Asia," they make a case for India and Pakistan voluntarily submitting reports about their fissile material under an existing international mechanism called the "Guidelines for the Management of Plutonium" or INFCIRC/549, supported by the IAEA. Simply put, the authors suggest that to enhance nuclear security in South Asia, more attention needs to be given to mitigating the risks emanating from the stockpiles of civilian plutonium. According to the guidelines, if a government chooses to participate in this reporting mechanism, they would provide information about their policies adopted in managing plutonium, including quantities of plutonium produced, received, shipped, lost, or even removed from inventory. Though the idea has value, it is important to recognize that participation in such an initiative would not be free from challenges and India may have several reservations.

According to the guidelines, if a government chooses to participate in this reporting mechanism, they would provide information about their policies adopted in managing plutonium, including quantities of plutonium produced, received, shipped, lost, or even removed from inventory.

Voluntary Mechanisms: Such voluntary reporting of fissile material can be useful in reducing the threat of nuclear terrorism, mainly of terrorist networks actively seeking a radioactive source of material for advancing their objectives. This

issue received significant attention during the NSS discussions, resulting in the securing and accounting of vulnerable HEU from various countries between 2010 and 2016. Since the NSS process did not address a possible threat from plutonium adequately, Squassoni and Vestergaard argue for the accounting of civilian plutonium. Since civilian plutonium stockpiles have "eluded restrictions," annual reporting could be useful in conveying that the nuclear material is accounted for, which will further improve confidence in the maintenance of nuclear security globally.

Specifically, it can be said that this proposal, if acted upon, is likely to: i) ensure nuclear transparency on the part of the reporting nation; ii) further solidify the adherence to a nuclear security norm, raising the reporting country's nuclear security profile; and iii) contribute to maintaining nuclear security in South Asia through an additional step. The idea has merit because it adds to the nuclear security architecture in the region, which is still at a nascent stage. If India and Pakistan participate in this initiative, South Asia will have its first nuclear transparency measure for civilian plutonium.

India's Reservations on INFCIRC/549: Squassoni and Vestergaard's proposal calls for India to report on its stockpiles of reactor-grade plutonium separated from the spent fuel of safeguarded pressurized heavy-water reactors. However, since this material is already under safeguards, it is accounted for as civilian plutonium and there is no need for India to report it under INFCIRC/549 separately. Additionally, the IAEA and the World Association of Nuclear Operators have regularly reviewed India's civilian nuclear facilities' safety record. India's Safeguards Agreement with the IAEA, approved by its 35-nation Board of Governors, states that it respects "…health, safety and physical protection and related security provisions in force in India…"

This demonstrates that the IAEA has confidence in India's nuclear safety and security related mechanisms related to civilian plutonium. Thus, the need to voluntarily declare civilian plutonium through INFCIRC/549 might be superfluous for India, especially if the logic of reporting is to bolster multilateral initiatives to prevent materials theft for nuclear terrorism. Since the responsibility of physical protection of the fissile material primarily lies with the possessing country, the need to repeatedly declare that India's civilian nuclear material remains safe may not be viewed by the government with a sense of urgency. Furthermore, India is already party to all 13 global instruments countering international terrorism. Thus, India might view its existing participation with regard to the management of civilian plutonium as sufficient.

The IAEA has confidence in India's nuclear safety and security related mechanisms related to civilian plutonium. Thus, the need to voluntarily declare civilian plutonium through INFCIRC/549 might be superfluous for India, especially if the logic of reporting is to bolster multilateral initiatives to prevent materials theft for nuclear terrorism.

It is difficult to imagine significant benefits to be gained by India from signing onto the INFCIRC/549 other than raising its own nuclear security profile. But in New Delhi's conception, even a raised nuclear profile like this may not really help India achieve an important goal — membership in the NSG. New Delhi believes its NSG membership is held up due to political reasons related to Chinese opposition and not because of its nuclear record.

Also, if being party to all 13 instruments combating terrorism hasn't helped India's record, then how can one measure like INFCIRC/549 do so? Another point is that binding nuclear security measures at least facilitate an exchange of information and best practices; as a non-binding and purely voluntary mechanism, INFCIRC/549 doesn't even provide that benefit. Finally, it is true that INFCIRC/549 is not only a reporting mechanism but also incorporates guidelines on the physical protection of nuclear material, their responsible handling, and transfers. But India is already contributing to these measures by participating in the Convention of

Physical Protection of Nuclear Material (CPPNM) and its amendment.

Not Effective Against Nuclear Terrorism: Squassoni and Vestergaard contend that INFCIRC/549 bolsters international nuclear security against the threat of nuclear terrorism. While it can be argued that the mechanism does this in a broader sense by propogating a culture of nuclear transparency that helps states keep one other accountable, it does not help in a material sense. It does not provide a mechanism for timely identification of nuclear materials theft, for example. India already participates in the IAEA's ITDB, which reports on cases of illicit trafficking and unauthorized activities involving nuclear and radioactive materials and analyzes them for information to better equip states to prevent such incidents. And unlike INFCIRC/549, ITDB is for all nuclear material, including plutonium, uranium, and thorium. Thus, India already participates in a much stronger mechanism to deal with threats of nuclear terrorism than INFCIRC/549.

The global stockpile of separated civilian plutonium grew rapidly between 1996 to 2005, at an average rate of about 50 tonnes a year; however, it has slowed down to 2 tonnes a year between 2005 and 2014.

Culture of Nuclear Transparency Needs Time to Develop: India acquired its nuclear capability only two decades ago in 1998, while other participating countries such as the United States, the United Kingdom, and China took almost four decades after acquiring nuclear weapons to accept the multilateral sharing of information. Moreover, the implementation of any such voluntary transparency measure is to be assessed in the light of the nuclear safety and security culture within the country, especially since Guideline 14 of INFCIRC/549 requires the publication of information on holdings of plutonium. India's integration into the global nuclear security architecture began only 12 years ago and thus, the culture of transparency is still evolving in South Asia.

Different Risk Perception of Plutonium: It is true that the global stockpile of separated civilian plutonium grew rapidly between 1996 to 2005, at an average rate of about 50 tonnes a year; however, it has slowed down to 2 tonnes a year between 2005 and 2014. Additionally, it must be noted that when assessing the risks from civilian plutonium, specifically its theft for nuclear terrorism, it is important to ask a pertinent question: how is a terrorist likely to use civilian plutonium? Making an explosive device from plutonium is even more challenging than using uranium to produce an improvised explosive device.

Voluntary Reporting Impacts India's Exceptionalism: As per INFCIRC/549, a state's management of plutonium is to be handled as per its obligations under the Nuclear NPT and its Safeguards Agreement with the IAEA. Now, the NPT members have forgone their right to nuclear weapons. Since India is a non-NPT member, it would not want its reporting mechanism to be linked with obligations for NPT non-nuclear weapon states. The reason may be symbolic but it does touch upon India's unique nuclear exceptionalism.

Conclusion: INFCIRC/549 does not provide India any attractive benefits apart from may be boosting its nuclear security profile. Furthermore, it eludes any verification mechanism and is also non-binding, which further diminishes the value of INFCIRC/549 in India's eyes. Finally, it seems that India would not be prepared to share this information yet, considering that no white papers or annual public press statements from the government on even broader nuclear issues are produced. Revealing estimates on civilian plutonium from safeguarded facilities, thus, seems to be a distant dream at this point. Finally, if such reporting is to ever be institutionalized as a norm in South Asia, a strong sense of its requirement has to be justified. That requirement has to come in the form of an IAEA obligation.

Source: https://southasianvoices.org, 23 March 2018.

OPINION – Peter Huessy

Why America Must Modernize its Nuclear Forces

"We took a procurement holiday for almost 30 years and stopped modernizing our force." That's what Gen. Garret Harencak, the former Air Force assistant chief of staff for Strategic Deterrence and Nuclear Matters, told one of my nuclear seminars in 2013. America's nuclear force is aging: US land-based ICBMs are now 47 years old, the B-52 strategic bomber is approaching 50 years, and the submarines are approaching 40 years — the longest any US submarine has ever been at sea.

The new *Nuclear Posture Review* is a restrained and well-thought out roadmap for the future development and modernization of US nuclear forces as well as a strategy for maintaining and improving America's deterrent capability. Given the age of US systems, and the late start the Pentagon got to modernization, a new strategic bomber will not be in the skies until the middle of the next decade. We won't see a new US land-based until the end of that decade. And there won't be a new Columbia class submarine until 2031. Waiting any longer would be a dangerous risk.

The choice America faces is simple: modernize or disarm. Doing nothing would rust the nuclear forces to obsolescence — essentially a policy of unilateral disarmament. Administrations may have delayed, truncated, or otherwise slowed modernization, but modernization has always been the path forward; the key issue has been when to do so.

The Modernization Debate: Many analysts have criticized the administration for its ambitious plan to modernize nuclear weapons, with most critiques focusing on the high price tag and worrying that the administration is going to increase the number of nuclear warheads. In fact, the modernization effort outlined in the *Nuclear Posture Review* is sensible and more affordable than the alternative – sustaining an aging force that requires greater and greater funding each year. Critics tend to highlight the cost implications of the *Nuclear Posture Review* because this is the first such review completed just as a major nuclear modernization program got underway. Thus future costs are more visible and much larger than previously projected under past nuclear reviews.

Many Americans may not realize this, but the last comprehensive modernization of the US nuclear deterrent began in 1981, some 37 years ago. The choice America faces is simple: modernize or disarm. Doing nothing would rust the nuclear forces to obsolescence — essentially a policy of unilateral disarmament. Administrations may have delayed, truncated, or otherwise slowed modernization, but modernization has always been the path forward; the key issue has been when to do so.

Indeed, the 2018 document does not propose policies that are a radical departure from previous nuclear policy: The proposed modernization of the triad of bombers, cruise missiles, submarines, and land-based missiles is largely inherited from the previous administration. The Senate ratified the New START Treaty, with the understanding that this approval was explicitly tied to most of the nuclear modernization that the 2018 Nuclear Posture Review is now endorsing.

Exploring the Costs: Using budget charts from the Center for Strategic and Budgetary Assessments' (CSBA) 2015 study of nuclear modernization costs — the cost of nuclear modernization is estimated to be $300 billion over 25 years, even in inflation-adjusted dollars. This is true even if one includes 25 percent of all nuclear-capable bomber costs, (though the real nuclear cost portion of the B-21 bomber program is around 3 percent). Estimates of $1.2–$1.7 trillion for the cost of nuclear modernization are incorrect. In these estimates, bomber costs are excessive, sustainment costs assume the worst case, the ground-based strategic deterrent numbers assume low rates of production, and modernization investments are confused with operations and maintenance funding of old, legacy systems.

Keeping the old systems around is getting expensive. The cost of simply sustaining the current force, with zero modernization, is close to $800 billion over 30 years according to an October 2017 Congressional Budget Office (CBO) report. This would include incremental fixes to the systems, but also incorporate inflation-adjusted dollars and cost growth. The figure assumes that there are few, if any, cost-effective measures to better sustain or support modern future systems compared to the relatively old systems of today that are indeed more and more expensive to keep in the force. The assumption is that new, modern weapons systems are going to require relatively expensive operating and sustainment budgets, which may not be the case at all.

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Thus, when the sustainment costs of the current old systems, the costs of the new systems when deployed, plus the acquisition costs of new systems, are all combined, the costs come to $1.2 trillion, according to that CBO report, far higher than any of the office's previous assessments. When examined closely, there are two important caveats to this figure. The report acknowledged using 100 percent of the bomber modernization and sustainment costs, even though all previous CBO assessments used a more realistic 25 percent. That factor alone increased the estimated 2017 costs by at least $142 billion compared to the similar CBO nuclear cost study done just two years before in 2015. And if expressed in then-year rather than 2017 dollars, the difference would have been more than $200 billion.

A B-52 has a maintenance to flying time ratio of 17 to 1. When the funds saved from retiring the B-1 and B-2 early are added to the $10 billion in operating costs over 30 years saved by the recently proposed B-52 re-engining, the overall bomber sustainment costs are reduced significantly from earlier estimates.

After the CBO made its 30-year assessment in October 2017, the Air Force announced it would be retiring the B-2 (and B-1) bombers early, which alone will further reduce bomber sustainment costs by $38.5 billion. A B-2 takes 27 hours of maintenance for one hour of flying time. By contrast, a B-52 has a maintenance to flying time ratio of 17 to 1. When the funds saved from retiring the B-1 and B-2 early are added to the $10 billion in operating costs over 30 years saved by the recently proposed B-52 re-engining, the overall bomber sustainment costs are reduced significantly from earlier estimates. CBO also factored in 100 percent of certain satellite costs, which CSBA does not, as the satellite mission cannot accurately be considered solely nuclear. Combined, these factors account for $250 billion in reduced cost estimates by my counting.

In estimating the sustainment costs of the future nuclear force, CBO clearly assumes little improved efficiency compared to the CSBA assessment. And given that sustainment of the nuclear force is two-thirds of the total nuclear costs, higher sustainment estimates obviously boost the anticipated expenditures. Similarly, future efficiencies will sharply reduce program costs. In contrast with CBO, the *Nuclear Posture Review* estimates lower sustainment costs from 2018 through 2029–30 and then a modest 1 percent ramp up to 2040. In short, it is cheaper and more intelligent to modernize forces rather than stopping or slowing modernization for budget reasons. To really save money, the United States would have to retire systems and get out of the nuclear business.

Digging into the Numbers: According to CSBA, a realistic estimate of the total cost of the nuclear enterprise comes to around $28 billion a year. This

is how much it would cost to sustain the old force, efficiently replace it, and in roughly 20 years have a fully modernized and sustainable force. The CSBA estimate rejected the CBO assumption that 100 percent of bomber costs should be included. CSBA used 25 percent of bomber costs plus more reasonable estimates of annual sustainment. CSBA estimated the full nuclear modernization and sustainment costs over 25 years were $706 billion, even in then-year dollars, peaking at $34 billion a year in 2029 but averaging $28 billion a year, or on average 4 percent of the defense budget.

Taken together, retiring the B-2 and the B-1 early saves $38 billion through 2050; adding new engines to the B-52 actually saves a net $10 billion, offset by the additional $22 billion needed to keep the bomber in the force longer.

Even considering that the CSBA looked at a 25-year horizon while the CBO looked at a 30-year one, (the longer-term estimate will of course be more, everything else being equal), the two assessments differ by at least $240 billion and as much as $300 billion. That's real money, even in Washington. It is true that in some years the annual cost will be higher than the average of $28 billion, but in any acquisition program, there first will be a ramp-up and annual expenditures will decline markedly thereafter. What's more, according to the CSBA report, is even at its peak, spending will grow to no more than $34 billion a year, which is a very reasonable 4.7 percent of today's defense budget even including anticipated inflation and program cost growth.

Current bomber, ICBM and submarine production will not result in a weapons system being put into the force until 2026, 2029, and 2031, respectively. By contrast, Russia says its entire nuclear deterrent will be fully modernized by 2021, having begun the effort in 2006.

And while the CBO and most other analyses assume the nuclear enterprise will cost more in the future than current estimates project, there is no reason future cost savings cannot be accomplished. Since the October 2017 CBO report, we have already seen multiple millions of savings realized in the ICBM Fuze program, according to my conversations with Air Force officers. $960 million has been saved in the hull costs of the new Columbia class submarines, and we expect $10 billion in projected savings from the plans to re-engine the B-52s.

Some argue that these are forgone costs and not costs that can be subtracted from current program estimates. Even if true, these savings bring previous estimates down, and reflect real program cost reductions. The planned retirement of the B-2 and the B-1 plus the re-engining of the B-52 were announced in December 2017 and February 2018, after the October 2017 CBO study, and thus these savings are not included in the CBO assessment. Taken together, retiring the B-2 and the B-1 early saves $38 billion through 2050; adding new engines to the B-52 actually saves a net $10 billion, offset by the additional $22 billion needed to keep the bomber in the force longer.

When buying weapons systems, it normally takes 12–13 years to get to initial operating capability. First the Navy and Air Force, overseen by the DOD, contract to reduce the risk inherent in such weapons systems. Then they move to research, development, test and evaluation. When those tasks are completed, the actual production of the bomber, submarine, or ICBM begins, with future annual production often stretched out to continue supporting the industrial base.

According to the *Nuclear Posture Review,* current bomber, ICBM and submarine production will not result in a weapons system being put into the force until 2026, 2029, and 2031, respectively. By contrast, Russia says its entire nuclear deterrent will be fully modernized by 2021, having begun the effort in 2006.

The Threat Environment: It is important to look at other nuclear powers to get a full picture of the emerging strategic landscape. Russia

continues to add to its arsenal of theater nuclear weapons, which are not under arms control limits. China, according to the *Nuclear Posture Review*, is "modernizing its nuclear weapons as part of an effort to prevent the United States from defending its allies and partners in the region." In addition, from 2009–2016, Russian military and government officials threatened the United States and its allies more than two dozen times with the use of nuclear weapons. Over that same time period, China also explicitly noted that its submarine launched ballistic missiles could destroy American West coast cities. North Korea has also regularly threatened to turn Seoul or New York or Tokyo into a "sea of fire."

Clearly, as the United States delayed modernization and dramatically reduced its nuclear arsenal through arms control, other nuclear powers including major American adversaries did not mimic this restraint. The United States, as it has for decades, needs advanced capabilities to respond to the advances of its adversaries. The threat environment does not stay static. Staying ahead of the threat lessens the chances an adversary will consider a reckless attack. To the extent America's leaders know the nuclear forces are deteriorating, they may be less willing to rely on deterrence to successfully challenge America's adversaries.

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For example, when the United States delayed modernization of its nuclear deterrent in the 1970s, the Soviet Union toppled the governments of more than a dozen countries. In the view of KGB Chairman Andropov, the "correlation of forces" was moving markedly toward the Soviets. Moscow was increasingly willing to take risks such as deploying nuclear missiles in Europe, invading Afghanistan, and supporting terror groups such as the Red Brigades, Black September, the IRA, and Baader-Meinhof gang. To avoid another similar decade of retreat and the rise of what was termed "Hollow Army," the United States must commit itself to a nuclear modernization effort.

Modernization and Arms Control: Critics also believe that modernization will be inconsistent with America's arms control obligations, specifically the obligation to stay within the limits of the 2010 new Star Treaty. However, the *Nuclear Posture Review* calls for a nuclear force that is consistent with being "prepared for and receptive to future arms control negotiations … as arms control is an important tool for managing competition and building predictability and transparency between nuclear armed states."

Moreover, America must have a "hedge" to maintain "flexibility to respond to a variety of current threats while preparing for future uncertainties." This means if the Russians abandoned New START treaty and expanded their nuclear forces, America would have to match their capability to maintain deterrence.

Modernization of the nuclear force is now threat-driven, according to Gen. John Hyten, head of U.S. Strategic Command. As U.S. adversaries build and deploy nuclear forces of greater capability, the United States has little choice but to do the same. By delaying those choices for nearly three decades, America largely pushed nuclear modernization into the next 20 years, such that the annual costs are higher than if modernization had taken place more gradually over a longer period.

Conclusion: As every previous administration has emphasized, the goal of the US nuclear deterrent is "to deter nuclear and non-nuclear attack, assure allies and partners … and hedge against uncertainty." Without a robust nuclear deterrent force, these tasks cannot be achieved. An aging force, rusting to obsolescence, won't be in the field

to deter, it will be retired. The good news is that, as a percentage of the defense budget and certainly compared to what America has spent historically on nuclear weapons, the costs to modernize are relatively modest. The United States must choose between keeping its deterrent force or gradually disarming. In the face of the threats America faces, modernization is the smart option: relatively cheap, stabilizing, and consistent with deterrent needs and arms control goals and obligations.

Source: Peter Huessy is Director of Strategic Deterrent Studies at the Mitchell Institute for Aerospace Studies. https://warontherocks.com/, 15 March 2018.

OPINION – Peter Wynn Kirby

Is Fukushima Doomed to become a Dumping Ground for Toxic Waste?

Despite promises of revitalisation from Japan's government, seven years on from the nuclear disaster the area is still struggling. This March 2018, seven years after the 2011 Fukushima Daiichi reactor meltdowns and explosions that blanketed hundreds of square kilometres of northeastern Japan with radioactive debris, government officials and politicians spoke in hopeful terms about Fukushima's prosperous future. Nevertheless, perhaps the single most important element of Fukushima's future remains unspoken: the exclusion zone seems destined to host a repository for Japan's most hazardous nuclear waste.

Japan possesses approximately 17,000 tonnes of spent fuel from nuclear power operations, such a development is vital. Most spent fuel rods are still stored precariously above ground, in pools, in a highly earthquake-prone nation.

No Japanese government official will admit this, at least not publicly. A secure repository for nuclear waste has remained a long-elusive goal on the archipelago. But, given that Japan possesses approximately 17,000 tonnes of spent fuel from nuclear power operations, such a development is vital. Most spent fuel rods are still stored precariously above ground, in pools, in a highly earthquake-prone nation.

Japanese officialdom relentlessly emphasises positive messages regarding Fukushima's short- and medium-term future, prioritising economic development and the gradual return of sceptical evacuees to their newly "remediated" communities. Yet the return rate for the least hard-hit communities is only about 15%. Government proclamations regarding revitalisation of the area in and around the exclusion zone intone about jobs but seem geared ominously toward a future with relatively few humans.

The Fukushima prefecture government is currently promoting a plan, dubbed The Innovation Coast, that would transform the unwelcoming region into a thriving sweep of high-tech innovation. Much of the development would be directed towards a "robot-related industrial cluster" and experimental zones like a robot test field.

The test field would develop robots tailored for disaster response and for other purposes on a course simulating a wide range of hurdles and challenges already well represented in Fukushima itself. Large water tanks would contain an array of underwater hazards to navigate, mirroring the wreckage-strewn waters beneath the Fukushima Daiichi plant, where a number of meltdown-remediating underwater robots have met a premature demise in recent years.

Elsewhere on the robot test field, dilapidated buildings and other ruins would serve as a proving ground for land-based disaster-response robots, which must navigate twisted steel rods, broken concrete and other rubble. Engineered runways and surrounding radiation-hit areas would serve as prime territory for testing parlous aerial drones for a range of purposes in various weather conditions – which would be difficult or impossible to achieve elsewhere in relatively densely populated Japan.

The planned site for the test field would link with a secluded test area about 13km south along the coast to coordinate test flights over the exclusion zone's more or less posthuman terrain. Naturally, unlike

Fukushima's human residents, robots would be oblivious to the elevated radiation levels found outside the Fukushima Daiichi facility. In addition, prefectural officials have suggested that the exclusion zone environs could play host to a range of other services that don't require much human intervention, such as long-term archive facilities.

Proud long-time residents of Fukushima, for their part, see all this development as a continued "colonisation" of the home prefecture by Tokyo – a well-worn pattern of outsiders using the zone for their own purposes, as were the utility representatives and officials who built the ill-fated plant in the first place.

Years of colossal decontamination measures have scraped irradiated material from seemingly every forest, park, farm, roadside, and school ground. This 16 million cubic metres of radioactive soil is now stored in provisional sites in and around the exclusion zone, waiting to be moved to an interim storage facility that has hardly been started and for which nearly half of the land has not yet even been leased.

in a nation with about 17,000 tonnes of highly radioactive spent fuel rods and no willing candidates for secure repositories, it is only a matter of time before it becomes possible for politicians to publicly back the idea of transforming the area around Fukushima Daiichi into a secure repository.

The state has promised to remove all the contaminated soil from Fukushima after 30 years, and government officials have been scrupulous in insisting that this will be the case – for soil. Yet in a nation with about 17,000 tonnes of highly radioactive spent fuel rods and no willing candidates for secure repositories, it is only a matter of time before it becomes possible for politicians to publicly back the idea of transforming the area around Fukushima Daiichi into a secure repository.

Government officials, including those tasked with nuclear waste storage, describe the quintessentially Japanese strategy of *saki-okuri,* or calculated postponement, in the context of nuclear waste storage. Such perception management is a subtle business, but by quietly and unrelentingly pushing back the day of reckoning – slowly changing the terms of debate – the broadly distasteful prospect of storing Japan's most dangerous material in its most tragically maltreated region would become gradually less intolerable to Japanese sensibilities.

The expanse of Fukushima in and around the exclusion zone represents an already contaminated area with, since 2011, far fewer residents to protest against such plans. Such a rare opportunity for relatively unopposed intervention in a struggling area will surely prove irresistible to the nuclear lobby.

Fukushima has been marginalised, disenfranchised, and outmanoeuvred for decades. After all, the electricity from Fukushima Daiichi went straight to the capital, not to Fukushima itself, which bore the risks. Since 2011, Fukushima has been saddled with the staggering burden of the meltdown's aftermath that, despite government PR, will encumber and stigmatise its citizens for at least several decades.

Source: *Peter Wynn Kirby is a nuclear and environmental specialist at the University of Oxford https://www.theguardian.com, 16 March 2018.*

NUCLEAR STRATEGY

PAKISTAN

Pak Gets Chinese Tracking Tech that can Boost Nuclear Missiles' Performance

The Chinese Academy of Sciences (CAS) announced that China has sold Pakistan an advanced optical tracking system that could potentially be used to track missile tests and boost development of advanced weapons that could render India's proposed ballistic missile shield impotent. The CAS claimed China was the first country to sell this advanced technology to Pakistan, a Hong Kong-based newspaper reported. A CAS official downplayed the sale as just

providing Pakistan a "pair of eyes."

The tracking system is believed to consist of advanced telescopes, cameras and laser-range finders in addition to other equipment that can precisely monitor a missile's trajectory from launch. The announcement is significant as it comes two months after the US Defense Intelligence Agency revealed that Pakistan was working on MIRVs. … The major military powers such as US, Russia and China have long had MIRVs, though Pakistan is regarded as the first nation in South Asia to openly aim at developing the capability on its 'Ababeel' missile. The Ababeel, which was first tested in January IN 2017, has a range of over 2,000km. A MIRV capability on the missile would give Pakistan the ability to not only hit nearly all major targets in India, but give it a much higher chance of defeating India's planned ballistic missile defence system.

China is effectively involved in virtually all major Pakistani defence programmes: the JF-17 fighter project, which is the Pakistan Air Force's main fighter; eight diesel-electric submarines that can carry cruise missiles and the Al-Khalid tank, which is a derivative of a Chinese tank.

However, the Ababeel and its MIRV technology would still need more tests to validate and improve its accuracy, which is where the Chinese tracking system comes in handy. The multiple sensors on the tracking system allow engineers to monitor the missile's trajectory and engine performance at various altitudes and prepare corrective measures to improve accuracy.

The sale underscores Beijing's deep strategic investment in Pakistan. From being Islamabad's oldest strategic ally that helped develop its nuclear missile programme, China is effectively involved in virtually all major Pakistani defence programmes: the JF-17 fighter project, which is the Pakistan Air Force's main fighter; eight diesel-electric submarines that can carry cruise missiles and the Al-Khalid tank, which is a derivative of a Chinese tank.

Source: https://www.theweek.in, 22 March 2018.

USA

US Nuclear Stockpile Decreasing in Size, but not Capability

The number of nuclear warheads kept in US stockpiles decreased by nearly 200 since the end of the Obama administration, according to information released by the Defense Department in response to a Freedom of Information Act request from the Federation of American Scientists. This reduction brings the total number of warheads down to 3,822 as of September 2017.

While this downsizing may seem to contradict the Trump administration's position on US nuclear posture, these reductions reflect "a longer trend of the Pentagon working to reduce excess numbers of warheads while upgrading the remaining weapons," according to Hans Kristensen, director of the nuclear information project at FAS.

In October 2017, President Donald Trump and Secretary of Defense Jim Mattis denied reports claiming the president was calling for an increase in the size of the US nuclear arsenal. … The 2018 Nuclear Posture Review introduced two new low-yield nuclear-capable weapons to the US arsenal, a sea-launched cruise missile and a nuclear-tipped D-5 Trident submarine-launched ballistic missile. Although the necessity and cost of these systems have been heavily questioned by critics, the capabilities have been defended by those inside the Pentagon as a necessary response to the return to great-power competition and a rapidly evolving 21st century threat environment.

The 2018 Nuclear Posture Review introduced two new low-yield nuclear-capable weapons to the US arsenal, a sea-launched cruise missile and a nuclear-tipped D-5 Trident submarine-launched ballistic missile.

Source: Daniel Cebul, https://www.defensenews.com, 27 March 2018.

Nuclear Warhead Manager Seeks FY19 Funding for New Nuke Designs

The agency in charge of managing America's nuclear warheads is in discussions with the Office of Management and Budget about getting funding to start work on two new nuclear capabilities sought by the Trump administration. The National Nuclear Security Administration, a semiautonomous agency within the Department of Energy, is a key player as the government seeks to create both a low-yield warhead for its submarine-launched ballistic missile and a new sea-launched, nuclear-capable cruise missile.

But while the Pentagon has identified those two systems as vital to national interests, and has set aside $22.6 million in fiscal 2019 for a low-yield ballistic warhead, the NNSA's budget request for FY19 doesn't contain any funds to support that work. "We are leaning as far forward as we possibly can, working with OMB and [the Department of Defense]" on the question of FY19 funds, said Lisa Gordon-Haggerty, the NNSA head, during congressional testimony. Philip Calbos, acting deputy administrator for defense programs at NNSA, later added that it would be "beneficial" for the agency to be able to begin work on the two new systems in '19, rather than having to wait until money is put into the FY2020 request.

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The officials did not clarify how they would go about getting that money added to the budget request, but it could come as either a supplemental request from the administration or through Congress during the authorization and appropriations process. Members of the House Energy and Water Development, and Related Agencies Subcommittee seemed open to that option during hearing, with several members saying they looked forward to talking with the agency officials in a smaller setting.

The Nuclear Posture Review laid out the need to invest in both a short-term development of a low-yield nuclear warhead that could be put on the Navy's Trident ballistic missiles, as well as a new nuclear-capable cruise missile that can be launched by naval vessels. But while the DoD is ready to invest in the near-term capability, the NNSA appears to have been unable to incorporate the final decisions of the NPR, as it was building its budget at the same time.

Calbos described the NNSA's portion of work on the submarine-launched ballistic missile as "a moderate level of effort, again relatively speaking, at a moderate cost. And we believe we can fit it in, in the near term." That is in line with the belief, expressed by defense officials, that the agency should be able to simply modify a handful of the W76-1 warheads already undergoing a service life extension. And because the sea launched cruise missile capability is not as near term, that should not impact the series of currently ongoing warhead life-extension and modification programs — assuming those all stay on track.

Both officials said they believe the warhead modernization efforts currently underway will not be impacted by the additional projects, but acknowledged that the real driver of keeping things on track comes down to stable funds. "This is not a one-, two-, three-year effort. It took us a while to reach the point we are in, in respect to the enterprise, and it will take us a while to get it back on secure footing for the next several decades," Calbos said. "Technically, we have the workforce that can do it. We're beefing up the enterprise so it can do the work it needs to do. We need sustained funding for many years."

Source: Aaron Mehta, https://www.defensenews.com, 20 March 2018.

BALLISTIC MISSILE DEFENCE

INDIA

BrahMos Supersonic Cruise Missile Successfully Tested-Fired

India on March 22, 2018 successfully test-fired the Brahmos supersonic cruise missile with an

indigenous seeker at Pokhran test range in Rajasthan. Defence Minister Sitharaman said the missile hit the target with "pin-point" accuracy and the success will further bolster India's national security.

The test firing comes three months after the Brahmos cruise missile was successfully test-fired for the first time from the Indian Air Force's frontline Sukhoi-30 MKI combat jet. …The range of the missile, an Indo-Russia joint venture, can be extended up to 400 km as certain technical restrictions were lifted after India became a full member of the MTCR last year. …

Brahmos missile is the heaviest weapon to be deployed on India's Su-30 fighter aircraft. Work has already begun to integrate the Brahmos supersonic cruise missile on 40 Sukhoi combat aircraft which is expected to fulfil the critical needs of the Indian Air Force in the wake of evolving security dynamics in the region.

The Defence Minister congratulated the DRDO on today successful test firing. Brahmos missile is the heaviest weapon to be deployed on India's Su-30 fighter aircraft. Work has already begun to integrate the Brahmos supersonic cruise missile on 40 Sukhoi combat aircraft which is expected to fulfil the critical needs of the Indian Air Force in the wake of evolving security dynamics in the region.

Source: *http:// www. tribuneindia. com, 22 March 2018.*

NUCLEAR ENERGY

ASIA

Asia Needs Nuclear for Clean and Reliable Electricity

Asia needs nuclear energy to meet its economic, energy and environmental goals, but such plans are still in the development phase in the South East region of the continent, Agneta Rising, director general of WNA, said March 21, 2018. Addressing delegates at the Sustainable Energy Technology Asia 2018 conference in Bangkok, Thailand, Rising noted that nuclear power generation is growing rapidly in Asia, having increased by 35% over the last five years.

Asia is a focus of new nuclear build, with 40 of the 56 reactors under construction globally being built in Asian countries. New countries are planning to start using nuclear generation, with construction of Bangladesh's first reactor under way and preparations progressing in countries such as Jordan, Saudi Arabia and Turkey.

South East Asia has become reliant on fossil fuels for electricity supplies, however, with coal-fired generation increasing dramatically, quadrupling since 2000. Electricity demand has risen sharply in the region and is expected to double over the next 20 years. "Countries in South East Asia can be part of a global clean energy future by committing to use nuclear energy. This will help reduce pollution, improve air quality and deliver better public health," Rising said.

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International vendors and supply chain companies are ready to work with businesses in the region to bring investment and help develop a highly skilled workforce, she said. To enable this, governments need to establish clear energy policies and develop nuclear energy infrastructure, training and education. "Nuclear energy will provide a clean and reliable 24/7 supply of electricity at a competitive price," Rising said. …

Source: *http://www.world-nuclear-news.org, 21 March 2018.*

INDIA

Construction of Two 700 MW N-Power Reactor in Haryana Starts

The government has begun construction of two nuclear power reactors of 700 MW capacity each at Haryana, nearly four years after the foundation stone of the project was laid. The NPCIL started excavation work for the first two units of Gorakhpur Haryana Anu Vidyut Pariyojana (Gorakhpur Haryana nuclear power project) at Gorakhpur village in Fatehabad district on 24 March in the presence of Atomic Energy Commission chairman Sekhar Basu. To be constructed at a sanctioned cost of Rs 20,594 crore, the two units would add 1400 MW base load capacity to the northern grid.

On completion, it will generate 980 crore units of electricity every year. Subsequently, two more units (GHAVP-3&4) would be set up at the same site. These are the first two nuclear power units to be constructed after India operationalised a new nuclear liability regime. The scheduled commissioning dates of the two units were 2020-21, but experts are skeptical on timely completion of the project.

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Four other 700 MW indigenous pressurised heavy water nuclear reactors are being built at Kakrapar in Gujarat and Rawatbhatta in Rajasthan. All of them are have been delayed by three to four years.

In May 2017, the Union Cabinet approved establishing another 10 700 MW nuclear power reactors in a fleet-mode. This includes the two units at Gorakhpur. Other units would be located at Mahi Banswara in Rajasthan (four units of 700 MW capacity each); Kaiga in Karnataka (2 units) and Chutka in Madhya Pradesh (2 units). The approval of 10 reactors on a fleet-mode is likely to accelerate the project work and generate manufacturing orders of close to Rs 70,000 crores to the domestic nuclear industry. …

Source: http://www.deccanherald.com, 25 March 2018.

UAE

UAE Completes First Korean-Built Nuclear Reactor

The UAE, with help from Korea Electric Power Corp., finished building the Arab world's first commercial nuclear reactor, a milestone in the oil-rich UAE's effort to curb its reliance on fossil fuels and develop cleaner sources of energy. Unit 1 of the Barakah complex plans to begin loading fuel in May, South Korea's energy ministry said in an emailed statement. South Korean President Moon Jae-in attended a ceremony to celebrate the facility's completion, the UAE's official WAM news agency reported.

It wasn't clear when Unit 1 in Abu Dhabi, capital and largest emirate of the UAE, will begin generating power. The Federal Authority for Nuclear Regulation will issue an operating license for Barakah Units 1 and 2 "when the operator meets all regulatory requirements," Christer Viktorsson, the regulator's director-general, said in an emailed response to a request for comment.

Barakah Unit 1 is the first of four nuclear plants that the UAE, with about 6 percent of the world's proven oil reserves, plans to bring into operation by 2021, the Persian Gulf nation's Energy Minister Suhail Al Mazrouei said in September. The plants are estimated to cost $25 billion and produce a combined 5,600 megawatts of power. Other Arab countries including Saudi Arabia and Egypt have also announced nuclear projects to help provide power to their growing populations and industries.

The UAE government expects the four Barakah

plants to contribute almost 25 percent of the nation's electricity after they're all operating, Emirates Nuclear Energy Corp. Chief Executive Officer Mohamed Al Hammadi told a conference in Abu Dhabi on Feb. 28. The UAE currently depends on imported natural gas to generate much of its electricity.

Source: Bruce Stanley and Heesu Lee, https://www.columbian.com, 27 March 2018.

NUCLEAR COOPERATION

INDIA–CANADA

India, Canada to Cooperate on Pressurised Heavy Water Reactors

Old collaborators in the field of peaceful nuclear technologies – India and Canada – signed a broad framework for research in the field of testing and designing of PHWRs and other non-power atomic technologies.

Old collaborators in the field of peaceful nuclear technologies – India and Canada – signed a broad framework for research in the field of testing and designing of PHWRs and other non-power atomic technologies. The arrangement was signed on February 23, 2018 during the visit of Prime Minister of Canada Trudeau to India.

Prime Minister Trudeau' visit to India was in news for the political tussle between the Indian and Canadian government but a lot of work was also done. The MoU was signed with the Department of Natural Resources of Canada concerning cooperation in the fields of science, technology and innovation. "The MoU is a broad framework arrangement for enhancing cooperation in research and development activities with Canada. The MoU facilitates mutual consultations on the areas of new material development and testing, design of advanced PHWRs, structural components of reactor systems including inspection and quality assurance programs, sharing of operational information, non-power application of radiation isotope technology, etc," Minister of State in the Ministry of Personnel, Public Grievances and Pensions and Minister of State in the Prime Minister's Office Dr. Jitendra Singh said in a written reply to the Parliament.

The MoU will be valid for a period of five years and can be renewed further through mutual consultations. Canada had put nuclear sanctions against India after the 1974 Pokharan nuclear tests. However, it renewed nuclear cooperation with India after over four decades in 2015 through a contract signed for the supply of seven million pounds of Uranium over the next five years. The deal was signed during the Canada visit of Indian Prime Minister Modi.

India-Canada civil nuclear cooperation dates back to mid-1950s when the nuclear reactor CIRUS was supplied to India under the 'Atom for Peace Programme' for civilian use of nuclear energy. India's indigenous nuclear reactors are based on CANDU technology.

Source: *http://www. nuclearasia. com, 17 March 2018.*

URANIUM PRODUCTION

CHINA

China Launches New Uranium Enrichment Centrifuges

China's uranium enrichment centrifuges have been upgraded and have large-scale commercial conditions, and the technological level and economic performance have been further improved to reach the international advanced level.

China has completed a "large-scale demonstration project for a new generation of uranium enrichment centrifuges", China National Nuclear Corporation (CNNC) announced on March 20, 2018. The new centrifuges have now been put into production at the Hanzhun fuel facility in Shaanxi province. The project was independently researched and developed by CNNC and has its own independent intellectual property rights, the company said.

"The completion of the demonstration project shows that China's uranium enrichment centrifuges have been upgraded and have large-

scale commercial conditions, and the technological level and economic performance have been further improved to reach the international advanced level," CNNC said. "The development and industrialisation of a new generation of uranium enrichment centrifuges will further increase China's position and competitiveness in the international uranium enrichment field." …

Source: http://www.world-nuclear-news.org, 21 March 2018.

NUCLEAR PROLIFERATION

ISRAEL

Israel Admits Bombing Syrian Nuclear Site in 2007, Says it's Warning to Iran

The Israeli military for the first time publicly acknowledged carrying out the 2007 airstrike that destroyed a suspected nuclear reactor in Syria, noting the mission should be a warning to Iran the Islamic Republic will not be allowed to develop nuclear weapons. Although Israel was widely believed to have been behind the Sept. 6, 2007 airstrike, it has never before commented publicly on it – until now.

The Israeli military for the first time publicly acknowledged carrying out the 2007 airstrike that destroyed a suspected nuclear reactor in Syria, noting the mission should be a warning to Iran the Islamic Republic will not be allowed to develop nuclear weapons.

… On 21 March 2018, the military released previously classified cockpit footage, photographs and intelligence documents about the airstrike carried out by eight F-15 fighter jets on the Al-Kubar facility near Deir al-Zor in eastern Syria, about 300 miles northwest of Damascus. According to the documents, the site had been in development for years and was scheduled to go into operation at the end of 2007.

Israel and Syria have always been bitter enemies. Throughout Syria's seven-year civil war, Israel has carried out well over 100 airstrikes, most believed to have been aimed at suspected weapons shipments destined for the Iranian-backed Hezbollah militant group, which targets Israel.

Israel's involvement in the strike has been one of the country's most closely held secrets. While it was not immediately clear why the military decided to go public, it comes after repeated calls in recent months by Prime Minister Netanyahu for the international community to take tougher actions on Iran and amid the possibility President Trump could scuttle the Iran nuke deal.

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At the time of the 2007 strike, Syria accused Israel of invading its airspace, but gave no further details about the target. The pre-mission briefing, made public on 21 March 2018, stated the operation should not be attributed to Israel so as to minimize the potential for an all-out war. It was ordered to be kept secret until further notice. Israeli Air Force Commander Maj. Gen. Norkin said the current turmoil in Syria has further vindicated the strike, particularly since the reactor was in an area later captured by the ISIS terror group. "Imagine what situation we would be in today if there was a nuclear reactor in Syria," Norkin said. "In historic hindsight, I think Israel's decision to destroy the reactor is one of the most important decisions taken here in the last 70 years."

In declassified internal "top secret" intelligence reports, the military said the mission to destroy the facility started at 10:30 p.m. on 05 September 2007 and ended with the return of the F-15s about four hours later. The paperwork appeared to indicate that the Syrian reactor was much closer to completion than previously reported.

"The message from the 2007 attack on the reactor is that Israel will not tolerate construction that can pose an existential threat," military chief Lt. Gen. Eisenkot said on 21 March

2018 statement. "This was the message in 1981 [when Israel took out an Iraqi nuclear reactor], this is the message in 2007 and this is the future message to our enemies." …

Source: http://www.foxnews.com/, 21 March 2018.

PAKISTAN

US Sanctions Seven Pakistani Firms for 'Nuclear Trade'

The Trump administration has added seven Pakistani companies to a list of foreign entities that presumably pose a significant risk to the national security and policy interests of the United States by allegedly engaging in nuclear trade. The move could undermine Pakistan's ambition of joining the NSG, an elite club of countries that can trade fissile materials and nuclear technologies.

A total of 23 entities added to the list that was published in the US Federal Register. Besides Pakistani companies, the list includes 15 entities from South Sudan and one from Singapore. All 23 entities now face stringent export control measures, which could prevent them from conducting international trade.

The move forms a series of decisions aimed at putting a squeeze on Pakistan. The list, prepared by the US Bureau of Industry and Security, declares that all seven companies are "reasonably believed to be involved, or to pose a significant risk of being or becoming involved, in activities contrary to the national security or foreign policy interests of the United States".

In all, a total of 23 entities added to the list that was published in the US Federal Register. Besides Pakistani companies, the list includes 15 entities from South Sudan and one from Singapore. All 23 entities now face stringent export control measures, which could prevent them from conducting international trade.

Among the seven Pakistani companies three are listed for "their involvement in the proliferation of unsafeguarded nuclear acti-vi-ties that are contrary to the national security and/or foreign policy interests of the United States". Two are accused of procuring supplies for nuclear-related entities already on the list and the remaining two are accused of acting as fronts for listed entities. An eighth Pakistani entity is based in Singapore.

The End-user Review Committee (ERC) of the US Department of Commerce determined that Mushko Logistics Pvt. Ltd., Singapore, and Mushko Electronics Pvt. Ltd., Pakistan, be added to the list on the grounds that these entities procured items for several Pakistani entities on the entity list.

The ERC determined that Solutions Engineering, Pakistan be added to the list based on its involvement in activities contrary to US national security and foreign policy interests. Specifically, the ERC determined that this entity has been involved in the procurement of US-origin items on behalf of nuclear-related entities in Pakistan that are already on the ERC list.

For the remaining five Pakistani entities, the ERC determined that three of the entities, Akhtar & Munir, Proficient Engineers and Pervaiz Commercial Trading Co. (PCTC), be added based on their involvement in the proliferation of unsafeguarded nuclear activities that are contrary to the national security and/or foreign policy interests of the United States. The ERC also determined that Marine Systems Pvt. Ltd. be added to the list for assisting Pakistani entities in circumventing US restrictions. The ERC also determined that Engineering and Commercial Services (ECS) be added to the list based on its involvement in supplying a Pakistani nuclear-related entity.

Companies dealing with the 23 entities added to the ERC list could face strict licence conditions or licence denials. The licence requirements apply to any transaction in which items are to be exported, re-exported, or transferred to any of the persons or in which such persons act as purchaser,

intermediate consignee, ultimate consignee, or end user. In addition, no licence exceptions are available for exports, re-exports, or transfers to the entities being added to the list in this rule. The list also includes several addresses of each of the seven Pakistani companies in Karachi, Lahore and Islamabad. The move would also have a negative impact on Pakistan's efforts to join the NSG....

Source: https://www.dawn.com/news/1397628, 26 March 2018.

SAUDI ARABIA

Can America Prevent Saudi Arabia from Going Nuclear?

Unless the JCPOA is strengthened, Saudi Arabia may find a way to get the bomb as a counter to Iran. Ahead of his visit to the United States, Saudi crown prince Salman clarified in an interview that while his country does not want nuclear weapons, "without a doubt, if Iran developed a nuclear bomb, we will follow suit as soon as possible.

Unless the JCPOA is strengthened, Saudi Arabia may find a way to get the bomb as a counter to Iran. Ahead of his visit to the United States, Saudi crown prince Salman clarified in an interview that while his country does not want nuclear weapons, "without a doubt, if Iran developed a nuclear bomb, we will follow suit as soon as possible." Such a clear and public statement by the de facto leader of Saudi Arabia was obviously meant to grab attention. This is not exactly breaking news for anyone that has been following Saudi Arabia in recent years, but the reiteration of Saudi concern with Iran's nuclear ambitions is significant for two reasons.

First, the Iran nuclear deal (JCPOA)—which Saudi Arabia has long believed is a flawed and will not stop Tehran from becoming a nuclear state—enables Iran to have an industrial nuclear program including uranium enrichment. Second, the statement reinforces the notion that Saudi Arabia's demand to enrich uranium as part of a civilian nuclear deal with the United States is not detached from the kingdom's desire to keep its options open in the military realm as well. In both regards, the factor that is driving Saudi Arabia's statements and stepped up nuclear plans is the implications of Iran's nuclear program, and the deal that was concluded with Iran in 2015.

While some have suggested that the crown prince's message highlights the importance of keeping the JCPOA in place as insurance that Iran will remain non-nuclear, the Saudi concern is quite the opposite: namely, that the nuclear deal in its current format has created a more aggressive Iran, and will not ensure that Iran remains non-nuclear. At the Munich Security conference in February 2018, Saudi foreign minister Adel Al-Jubeir could not have been clearer about how his country views the JCPOA, and Iran's regional behavior: *We are letting [the Europeans] know that the nuclear agreement that was signed with Iran is lacking. The sunset provision has to be amended, and the inspections have to broadened to include non-declared and military sites. We also believe the nuclear agreement itself does not resolve the issue of Iran's radical behaviour which has to do with the ballistic missile resolutions of the United Nations, exporting ballistic missiles that are used to target civilians."* He went on to criticize Iran's support for terrorism, and the revolutionary guards who are causing "mischief" within the region and the world.

The recent Saudi messages are directed at the Trump administration's current efforts to garner European support to strengthen the JCPOA. This explains the foreign minister noting that Saudi Arabia's assessment of the deal and Iran's regional behavior has been relayed to the Europeans, who have so far not been forthcoming on improving the JCPOA. Riyadh is clear that if the JCPOA is not strengthened and Iran does goes nuclear, Saudi Arabia will be right behind Iran.

All of this comes on the heels of Saudi plans for a civilian nuclear program, including a demand to work on the fuel cycle—namely, uranium enrichment and reprocessing of plutonium.

Discussions about Saudi Arabia's desire to close deals for a civilian nuclear program have accelerated in recent weeks, and negotiations with the United States on the subject have been renewed. During the Obama administration, the president insisted on holding Saudi Arabia to the "gold standard" that it set for civilian nuclear cooperation, namely, that the state in question must renounce the right to work on the fuel cycle—due to the potential proliferation dangers.

The kingdom claims that it needs nuclear energy to answer its growing energy needs, to reduce its dependence on oil and free up oil for exports. But Saudi Arabia has not hidden its additional strategic calculations towards Iran. Several years ago, so as not to fall behind Iran, Saudi Arabia announced its intent to build sixteen nuclear reactors over the next twenty years.

The background to the question of a state's supposed right to work on the fuel cycle is set by the NPT. According to one interpretation of Article IV, the NPT grants states the right not only to cooperate on developing a civilian nuclear program, but broadens that right to include independent production of fuel for its reactors (rather than buying the fuel on the open market). It became clear that this broad interpretation was not to be encouraged because uranium enrichment is dual-use technology—it can produce fuel for reactors, but if uranium is enriched to very high levels, the same centrifuges can produce the fissile material needed for a nuclear bomb. This was the rationale for creating the gold standard, and the first state in which it was implemented was the United Arab Emirates in 2009.

The key to getting Riyadh to adhere to the gold standard for civilian nuclear programs, and more importantly, to back off from any ideas about becoming a nuclear state, is to ensure that Iran cannot acquire nuclear weapons. And the first step in that regard is to improve the Iran nuclear deal.

Does Saudi Arabia need an advanced nuclear program for civilian purposes? The kingdom claims that it needs nuclear energy to answer its growing energy needs, to reduce its dependence on oil and free up oil for exports. But Saudi Arabia has not hidden its additional strategic calculations towards Iran. Several years ago, so as not to fall behind Iran, Saudi Arabia announced its intent to build sixteen nuclear reactors over the next twenty years. Riyadh has received offers from the United States, China, Russia, France and South Korea for building the first two reactors. While insisting that the program is for peaceful purposes only, the Saudi demand to enrich uranium is a serious concern.

However, when the global powers negotiating the JCPOA agreed to legitimize Iran's uranium enrichment program, the gold standard for civilian nuclear programs was dangerously undermined. After years of sanctioning Iran's uranium-enrichment activities—and well-aware of the dangers of this dual-use technology—the Obama administration nevertheless conceded to Iranian demands to treat it like any "normal" member of the NPT, and grant it its "rights," including uranium enrichment. After doing so, it is difficult to justify why Saudi Arabia cannot do the same; especially when the legitimacy was granted to a NPT *violator,* whereas Saudi Arabia is a member in good standing of the treaty.

At the end of the day, Saudi Arabia would probably be happier not to go down the nuclear route. The key to getting Riyadh to adhere to the gold standard for civilian nuclear programs, and more importantly, to back off from any ideas about becoming a nuclear state, is to ensure that Iran cannot acquire nuclear weapons. And the first step in that regard is to improve the Iran nuclear deal. The Saudis may be raising the issue to pressure the Europeans, helping to convince key

European states that they need to work with the Americans to correct the JCPOA's most blatant flaws.

Meanwhile, in considering the Saudi bid, the United States needs to juggle additional considerations. First, if an agreement is not reached—and Saudi Arabia decides to cooperate with Russia or China on its civilian nuclear plans—Moscow and Beijing could agree to more lax nonproliferation standards, and the United States would lose any control over how the program proceeds. As such, Washington has a clear interest in being the one to make the deal. As a member of the NPT, Saudi Arabia cannot simply start developing nuclear weapons. Riyadh would be under the same restrictions as any other NPT member state that decided to violate the terms of the treaty, like Iran. But the United States must insist on some additional guarantees for a civilian nuclear deal: adherence of Saudi Arabia to the additional protocol; full US involvement in the program, including veto power over each step, on a case by case basis; and Saudi agreement to send the spent fuel from the nuclear reactors abroad.

The best route going forward is not to tie Saudi Arabia's civilian program to problematic JCPOA conditions and timelines (as some have proposed), but rather to strengthen or fix the JCPOA itself. The flaws in the JCPOA—and enhanced Iranian regional aggression following conclusion of the deal—is what is driving Saudi Arabia to go down the same route. The only way to reassure Riyadh is to directly address the kingdom's concerns that the nuclear deal has increased Iran's hegemonic ambitions while not ending its ability to become a nuclear state.

Source: http://nationalinterest. org, 21 March 2018.

NUCLEAR DISARMAMENT

SWITZERLAND

Why Switzerland hasn't (Yet) Signed the Treaty Banning Nuclear Weapons

Switzerland has not yet signed or ratified the Nuclear Weapons Ban Treaty, adopted by the United Nations last summer 2017. A decision is expected in the coming months. Meanwhile, pressure is building for the Swiss to adhere to the convention. Despite participating in the preparatory work and negotiations of the treaty, Switzerland is one of several countries that has yet to sign the Treaty on the Prohibition of Nuclear Weapons. To date, 122 countries have adopted the treaty, 57 have signed and five have ratified it.

Switzerland participated in negotiations and the preparatory work of the treaty. We have approved the result of the negotiations on July 7,2017 because Switzerland shares the desire for a world without nuclear weapons and supports the mention in the treaty of the catastrophic humanitarian impact of the use of a nuclear weapon.

Campaigners argue that a failure to sign the treaty by Switzerland could have an impact on the country's humanitarian credentials. "If Switzerland does not sign this treaty, people will question our status as a champion of humanitarian rights and disarmament. I think [failure to sign] would undermine our credibility in this area," Beatrice Fihn, head of the Geneva-based ICAN said during an interview on RTS recently. ICAN received the 2017 Nobel Peace Prize for its driving role in the adoption of the Treaty on the Prohibition of Nuclear Weapons which is designed to reinforce article 6 of the Treaty on the non-proliferation of Nuclear Weapons.

Will the Swiss parliament agree to its ratification? Both chambers are due to debate the question following a parliamentary filed by Social Democrat Carlo Sommaruga, urging Bern to ratify the treaty as soon as possible.

Doubts in Bern: Ambassador Dallafior, who represents Switzerland at the United Nations Conference on Disarmament in Geneva, defends

the cautious position taken by Bern in relation to the signing of the treaty. She says it may take several months before a decision is made to sign the treaty or not. "An interdepartmental group in Bern is analysing the text to evaluate its coherence with the law and its articulation with respect to the Treaty on the non-Proliferation of Nuclear Weapons, and if prohibition is the best method for achieving nuclear disarmament," says Dallafior.

Tates that possess nuclear weapons and those protected by them under bilateral agreements still rely on them and don't want them to be called illegal or illegitimate as this would call into question their security arrangement, but they are a minority.

"Switzerland participated in negotiations and the preparatory work of the treaty. We have approved the result of the negotiations on July 7,2017 because Switzerland shares the desire for a world without nuclear weapons and supports the mention in the treaty of the catastrophic humanitarian impact of the use of a nuclear weapon."

However, the government does not hide a certain scepticism towards this agreement: "We are not sure that this treaty will really be a step towards the elimination of nuclear weapons because the countries which have the atomic bomb are not a party to it, although we are convinced that they should be implicated, them and their allies. This treaty should not be against them but with them," insists Dallafior.

The quantity of nuclear weapons may have gone down but capacities have increased from a qualitative standpoint. Every nuclear state is carrying out modernization programmes.

For Fihn, this argument does not wash. "Disarmament is something that happens over the long term. We are going to be able to ban and eliminate all the nuclear weapons. The only question to ask is the following: are we going to do it now or after they have been used," Fihn asked in the same RTS interview.

Difficult Compromise: Former French diplomat and consultant with the Geneva Centre for Security Policy (GCPS) Marc Finaud emphasises the difficulties of the Swiss position: "Bern wants to examine all the implications of the treaty. That's logical and legally justified. But what Switzerland hopes to do – bridge the divide between the opponents and partisans of the treaty – seems like trying to square the circle. You either agree to it or you don't. There is practically no possible compromise."

A specialist in the proliferation of weapons, Finaud says: "States that possess nuclear weapons and those protected by them under bilateral agreements still rely on them and don't want them to be called illegal or illegitimate as this would call into question their security arrangement, but they are a minority. The vast majority of countries support the text. So it's a growing trend and a norm that will exist and that's where all countries will have to make a choice. Switzerland is confronted with this choice and it will be difficult to have a compromise solution." In fact, the treaty's adoption is a recognition of the renewed threat posed by atomic bombs.

Multiple Threats: The risk in North Korea is especially palpable in spite of the spectacular announcement of a possible meeting between US President Trump and North Korean leader Kim who declare themselves ready to negotiate the denuclearisation of the Korean peninsula that has reduced tensions to a certain extent. But the fact remains that North Korea considers itself a new nuclear power, adding to the list of eight countries which hold nuclear weapons (France, Britain, Russia, United States, China, Israel, India and Pakistan).

The risk of proliferation is far from being side-lined, as much because the US president is still threatening to derail the international agreement on the Iranian nuclear programme, which, in fact, aims to prevent Tehran from becoming another

nuclear power.

Risk to Existing Treaties: Dallafior points out another aspect of the threat posed by nuclear weapons. "For several years, we have observed with great concern a trend towards armament rather than disarmament in the nuclear field," she comments. "The quantity of nuclear weapons may have gone down but capacities have increased from a qualitative standpoint. Every nuclear state is carrying out modernization programmes."

UN secretary general Antonio Guterres shares her concern. At a meeting of the Security Council on the non-proliferation of weapons on January 18,2018 Guterres reminded attendees: "The concerns in the world about the subject of nuclear weapons have reached their highest levels since the Cold War. This in the context of increasing military budgets and over-accumulation of weapons". A growth in the arms trade that was documented in the most recent report by the SIPRI.

Guterres singled out Washington and Moscow, commenting that "the confidence regarding the nuclear issue and other issues between the United States and the Russian Federation continues to weaken. Vital measures to reduce strategic armaments taken during and after the Cold War are under threat. It appears that there is no longer an interest in negotiating new treaties to reduce the nuclear arsenal after the expiration of the Treaty on Measures for Further Reductions and Limitations of Strategic Offensive Arms, in 2021."

Other Avenues: Pertinent or not, the Treaty on the Prohibition of Nuclear Weapons is far from the only response to the nuclear threat. In Geneva, the CD has agreed on a new working procedure [[to establish five working groups to explore common ground on so-called "core issues"] after 20 years of paralysis, leading some to hope that new ways of addressing the nuclear threat could be on the horizon if the willingness to advance demonstrated by its members continues. "I note that this decision has been taken by consensus, which seemed impossible in relation to the CD. It concerns nuclear, but also other developments in the weapons industry. Disarmament as a whole," comments Dallafior.

Source: https://www. swissinfo.ch, 19 March 2018.

NUCLEAR SAFETY

GENERAL

IAEA Offers Guidance on Lifting Nuclear Emergencies

Countries have made preparations for responding to nuclear and radiological emergencies, but too little has been done to prepare for the lifting of those emergencies, according to the IAEA. It has now released a guide providing advice on the transition to a normal state following an emergency.

Most states have paid particular attention to ensuring adequate preparedness to respond effectively to a nuclear or radiological emergency in order to protect human life, health, property and the environment early in the response. However, less attention has been devoted, at the preparedness stage, to practical arrangements for dealing with the challenges associated with the termination of an emergency and the transition to the 'new normality'.

…The publication – Safety Guide on Arrangements for the Termination of a Nuclear or Radiological Emergency – discusses arrangements to be made at the preparedness stage, as part of overall emergency preparedness. It offers guidance and recommendations for "the termination of a nuclear or radiological emergency and the subsequent transition from the emergency exposure situation to either a planned exposure situation or an existing exposure situation".

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arrangements for dealing with the challenges associated with the termination of an emergency and the transition to the 'new normality'."

The IAEA said the new guide "elaborates the prerequisites that need to be fulfilled so that responsible authorities can declare the nuclear or radiological emergency ended and it gives detailed guidance on adapting and lifting protective actions." The guide is intended to assist decision making is based on "scientific considerations regarding radiation protection, established best practices and lessons learned from experience", including the Fukushima Daiichi, Chernobyl and Three Mile Island accidents.

The safety guide supports the implementation of requirements included in the IAEA General Safety Requirements publications Preparedness and Response for a Nuclear or Radiological Emergency and Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards. ...

In addition to the IAEA, the publication is sponsored by the Food and Agriculture Organisation of the UN, the International Civil Aviation Organisation, the International Labour Office, the International Maritime Organisation, Interpol, the OECD's Nuclear Energy Agency, the UN Office for the Coordination of Humanitarian Affairs, the World Health Organisation and the World Meteorological Organisation. The IAEA said training materials on the new safety guide will be published in the coming months.

Source: http://www.world-nuclear-news.org, 16 March 2018.

NUCLEAR WASTE MANAGEMENT

USA

This Father-Daughter Team Says it has a Cheaper, Safer Way to Bury Nuclear Waste

A case study in the annals of political paralysis has been Nevada's Yucca Mountain, a would-be repository for the country's nuclear waste that's never quite come to serve that purpose. The debate over whether to store spent nuclear fuel inside Yucca has entered its fourth decade, and rumblings from the White House and Congress suggest lots more ineffectual arguing ahead. That is, unless the Mullers get their way.

Richard and Elizabeth Muller have come up with one of the more unusual father-daughter businesses in recent memory. On March 20, 2018 they announced a startup called Deep Isolation that aims to store nuclear waste much more safely and cheaply than existing methods. The key to the technology, according to the Mullers, is to take advantage of fracking techniques to place nuclear waste in 2-mile-long tunnels, much deeper than they've been before—a mile below the Earth's surface, where they'll be surrounded by shale. ...

On March 20, 2018 they announced a startup called Deep Isolation that aims to store nuclear waste much more safely and cheaply than existing methods. The key to the technology, according to the Mullers, is to take advantage of fracking techniques to place nuclear waste in 2-mile-long tunnels, much deeper than they've been before—a mile below the Earth's surface, where they'll be surrounded by shale. The US has about 80,000 tons of nuclear waste, mostly sitting at about 70 sites, in aboveground water pools. In the late 1980s the government made plans to store waste at Yucca Mountain by burying it in tunnels 1,000 feet deep.

The US has about 80,000 tons of nuclear waste, mostly sitting at about 70 sites, in aboveground water pools. In the late 1980s the government made plans to store waste at Yucca Mountain by burying it in tunnels 1,000 feet deep. Energy companies have contributed some $40 billion to a Yucca development fund, but that money, like the tunnel development, is frozen. Opponents say the site is too close to an earthquake fault, or that long-term water damage

could breach the storage containers, or that Nevadans don't want to live next to a giant waste dump. The plans last stalled during the early days of the Obama administration, when the White House nixed a proposal that aimed to complete Yucca for $96 billion, citing concerns about the container tech.

With each passing year, the US produces an additional 2,000 tons of nuclear waste, and the total is already more than Yucca Mountain was meant to hold. While President Trump has sought a modest $120 million to restart the program, Congress has made clear it's not going to broach the subject in an election year. "It's quite a serious problem," says Rodney Ewing, a Stanford professor of geological sciences who specializes in nuclear security. "As a country, we seem to not be paying attention to the obvious difficulties we have with the waste."

Nuclear waste experts have contemplated deep-drilling for half a century, mostly by proposing to bore straight down into granite and crystalline rock. But tests of these techniques haven't gotten very far, being blocked, on occasion, by the public. These approaches have been deemed costly and possibly unsafe, because stacking containers on top of one another puts so much weight on the bottom drums. The Mullers say it's much cheaper and safer to drill horizontal tunnels, and to do so in shale. They can fit the typical waste canisters (each 1 foot in diameter and 14 feet long) quickly and safely into shale tunnels, they say, given advances in fracking equipment. "Drilling the holes takes a couple weeks at most," says Elizabeth.

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Scott Tinker, the state geologist of Texas, has reviewed Deep Isolation's technology and says the Mullers might be onto something. "Isolation in horizontal wells in shale is feasible," he says, and the technology exists to remove the fuel containers if a problem arises or techniques are developed to make use of or clean the spent fuel. But, he says, it's worth worrying about shifts over time in the shale or of larger geographic faults.

It'd be best to keep the tunnels close to existing nuclear waste sites, the Mullers say. The US is so shale-rich that the waste disposal tunnels could be placed near nuclear production sites, so no hauling of waste would be required. The boreholes would also be much deeper than something like Yucca, vastly reducing the chance of radioactive waste leaking into the water supply.

The idea for Deep Isolation grew out of the climate change work. Richard and Elizabeth are convinced that shifting China from coal to natural gas should be a priority, and when their effort to form a gas fracking venture in that country bogged down, they applied their newfound knowledge of drilling techniques to nuclear energy. The Mullers argue that the world must increase its use of nuclear energy to slow climate change and say solving the waste problem would encourage adoption.

Over the past two years, Deep Isolation has been studying waste disposal, filing patents, and hiring 10 consultants and five staffers, including a couple to deal with the legislative morass in Washington. The company's advisers include Steven Chu, the former U.S. secretary of energy, and Per Peterson, a nuclear engineering professor at Berkeley who's advised the government on waste disposal.

Before the Mullers can drill any holes in shale, they have massive challenges to overcome. Stanford's Ewing says Deep Isolation will likely struggle to persuade dozens of communities to accept having a long-term nuclear waste site nearby and to persuade the government to let commercial companies tackle the problem. The two have drafted federal legislation that could lead to private nuclear waste disposal. "The government might allow this," says Allison Macfarlane, former chair of the US Nuclear

Regulatory Commission.

The Mullers, who've raised only $600,000 so far to explore their ideas, plan to seek about $10 million from investors. They've patented ideas related to drilling and storage techniques but would eventually need to secure multimillion-dollar licenses from each nuclear site, a timely and costly process. They concede their startup is high-risk by the standards of most venture capitalists. They maintain, however, that many of the billions of dollars set aside to deal with the problem of nuclear waste can be theirs if they provide proof of a viable, safe solution. … Her father, who in his climate-skeptic days was funded by organizations with conservative backers such as the Kochs and the Mercers, has endured attacks from all political sides—a skill that could come in handy as the Mullers head to Washington.

Source: *https://www.bloomberg.com, 20 March 2018.*

Centre for Air Power Studies

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