



# NUCLEAR SECURITY



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

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## OPINION – Manpreet Sethi

### US-North Korea Military Swashbuckling and China's Role

Temperatures are high all across India, but this is a normal seasonal phenomenon. Far more worrisome is the soaring of temperatures between the US, North Korea and China. The military swashbuckling currently under way between the US and North Korea is of a kind that has not been seen in a long time. President Trump has indicated the end of his "strategic patience" with the North Korean actions that he sees as provocations.

But not one to be cowed down, Kim Jong-un has had Choe Ryong Hae, his close military associate, boldly state, "We will respond to an all-out war with an all-out war and a nuclear war with our style of a nuclear attack." To put adequate punch into his bluster, he celebrated the 105th anniversary of his grandfather by putting on parade a panoply of the country's missile force. Thankfully, he did not conduct a sixth nuclear weapon test, and the missile test that he did choose to conduct, failed.

Every time US-North Korea relations flare up (and it happens regularly at this time of year since the US and South Korea hold their joint annual

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military drills in the region that are perceived as provocative by Pyongyang and which it responds to with its own actions), it draws attention to the role of China. The US has long expressed its belief that China can and must play a key role in counselling North Korea since Beijing is the only major economic underwriter and diplomatic supporter of Pyongyang.

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effectively use Pyongyang to calibrate tensions with the US, it was all good. But Kim Jong-un has managed to cock a snook at Beijing through some of his recent actions that have shown up the limits of Chinese influence on the state. This has been disconcerting for China. Meanwhile, President Trump has taken a more hard-line position on North Korea that appears far less sensitive to the implications that his actions, including military ones, might have for China.

Consequently, for a change, China appears to be in the hot seat in this muddle, trying to settle frayed tempers on both sides. China's Foreign Minister Wang Yi urged both parties to "refrain from inflammatory or threatening statements or deeds to prevent irreversible damage to the situation on the Korean peninsula." The fact that President Trump chose to send nearly five dozen Tomahawk missiles to Syria while Premier Xi Jinping was his guest was certainly an action with messages for many quarters. His resolve to take hard, military decisions was well evident, even if the actual damage on the ground was, intentionally or unintentionally, quite limited.

China has expressed its support for dialogue and has called upon both sides to stop provoking and threatening each other. It has also shown greater inclination to use some of the leverages it still has with the country especially on coal imports. President Trump's resolve to do something about the situation, whether with Chinese support or not, appears to have shaken up Beijing to become more proactive so as to avoid a situation that could be severely adverse to it.

Undoubtedly, it would be in the interest of all stakeholders if a political solution could be found to the problem with some sort of negotiation in the Six-party talks format. The experience of multilateral diplomacy with Iran has been a positive one. But then, North Korea is a different kettle of fish and all other parties too do not have

particularly cordial relations with one another. From one perspective, the talks could provide a common platform to address some of the misgivings and also build mutual trust and confidence amongst the parties. From another perspective, however, to get the process going, given the political reality of the moment, will be a huge task in itself.

One major problem appears to be the precondition of North Korean denuclearisation that US has set for negotiations. This is unrealistic and unrealisable. It may be an outcome, if at all ever, that might come about after a process of mutual trust and security-building. However, it cannot be the starting point to get Kim Jong-un to the negotiating table. Given the bitter history of hostility between Washington and Pyongyang, this may be the moment for China to rise to the occasion and play a constructive role. Having been an active party in the creation of a nuclear North Korea, which seems to have now acquired a mind of its own, it would be equally important for China's own security to rein it in through a web of measures acceptable to all sides.

For the moment though, two unpredictable leaders appear to be engaged in a game of chicken. This certainly has its risks, not least from inadvertent escalation as a result of incidents or accidents between any of the parties involved. It rests upon all the stakeholders to explore possible solutions to a problem that has persisted for nearly a quarter of a century.

Source: <http://www.ipcs.org>, 19 April 2017.

#### INTERVIEW – Alexey Pimenov, ROSATOM

#### Kudankulam is one of the Safest in the World

The Kudankulam nuclear power plant has all post-Fukushima safety requirements in place, said Alexey Pimenov, Chief executive of ROSATOM, South Asia, Marketing India Pvt Ltd, the Russian partner for state-run NPCIL in supplying reactors

and running the plant. Pimenov told ET that commercial agreements for units 5 and 6 of the plant will be concluded soon.

***What is the latest update on the Kudankulam NPP construction project in India?***

Unit 1 of the Kudankulam NPP was put into commercial operation in December 2014, and Unit 2, - in late March of this year. Units 3 and 4 of the Kudankulam NPP are under construction. The nominal capacity of Units 1 and 2 is 2000 MW. Unit 1 produced over 13 million units of power by January, 26 of this year. It had been continuously in operation for 278 days and posted more than 1,000 crore profit. The tariff on Kudankulam NPP power generation is one of the most competitive tariffs in India and the region. It is maintained at the level established by the Indian government back in 2010-2011 without any escalation. The cost of power generation from KKNPP is Rs 4.10 per unit.

***What is the current status of the agreement on Units 5 and 6?***

The negotiations are on for Unit 5 and 6. We intend to sign a general framework agreement and a credit protocol based on negotiation results in the nearest future.

***How safe is the Kudankulam NPP?***

Kudankulam NPP is one of the safest in the world with all post-Fukushima safety requirements being implemented and functioning successfully. By the way, after the detailed analysis of the technical design of Units 1 and 2 we came to a conclusion that they would have withstood a Fukushima-like accident. Active and passive safety systems ensure an unprecedented level of safety with the ability to prevent any anticipated operational occurrence. Among them are double localizing and protecting

containment, passive heat removal system from reactor plant, core catcher, and closed industrial water intake for NPP.

The NPP is also protected from natural and technological disasters, including earthquakes, tsunamis, tornadoes even plane crash. We pay a lot of attention to the environmental safety as well. For example, when sea water for NPP is collected, it goes through a special system called "bucket" ensuring fish and plankton return to their natural habitat

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***How many more units is ROSATOM planning to build in India?***

The Strategic Vision adopted in December 2014 for strengthening cooperation in the peaceful use of atomic energy between Russia and India stipulates that at least 12 units of Russian design are to be commissioned in India

within the next 20 years. As far as we know, the Indian government is actively searching for sites to build new power plants.

***Have you decided on the technology for this NPP?***

In 2015, India declared its intent to allot a new site for the construction of Russian-designed power plants of with enhanced-capacity unites. Russia is ready to offer "Generation 3 plus" VVER-1200 reactors equipped with state-of-the-art safety systems. Recently this year we have installed the world's first "Generation 3 plus" reactor at Novovoronezh NPP in Russia.

***Are there any other areas for cooperation between India and Russia in the field of peaceful nuclear energy?***

The last few years have been fruitful in terms of identifying new areas for cooperation between Indian companies and ROSATOM's enterprise. For example, the United Innovation Corporation and Hindustan Agro declared their intent to develop a

network of integrated infrastructure irradiation centres. Radiation technologies are known for destroying harmful microorganisms, bacteria and viruses in foods, and extending the shelf life of different products.

**Are two countries cooperating in the high-tech and innovation spheres?**

Yes, of course. For example, Isotop, a subsidiary of ROSATOM, supplied Cm-244 emission sources to the ISRO. It will be used for calibrating the chemical composition of moonrocks and soil during Chandrayan-2, the second lunar mission. Moreover, we have achieved success in developing and producing composite materials. UMATEX Group, another subsidiary of ROSATOM, signed an agreement with Indian companies on localizing the production of carbon clothes in India. This will allow us to cut costs and export joint Indo-Russian products. The development and production of mass-market products made of composite materials is stipulated as well, including helmets and high-pressure containers. These and other examples demonstrate that our cooperation goes beyond the construction of nuclear power plants.

**What are the other promising areas for cooperation do you envision in the future?**

Together we can solve the water crisis, which India has first-hand knowledge of. It is widely known that desalination is key to obtaining fresh water from sea water. The key challenge here is to ensure an uninterrupted, round-the-clock and stable supply of energy for running desalination equipment. Desalination plants can be constructed next to nuclear power plants, but not all of India has operating nuclear reactors in place. Floating nuclear power plants (FNPPs) under development in Russia might be a good solution for this. Not only are they capable of providing an

uninterrupted supply of energy to those areas in India (especially coastal ones) that have no nuclear plants in their vicinity, but they can also provide large amounts of desalinated water.

**What are the future prospects Indo-Russia relations in the sphere of the peaceful use of nuclear energy?**

We are proud of the current level of Indo-Russian cooperation in the field of nuclear energy, including the construction of nuclear power plants and application of nuclear technologies in sustainable development, for example in strategic areas like medicine, agriculture, infrastructure and etc. There is certainly a lot of hard work ahead, but I am confident that together we will achieve even more success that will be mutually beneficial to both our countries.

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*Source: Excerpted from interview by Dipanjan Roy Chaudhury, <http://economictimes.indiatimes.com>, 26 April 2017.*

**OPINION – Peter D. Zimmerman**

**Two to Tango with Nuclear Weapons**

Somewhere in the American southwest, not so very far from civilization, there is a fenced and guarded compound within another fenced and guarded compound in the distant reaches of a large military base. I won't hint at its location, but it does show up on web searches if you know what to look for. Beneath the fence is a vault where nuclear weapons wait on transport dollies tended by highly trained technicians, each with Department of Energy "Q" security clearances, the ones that give the holder access to the deepest secrets of nuclear weapons. The techs have demonstrated that they are loyal, trustworthy and reliable Air Force members.

On any given day two of them may select a bomb and wheel it out of its cage to a large work room.

Another pair of technicians attaches a harness to the city buster and uses a crane to lift the weapon by its tail until it hangs free. After carefully making certain that the weapon cannot possibly explode, they approach it as casually as a Maytag repairman working on a broken washer. They deftly replace components beyond their use-by dates, batteries and the like, and verify the bomb meets factory specs. The weapon is then buttoned up, lowered and two airmen return it to its storage location.

Two, always two, people. No unaccompanied person ever approaches a nuclear weapon. It's a basic precaution against theft, misuse or sabotage and is not unique to the nuclear weapons world, nor to the United States. Under the prairies of Montana or the Dakotas underground bunkers are buried adjacent to a bomb-proof silo containing a Minuteman intercontinental missile. Two Air Force officers occupy two somewhat shabby chairs mounted so that an atomic blast won't eject their occupants. In front of each officer is a lock. Each launch officer carries a key. The locks are spaced so that one person cannot possibly turn both keys within the few seconds the computer will allow. But if both keys turn simultaneously, a blast door swings out of the ground, and the Minuteman missile leaves its silo on a one way trip. It takes two people at every step, from decoding the message that rattles in on the teletype machine, to checking its contents for the authentication message, to making final adjustments.

Somewhere under the ocean a missile submarine receives a message. The captain and his executive officer separately decode and authenticate it. It always requires two people, two separate actions, to launch, steal, sabotage or tinker with an atomic warhead. This is the inviolable two person rule intended to prevent misuse of a nuclear weapon. It has been that way since the bomb that

destroyed Hiroshima was loaded into the Enola Gay to force an end to World War II.

But the system deliberately breaks down at the single point where failure would be catastrophic. Only one person need act in order to launch all American nuclear weapons. The president. There is no two-person rule for ordering a strike. Nobody except the president needs to agree; nobody in the chain from president to launch officer has authority to question the order. If the president orders a launch, the system executes it. The service members involved may have their doubts, but years of military training have conditioned them that even this order must be obeyed.

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Since 1941 American strategic thinking has been held hostage to the memory of Pearl Harbor. The Roosevelt Administration and the Japanese government were in negotiations to settle their disputes peacefully, but even while his emissaries were talking in Washington the Japanese emperor's aircraft carriers were turning into the wind to launch the

bombers that would sink many warships of the US Pacific Fleet. The US Navy was left practically disarmed in just half an hour or so. The United States vowed that never again would a potential enemy be able to launch a surprise attack to which this country could not respond instantly and in kind.

This made sense during the height of the Cold War when the United States, terrified by the prospect of a nuclear Pearl Harbor, sought to ensure that a counter strike could not be thwarted by a clumsy decision-making process that would require more time than the country expected to have. A missile from a submarine hiding off our East Coast could destroy Washington less than 12 minutes after its launch.

A satellite or a radar would spot the missile. The president would be told that one or more nuclear missiles was heading our way. A field-grade officer

toting the portable nuclear launch control system, the "football," would show the president his options, and the president would pull out his credit card-like authenticator, the "biscuit," select his response from a menu, give the order, and use the biscuit to prove his identity. Everything else is automatic, and there is no legal way to countermand or stop its execution.

At least twice the Soviet Union and the United States have come very close to launching nuclear weapons based on the warnings provided by radar and satellite systems. A Soviet officer did not pass a notification of a rocket launch to the Kremlin at a time he knew that tensions between the powers were minimal. A good thing; it was not a nuclear missile but a small scientific rocket launched from a Norwegian island and carrying an innocent payload. The Soviets had been notified in advance of the launch, but somehow the message was lost. Bad weather has sometimes fooled American defenses into thinking that a flight of geese was actually a nuclear missile, and only good judgment stopped the alert in its tracks.

But human intervention is only legal going up the chain to the president. It's ruled out if the president sends down a message ordering a launch, even if he or she is mistaken. Nor is there any way at all to stop a drunk president, an angered and offended president, an insane one, or merely a bored and curious one from simply ordering the opening of the football and the launch of one or more nuclear weapons.

This is true for all presidents. My argument is not intended to single out the current president as less reliable than his predecessors; it is equally applicable to every person with a finger on the button, past or future as well as present. If it were still plausible that nuclear catastrophe could come as a bolt from the blue, a massive launch by another country when the world is generally at peace and no flash points active, maybe the hair

trigger still in place would make sense. However, it is clear that the Pentagon no longer believes in a nuclear Pearl Harbor.

During the Cold War the U.S. had several ways to ensure that an order to launch would get through, and that if there were no one left alive in Washington to give the order, a flag or general officer could still launch missiles and fight a war. "The Looking Glass" aircraft, a heavily modified Boeing 707, slowly orbited high above the central United States.

In the event of nuclear war, and if the president was out of contact for a (top secret) period, the airborne commander would open his sealed orders and take charge of a nuclear response previously selected by the president. The Glass was airborne 24/7, 365 days a year, without a break from February 3, 1961 until July 24, 1990 when the last continuous airborne command mission

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landed at Offutt Air Force Base in Nebraska. The planes remain, the mission to assume command in case of nuclear catastrophe still formally exists, but the aircraft normally sit on the ground. The Navy had a similar plan. The TACAMO (Take Charge and Move Out) aircraft could order the launch of submarine-based missiles. TACAMO and Looking Glass missions have been combined; neither mission is on constant airborne alert.

Today, the United States does not even contemplate a nuclear Pearl Harbor; if it did, Looking Glass and TACAMO would still be flying. The truth lies in operations, not declarations. The leaders of North Korea might launch their missiles, but for the foreseeable future they can't reach our command centers. And in any event, for many years to come they will have too few weapons to decapitate our government. Still other potential nuclear proliferators, Iran perhaps, might conceivably threaten a nuclear attack. But again they will not be capable of immobilizing our deterrent forces.

Both Russia and China could strike at our forces, but both would almost certainly give political warning that our relations had deteriorated to where a war was plausible. Nobody in authority believes that the president will have to order a nuclear strike in a matter of minutes. Time for consultation will certainly exist. There is no reason to take the risk that an unstable president could order up nuclear holocaust acting alone or that the commander in chief could misread warnings and stumble into war. It is time to change the law and procedures to provide a legal path to stop a rogue launch.

The goal is to ensure that no single person, acting on his or her sole authority, should be able to launch nuclear weapons.

An essential part of the solution is that there is at least one person with the power to veto a launch who is not within the president's inner circle and not subject to his pressure and even charisma. There are many new laws and procedures that could achieve that goal; some are simple in concept – the secretary of defense could

be authorized to become a "circuit breaker" to thwart a misguided launch order. Others may be too complex to implement in real life, for example requiring consultation with the Congressional leaders. And still others may be too complicated to enact in law or regulations.

Some have suggested that the Cabinet be polled; and still other scholars advocate a three-man rule. It is a political question for our elected officials to decide with public input. But the president and the Congress must work together now, ignoring partisanship, to prevent an accidental, or even an intentional nuclear holocaust. It is time to extend the two person rule to the top of the pyramid, so that not even the president can start a nuclear war alone.

Source: <https://www.usnews.com>, 26 April 2017.

**OPINION – Tarishi Verma**

**What is the North Korea-US Nuclear Threat All About?**

The United States of America has been at odds with North Korea since the latter started developing its own nuclear weapons that put US at visible risk. North Korea test-fired a ballistic missile, four days after its 85th military anniversary, further aggravating this equation. However, according to reports, this was North Korea's fourth unsuccessful missile test since March. In response to this test, Donald Trump tweeted that through this test firing, North Korea has disrespected China, adding that the test was unsuccessful.

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The test comes after the UNSC meeting where US Secretary of State Rex Tillerson acknowledged the "very real threat" of North Korea launching a nuclear attack on Japan or South Korea. Tillerson said all options to deal with the threat were on the table. He also acknowledged that failure to deal with this threat could cause mass

destruction. This was preceded by a week full of ambiguous policies of the Trump administration for North Korea.

According to an analysis by Vox, the policies of former presidents have been different from each other. The Clinton administration tried negotiations, Bush administration suspended all talks, and the Obama administration waited and watched, terming their policy as "strategic patience". The Trump administration, however, has been unclear in what its policy will be. It has flitted from aggression to "strategic patience" in the past two weeks.

... Officials were hauled into a bus and taken to the White House to be briefed on the policy. In this meeting, the administration said it was looking at economic sanctions and diplomacy with

its allies (mainly China) in order to curb the nuclear proliferation. This meeting, however, left officials dissatisfied as it was similar to previous policies.

... Rex Tillerson did a U-turn on his own statement made a month ago and said he was open to "direct negotiations" with the country. Earlier, he had suspended any possibility of negotiations. Vox analyses that these policies essentially mean the administration is sticking to its predecessor's policy of "strategic patience" even though the officials deny the same; but what the administration wants is still not clear.

... However, in an interview published by Reuters, US President Donald Trump said that a conflict was very much possible with North Korea. "There is a chance that we could end up having a major, major conflict with North Korea. Absolutely," Trump told Reuters. "We'd love to solve things diplomatically but it's very difficult."

In spite of this heady warning, however, North Korea went ahead and tested its ballistic missile,

showing defiance in its action. The Trump administration is also keen on pushing China towards economic sanctions over North Korea since China is where it gets most of its economic resources from. If China cuts the trade significantly, North Korea will lose out on major resources required to build these nuclear weapons.

**The ICBM:** Among all of its nuclear weapons, the US could be most wary of North Korea successfully testing the Taepodong-2, which is an ICBM with a range of 15,000 km. This missile, if launched, can cause destruction in major US cities; a narrative long held by most major news organisations in the country. While the US and Russia have had this missile since the Cold War during which this was used for military threats, North Korea has unsuccessfully tested it under

the garb of testing a rocket engine.

North Korea does have a huge stockpile of small and medium range missiles that can be used to launch a nuclear attack on Japan and South Korea, which are strong US allies and 62,000 US troops that are stationed in these countries. North Korea has been trying to develop these weapons for the past 10 years and has managed to downsize the nuclear weapon that will be attached to the missiles, thus coming closer to developing the Taepodong-2.

**Long Term Consequences:** The US has maintained that an aggressive rogue state should not be given access to nuclear weapons. In the face of such far reaching consequences, Trump administration is

still shaky with its North Korea policy and Donald Trump has, in addition, launched an attack on South Korea by asking it to pay for the deployment of THAAD system.

North Korean dictators – Kim Jong Un and predecessors Kim Jong-il, Kim Il-sung – have maintained that nuclear armament is necessary for security of the

country, beginning their nuclear arms program in 1962 for "all-fortressization", which has led to the extreme military state of the country today. While it signed the Non-Proliferation Treaty, it backed out of it in 2003 and has continued to test its nuclear weapons since 2006.

Even so, with the economic sanctions that the US can impose – though not as major as North Korea's trade ally, China – the balance is tipped in favour of US. For North Korea, the development of Taepodong-2 successfully will help secure the odds in its favour. The development of its nuclear weapons will also force US allies South Korea and Japan to develop nuclear weapons of its own as it lies under direct threat from North Korea, even with its mid-range ballistic missiles. This will cause nuclear proliferation, violating the terms of the non-proliferation treaty signed by these countries.

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North Korea has defied not just the US but also the UN in its ballistic missile test. With consecutive tests since the beginning of the year, North Korea seemingly remains undaunted by the war of words happening against it. It remains to be seen what concrete action US takes against it.

Source: <http://indianexpress.com>, 29 April 2017.

**OPINION – Ron Kampeas**

**What the North Korea Crisis Says about the Iranian Nuclear Deal**

The Trump administration has endorsed a narrative long promoted by critics of the Iran nuclear deal: It's North Korea all over again. "An unchecked Iran has the potential to travel the same path as North Korea, and take the world along with it," US Secretary of State Rex Tillerson said at a press availability. He was explaining why President Trump had ordered a review of the Iran nuclear deal reached by his predecessor, Barack Obama. "The United States is keen to avoid a second piece of evidence that strategic patience is a failed approach," Tillerson said. "Strategic patience" is a rubbery term that critics have applied loosely to presidents – Republican and Democratic – who do not strike back swiftly at evidence of nascent rogue weapons-of-mass-destruction programs, instead preferring diplomatic and economic pressure.

It has been applied to North Korea and the policy first instituted by the Clinton administration in 1994, when it signed the Agreed Framework with that country, but also to how President George W. Bush attempted to renegotiate a North Korea deal in the mid-2000s, and to the chemical weapons removal pact Obama negotiated with Russia and Syria in 2013. The North Korea framework collapsed in the early 2000s, during the Bush administration, and in 2006, North Korea tested a nuclear device. Syria's apparent use of sarin gas in an attack earlier this month that killed 89 civilians in rebel-held

territory suggested that the 2013 removal of chemical weapons was not fully implemented. Tillerson's implication: Without a thorough review of the nuclear deal, Iran could also one day surprise the world with a nuclear test.

Is he right? It's obviously too soon to say. But here are some ways the Iran deal is similar to its failed North Korea predecessor – and ways it is different.

**Sanctions Relief:** In both the North Korea and Iran cases, some sanctions relief was up front – critics say that was a recipe for failure. With North Korea, the United States agreed to deliver 500,000 tons of oil to the cash-starved nation. (There were other goodies, but these were attached to progress in the dismantling of its nuclear capacity.) In the Iran deal, the US agreed to unfreeze American-based Iranian assets held since the 1978 revolution, amounting to \$400 million, and to lift secondary sanctions targeting businesses in other countries that deal with Iran. (Bans on US business with Iran mostly remain in place.) It's not clear yet what benefit Iran accrues from the lifting of the secondary sanctions – estimates vary wildly between \$40 billion and \$150 billion.

In addition, non-nuclear sanctions — relating to Iran's backing for terrorism and its human rights abuses — remain in place. "Tillerson is reflecting concerns that the Iran deal has many of the same inherent flaws as the Agreed Framework and may end up in the same scenario," said Mark Dubowitz, the executive director of the Foundation for Defense of Democracies, the preeminent think tank opposing the Iran deal. Daryl Kimball, the executive director of the Arms Control Association, which backed the Iran deal, said that unlike in the North Korea deal, the Iran agreement has "snap-back" provisions that allow the United States to reimpose the sanctions should Iran ever be in violation. Critics of the Iran deal counter that while the United States may snap back the sanctions,

many other nations that were part of the alliance that imposed international sanctions on Iran in 2011 would not. Deal defenders say the prospect of the United States reimposing sanctions on Iran, even if it does so alone, is enough to keep Iran from breaking the agreement.

**Inspections:** The North Korea deal required the dismantling of three nuclear reactors, one completed and two under construction. The Iran pact requires 24/7 access to known enrichment facilities and allows inspectors to demand access – albeit with a waiting period of 24 days – at any other facility they suspect of nuclear weapons activity. On the day Tillerson announced the review of the deal, he also affirmed that Iran was in compliance. The North Korea agreement referred only in vague terms to inspections beyond the three facilities and did not explicitly count out weapons-enriched uranium, although its ban was certainly implied in the endgame — a nuclear-free Korean peninsula. (The reactors that were shut down enriched plutonium.)

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The North Koreans fiercely resisted inspections beyond the three facilities. The difficulty is not in detecting whether a nation is violating the agreement – intelligence agencies and satellite surveillance have been proficient at tracking down violations. It was North Korea's attempt to secretly enrich uranium in the early 2000s that precipitated the collapse of the deal, and the Obama administration exposed the existence of a secret uranium enrichment plant in Fordow, Iran, in 2009, based on intelligence reports. Instead, problems could occur in attempts to inspect sites where inspectors do not have easy access.

Dubowitz said the provision allowing inspectors to demand access to suspected sites may be unenforceable: Hard-liners in the Iranian leadership have said repeatedly that access to military sites would be a no-go. "It's the covert

sites that are the big problem," he said. "If you're not getting into the military sites, the deal is deeply flawed." Heather Hurlburt, the director of New Models of Policy Change at New America, a think tank that backed the Iran deal, said the inspections regime is much more intrusive in the Iranian case. "It's like comparing the security check at a Manhattan office tower with the security check at Ben Gurion," she said, referencing the Israeli airport known for its stringent measures.

**Neighbours:** Iran is a diverse nation with an ancient tradition of multilateral ties with its neighbours. North Korea is a secretive Stalinist regime and has just one significant relationship – with China. Kimball said the world powers that negotiated the Iran deal granted Iran considerable leverage: Iran does not have the self-contained system that allows Kim Jong-un, North Korea's leader, to retain power even as his people starve. In order to survive, he suggested, the regime must allow Iranians to trade and thrive. "The Iranians highly, highly value

the removal of nuclear sanctions and access to oil markets," Kimball said. "There was no similar incentive for North Koreans." Iranians "deeply fear" losing access to the outside world, he said.

"As time goes on they will be more accustomed to this liberal environment of trade and investment," Kimball said, "and that will make it more appealing to them to continue to comply." Dubowitz said it was Iran's ambitions in the region that made it more dangerous, adding that Kim was unlikely to strike unless he felt his regime was threatened. The Iranians, Dubowitz argued, could one day use nuclear leverage to support their expansionist claims in the Middle East, including in Syria, where they are backing the Assad regime in quelling the rebellion, in Yemen, in the Persian Gulf – and against Israel. "North Korea is an

isolationist pariah nation with a Stalinist ideology that appeals to no one," he said. "Iran sees itself as guardian of the Islamic world."

**Deadlines:** The goal of the Framework Agreement was a "nuclear-free Korean peninsula" – no nukes, period. North Korea was to be allowed to get light-water reactors, which are proliferation resistant.

Iran, beginning eight years after the 2015 agreement, will be allowed in increments to reactivate centrifuges that could conceivably enrich uranium to weapons grade. That has been a key concern of critics of the Iran deal, known officially as the Joint Comprehensive Plan of Action. "The JCPOA fails to achieve the objective of a non-nuclear Iran," Tillerson said in his press availability. "It only delays their goal of becoming a nuclear state." Kimball sounded exasperated at what has become a common misperception. "The deal obliges Iran to never pursue nuclear weapons in the future," he said.

While it is true that the agreement allows Iran to enhance its enrichment capabilities over time, and decreases the breadth of the inspections regime, Iran remains a signatory to the NPT. As part of the deal, it signed on again to the "additional protocol" that allows International Atomic Energy Agency inspectors expanded access to sites in perpetuity. (Iran had previously shucked off the additional protocol.) The protocol has no sunset clauses.

Why can't we be friends?: It wasn't just bad actions by North Korea that killed the deal – it was bad faith and distrust on all sides. President Bill Clinton signed the deal in 1994, but by the time of implementation, an adversarial Republican Congress was in place and frustrated the deliveries of promised heating oil. In both the North Korea and the Iran cases, missile development has been an obstructing factor. Neither deal touched ballistic missiles, but testing

the devices, capable of delivering a nuclear weapon, has exacerbated tensions. The United States in the late 1990s began to sanction North Korea for its ballistic missile tests, but North Korea defiantly kept testing them and said the sanctions were eroding the framework agreement. A similar scenario is playing out now. The Obama administration last year and the Trump administration this year issued new sanctions following Iranian missile tests; Iran has said it sees the sanctions as undermining the agreement.

Trump made clear he sees the missile tests as the problem, saying Iran that "they are not living up to the spirit of the agreement."

Source: <http://www.timesofisrael.com/>, 26 April 2017.

#### OPINION – Jamie Condliffe

#### Why America's Old Nuclear Plants could be Dragging Down Clean Energy Development

**While it is true that the agreement allows Iran to enhance its enrichment capabilities over time, and decreases the breadth of the inspections regime, Iran remains a signatory to the NPT. As part of the deal, it signed on again to the "additional protocol" that allows International Atomic Energy Agency inspectors expanded access to sites in perpetuity. (Iran had previously shucked off the additional protocol.) The protocol has no sunset clauses.**

The nuclear industry is currently reeling in the wake of the meltdown of Toshiba's reactor business. As we've previously reported, the Japanese technology conglomerate was building the only new reactors currently in construction within the U.S. So its failure to succeed in capitalizing on a new generation of smaller reactors looks set to put a huge damper on the construction of new plants in the coming years.

In reality, though, the industry has been nothing but sluggish for decades. Tightening regulations, soaring construction costs, and a nightmarish PR problem have all served to undermine many plans to build new nuclear facilities.

Trouble is, nuclear is the only low-carbon energy source that can provide reliable baseload power, because renewables like wind and solar vary with the time of day and weather conditions. With no new nuclear plants scheduled to come online,

pressure to curb carbon dioxide emissions has led some states to keep old reactors running into their old age.

As Bloomberg notes, New York and Illinois are investing billions of dollars to keep old facilities in action, and Connecticut, New Jersey, and Ohio are among states contemplating the same idea. It's an expensive process, though it does mean that new natural gas plants aren't required to fill the gaps left by wind and solar.

But according to Bloomberg's report, that investment could be damaging the renewables sector. In a painful one-two, clean energy funds are being diverted away from solar and wind projects to keep the nukes running, while sometimes overly high baseload supplies maintained by continued use of old nuclear keeps energy prices low, making investment in renewables less attractive.

All that said, the extreme alternative—simply letting nuclear slide from use—is none too palatable. As David Gattie and Scott Jones from the University of Georgia argue for Forbes, allowing nuclear to simply sputter out altogether will make it hard to meet the emissions targets required by the Paris climate agreement, and could also weaken America's nuclear science expertise.

A middle way may be new breeds of smaller nuclear reactors that could allow the country to maintain a reliable clean energy baseload capacity while leaving room for increased adoption of renewables. And ultimately, we will need to pull the plug on those aged plants.

Source: <https://www.technologyreview.com>, 25 April 2017.

## **NUCLEAR STRATEGY**

### **USA**

#### **North Korea Nuclear: US 'Working with China' on Response**

The US and China are working on a "range of options" following North Korea's latest missile test, the top security adviser to US President Trump

says.

Lt Gen HR McMaster told ABC News that there was consensus with China that the situation "could not continue". His comments come after a failed missile test launch by North Korea and a massive military parade. President Trump had earlier said China was "working with us" on the issue. Beijing, Pyongyang's biggest ally, has come under pressure from Washington to exert more pressure on its neighbour.

These comments appear to be the first confirmation that both countries are working together on how to deal with the North Korean issue. Mr McMaster, who was in the Afghan capital, Kabul, said the latest launch "fits a pattern of provocative and destabilising and threatening behaviour". "The president has made clear that he will not accept the United States and its allies and partners in the region being under threat from this hostile regime with nuclear weapons," he said. "I think there's an international consensus now, including the Chinese and the Chinese leadership, that this is a situation that just can't continue."

Earlier in April, South Korean and US military officials said a North Korean missile had detonated soon after launch. The US Pacific Command said it believed it to be a ballistic missile. Investigations were continuing, but one unnamed US official said it was unlikely to have been an intercontinental (ICBM) missile. Ballistic missiles follow high trajectories and are initially powered and guided, but fall to their target under gravity. Meanwhile, US Vice-President Mike Pence is on a 10-day tour of Asia intended to reassure allies of US commitment to their security. In the South Korean capital, Seoul, Mr Pence called the failed launch a "provocation".

Source: <http://www.radionz.co.nz>, 17 April 2017.

#### **Trump Invites Entire Senate to White House for North Korea Briefing**

Extraordinary step taken as administration pressures UN Security Council for full force of existing sanctions and further measures in event

**There was consensus with China that the situation "could not continue". His comments come after a failed missile test launch by North Korea and a massive military parade. President Trump had earlier said China was "working with us" on the issue. Beijing, Pyongyang's biggest ally, has come under pressure from Washington to exert more pressure on its neighbour.**

of nuclear test. The entire US Senate went to the White House on 26 March to be briefed by senior administration officials about the brewing confrontation with North Korea.

The unusual briefing underlines the urgency with which the Trump administration is treating the threat posed by Pyongyang's continuing development of nuclear weapons and missile technology. It follows a lunch meeting Trump held with ambassadors from UN member states on the Security Council earlier in the week where he emphasised US resolve to stop North Korea's progress. "The status quo in North Korea is unacceptable and the council must be prepared to impose additional and stronger sanctions on North Korean nuclear and ballistic missile programs," Trump said at the meeting. "North Korea is a big world problem, and it's a problem we have to finally solve."

On 21 April, the US secretary of state, Rex Tillerson, is due to chair a security council foreign ministers' meeting on the issue in New York, at which the state department said he would call once more for the full implementation of existing UN sanctions or new measures in the event of further nuclear or missile tests. This meeting will give the security council the opportunity to discuss ways to maximise the impact of existing security council measures and to show their resolve to respond further provocations with appropriate new measures," said Mark Toner, state department spokesman. Senators are to be briefed by the defence secretary, James Mattis, and Tillerson. Such briefings for the entire senate are not unprecedented but it is very rare for them to take place in the White House, which does not have large secure facilities for such classified sessions as Congress.

Officials said the briefing would take place in the auditorium of the Eisenhower Executive Office Building, which can be adapted for such an event. Michael Anton, a spokesman for the national Security Council, said that although the Senate did have its own facilities, "the president offered this to [Senate majority leader Mitch] McConnell

as a gesture and McConnell appreciated that so decided to do it here."

"Keep in mind this is still a Senate meeting, not a White House meeting," Anton added. Senate aides were unsure of the purpose of using the White House as a venue, speculating it could be symbolic and intended to show Trump's seriousness or to showcase an assertive president as he approaches 100 days in office. The state department appeared unaware that Tillerson would be delivering the briefing.

A sixth North Korean nuclear test has been anticipated for some months now. Some observers speculated that it could be conducted on the anniversary of the founding of the North Korean armed forces, but the morning came and went without one.

**The status quo in North Korea is unacceptable and the council must be prepared to impose additional and stronger sanctions on North Korean nuclear and ballistic missile programs," Trump said at the meeting. "North Korea is a big world problem, and it's a problem we have to finally solve.**

Instead, Pyongyang held major live-fire drills in an area around its eastern coastal town of Wonsan, South Korea's military said. When the US envoy to the UN, Nikki Haley, was asked what the US would do if

Pyongyang carried out a nuclear test, she told NBC news: "I think then the president steps in and decides what's going to happen." Haley said the US was not "looking for a fight" with North Korea but warned Pyongyang should not "give us a reason" for one. The US aircraft carrier Carl Vinson and its battlegroup are due to arrive off the Korean peninsula after exercises with the Japanese navy. An Ohio-class guided missile submarine, the USS Michigan, docked at the South Korean naval base of Busan, the US navy reported, in what was described as "a routine visit".

North Korea's state-run newspaper the Rodong Sinmun declared the country's armed forces were ready to show their strength by sinking the carrier "with a single strike". Meanwhile the Chinese president, Xi Jinping, has called for calm in a phone call with Trump. China "hopes all parties involved will exercise restraint and avoid doing anything to exacerbate the tense situation on the peninsula", he said according to a summary of the

call released by China's foreign ministry.

In recent days Haley and other US officials have underlined China's helpfulness in seeking to increase pressure on the North Korean leader, Kim Jong-un. "Working with China for the first time — they have really been our partner in trying to make sure that we hold him at bay, and I think it's a new day when you've got China and the United States working together on a statement to condemn North Korea," Haley said.

"They put pressure on him. He feels it. That's why he's responding this way. And I think it is a different day."

Source: <https://www.theguardian.com>, 25 April 2017.

## RUSSIA

### Russian Navy Reveals World's Biggest Nuclear Submarine with Twenty Missile Launchers

The Russian Navy will be receiving the biggest nuclear submarine in the world at 184 metres. The war ship, named Belgorod or Project 09852, will outperform the nuclear-powered Typhoon missile cruiser Project 941, which is currently the largest nuclear submarine in the world. Belgorod is equipped with 20 launchers for ballistic missiles, each with 10 nuclear warheads. The submarine Project 09852 will be made to carry out research missions and to carry uninhabited deep-sea vehicles as well as specialist scientific equipment. Its mission will be to study the bottom of the Russian Arctic shelf, searching for minerals and laying underwater communications. Professor Vadim Kozyulin, of the Academy of Military Sciences, said: "It will transport and install autonomous nuclear submarine modules designed to charge uninhabited submarines on the seabed.

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"The submarine will ensure the deployment of a global underwater monitoring system, which the military is building on the bottom of the Arctic waters." The submarine has combat posts, crew cabins, a swimming pool, a gym and even a smoking room inside. Russian President Vladimir Putin has ordered his navy prioritise the development of strategy nuclear forces and modernise its weaponry. Mr Putin, said: "At the end of 2016, the share of modern weapons and equipment in the navy was about 47 percent. "The rate should be raised to 70 per cent by 2020. "Russia should ensure the presence of its naval forces in all strategically important areas of the world oceans." The Royal Navy deployed a warship into Putin's backyard in a bid to deter any further plans of Russian

aggression. Earlier this month, the Russian Naval Chief stated the country's submarine fleet is as strong as it was during the Soviet Union, as tensions with Trump reach Cold War levels.

Source: <http://www.express.co.uk>, 25 April 2017.

## BALLISTIC MISSILE DEFENCE

### AUSTRALIA

#### Australia Must Build a Missile Defence Shield

Rising tensions with North Korea underscore the need for Australia to "get much more serious" about amassing a missile defence system that could protect overseas forces and ultimately the mainland, a former national security adviser says. Andrew Shearer, a leading defence specialist who worked for former prime ministers Tony Abbott and John Howard, is one of several experts who told Fairfax Media that Australia needed to consider missile defence to counter rapid advances in ballistic missile technology that are increasing in range and accuracy.

A system that protects the Australian continent would cost billions of dollars. While missile defence has come a long way since the days of former US president Ronald Reagan's Star Wars scheme, intercepting long-range, intercontinental ballistic missiles remains a major technical challenge. But Mr Shearer, who is based at the Washington-based Centre for Strategic and International Studies, told Fairfax Media: "The problem is that North Korean - and Chinese - missile development has been accelerating very rapidly, particularly over the past few years, to the extent it has often taken western analysts by surprise.

**A system that protects the Australian continent would cost billions of dollars. While missile defence has come a long way since the days of former US president Ronald Reagan's Star Wars scheme, intercepting long-range, intercontinental ballistic missiles remains a major technical challenge.**

"The cumulative effective of these capabilities is to increase the missile threat to ADF forces deployed forward in the [Asia] region - whether independently or as part of an allied coalition - but also, over time, to reduce Australia's strategic depth and put Australian and allied forces operating from rear bases on the mainland at greater risk. The latter is a new threat but one that will become very real over the next decade." He said that Australia therefore had to "get much more serious, potentially quite quickly given the looming North Korea threat, about missile defence for deployed forces".

**The US military has started installing a controversial missile defence system at a site in South Korea, amid high tensions over neighbouring North Korea's nuclear and missile ambitions. The Thaad system is designed to protect against threats from North Korea. Hundreds of local residents protested against the deployment, as vehicles carrying equipment arrived at the site in the south of the country.**

In the longer run, defence planners needed to examine systems "to defend the continent against the new and growing threat posed by long-range ballistic missiles that could be used to strike or intimidate future Australian governments". Such a move would see Australia join an elite group of nations with a missile defence system, including France, the United Kingdom, Japan, Israel and Russia.

North Korea warned that Australia's support for the US "will be a suicidal act of coming within the range of the nuclear strike", though it does not yet have

the technology to deliver a nuclear weapon to Australia. Mr Shearer and others said Australia could upgrade the navy's coming Air Warfare Destroyers so that their Aegis combat system could fire SM-3 missiles to intercept missiles.

He said ultimately Australia needed to consider systems akin to THAAD system being deployed in South Korea or the US PAC-3 Patriot system. The Turnbull government's 2016 defence white paper said the risk of missile attack on Australia was "low" but warned that "longer-

range and submarine-launched ballistic and cruise missiles could threaten Australian territory, and shorter-range ballistic and cruise missiles pose a threat to our deployed forces".

Australia and the US have formed a working group to consider an integrated air and missile defence system but Australia's priorities for that are defending forces deployed in the region. ...Global tensions over the North Korea threat remain high. The US started moving parts of its THAAD anti-missile defence system into South Korea to counter threats from the rogue neighbouring state. The planned site is about 250 kilometres south of Seoul and is expected to

be operational by the end of the year.

Source: <http://www.bunburymail.com.au>, 27 April 2017.

## **SOUTH KOREA**

### **North Korea Tensions: US Installs Missile Defence System in S Korea**

The US military has started installing a controversial missile defence system at a site in South Korea, amid high tensions over neighbouring North Korea's nuclear and missile

ambitions. The Thaad system is designed to protect against threats from North Korea. Hundreds of local residents protested against the deployment, as vehicles carrying equipment arrived at the site in the south of the country.

China argues Thaad will destabilise security in the region. The US has in recent days deployed warships and a submarine to the Korean peninsula, amid fears North Korea could be planning further missile or nuclear tests.

The Trump administration, which has been urging China to rein in its ally, North Korea, is due to hold a classified briefing for senators on the situation at the White House later. The Thaad system is designed to intercept and destroy short and medium-range ballistic missiles during their final phase of flight. "South Korea and the United States have been working to secure an early operational capability of the Thaad system in response to North Korea's advancing nuclear and missile threat," South Korea's defence ministry said in a statement.

The system - agreed last year under the Obama administration - is not expected to be operational until the end of 2017, it added. The development coincides with China launching a new aircraft carrier - the first to be made domestically - in a bid to boost its own military presence in the region. ... US has previously deployed it in Guam and Hawaii as a measure against potential attacks from North Korea. China has expressed "serious concern" over the Thaad deployment and is urging the US and South Korea to withdraw the system, foreign ministry spokesman Geng Shuang told reporters. The deployment has caused significant tension with China - South Korea's largest trading partner - and coincided with a number of economic measures imposed by China, including a ban on tour groups which saw a 40% drop in the number of Chinese visitors in the past month. South Korea

last month lodged a complaint with the WTO, but China denies its recent moves are related to the Thaad deployment.

Source: <http://www.bbc.com>, 26 April 2017.

## NUCLEAR ENERGY

### CHINA

#### China Deploys Floating Nuclear Power Plant to South China Sea

In April 2016, reports began coming in that China has plans to build floating nuclear power plants in the South China Sea. A floating nuclear power plant consists of one or more nuclear reactors,

located on a platform at sea. China apparently plans to "speed up the commercial development" of the South China Sea and views the nuclear power plants as part of that plan. Final assembly of the reactor is reported to start in coastal city of Huludao, in Liaoning province, and will be built by Bohai Shipbuilding Heavy Industry Co Ltd, a unit of China Shipbuilding Industry Corp (CSIC). China's 2016 nuclear plan, a component

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of the China's 13th five-year plan, is evidently to complete 58 nuclear reactors by 2020 and build another 100 gigawatt-sized reactors by 2030. These would make China the largest nuclear power producer in the world. China's floating nuclear reactor initiative seems to be a component of this nuclear plan.

**Reasons for such Reactors:** China's stated reasons for venturing into such technologies include providing an inexpensive source of electricity and fresh water for both military and economic gains, as well as ensuring China's strategic dominance in the South China Sea. Nuclear power plants could not only provide cheap electricity to defence facilities but also to desalination plants. Normally, the defence facilities such as airports and

harbours depend on oil or coal for power generation. A nuclear power plant on the sea would ensure a continuous supply of water as coolant — a necessity for any reactor.

A 60 MWe reactor is said to be beneficial for supplying electricity, heat and desalination, and could be used on islands and on coastal areas or for offshore oil and gas exploration. A common theme in the narrative about floating nuclear power plants is that they would provide energy and freshwater to the disputed Spratly Islands and also to China's artificial islands in the South China Sea, such as Woody Island. Beijing, however, is entangled in territorial disputes with Japan, the Philippines, Malaysia, and Vietnam, to name a few in the region.

China is already building man-made islands in the South China Sea by shifting sediment from the sea floor to the reefs. It is also building ports, airstrips and radar facilities. In 2016, reports also stated that China has deployed HQ-9 surface-to-air missiles in the Woody Island, close to the Paracel Islands in South China Sea. China has also deployed a HQ-9 and shorter ranged HQ-6 air defence system at the Paracel Islands.

At the Hainan base, China operates guided missile-destroyers: Yinchuan, Hefei, Kunming, and the Changsha. The DF-21D "carrier killer" ASBM is also an added asset for China. China has, as well, unilaterally established an Air Defence Identification Zone (ADIZ) in the East China Sea and stated that it had the right to establish similar zones in the South China Sea. As China flexes its muscles in the South China Sea, building a floating nuclear reactor is yet another step toward strengthening this regional dominance. All these man-made islands have limited amounts of fresh water. A key part of aircraft maintenance to avoid corrosion when operating in a salt water environment is washing the planes down with

fresh water or chemical solvents. While desalination is an option, nuclear energy might facilitate that. China already has experience in nuclear desalination, with China General Nuclear Power commissioning a sea-water desalination plant that uses waste heat to provide cooling water at the Hongyanhe project at Dalian, in Liaoning province....

Maritime nuclear floating reactors would apparently provide an advantage for offshore gas exploration. The South China Sea is crucial for states vying to gain influence in the Persian Gulf and the Middle East, as well as for maritime commerce. The South China Sea is also rich in hydrocarbons and fish in a region where the staple diet is fish. In addition, with proven oil reserves, the South China Sea would yield 130 billion barrels of oil, according to Chinese estimates.

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Moreover, 80 percent of the China's energy requirements pass through the Malacca Strait into the South China Sea; China is therefore largely dependent on the Malacca Strait and the South China Sea, a circumstance termed by then-Chinese President Hu Jintao as the "Malacca Dilemma." Building nuclear reactors in the South China Sea would enable Beijing to exert its assertiveness at every turn.

**Hazards:** Constructing such reactors in a region prone to typhoons is, as can be imagined, hazardous, resulting in accidents and meltdowns. Radioactive waste would spread to neighbouring countries and cause catastrophic damage to sea-currents as well as maritime flora and fauna. Moreover, the capacity of maritime reactors to produce power is far less than for land-based reactors. China's motive for building the nuclear reactors, however, is clear: to exert its dominance and influence throughout the area.

*Source: <https://www.gatestoneinstitute.org>, 24 April 2017.*

## FINLAND

### Finland Greens Look to Nuclear

Four Green Party candidates in Finland have retracted a long-standing opposition to nuclear power, noting that the government's "current bio-energy policy is ... a disaster for both the climate and the Finnish nature". The four candidates - Jakke Makela, Tuomo Liljenback, Markus Norrgran and Heidi Niskanen - said their interpretation of the Green Party's platform "does not rule out modern and possibly more economical nuclear technologies, such as small nuclear reactors."

They also noted that about a third of the Green Party members would already "accept nuclear power, at least under some conditions," and said it was time for "an open discussion," on the topic despite its history as a "topic that divides opinions very strongly". The candidates said it was an issue that would not splinter the Green Party, as it held onto the party's core beliefs of "responsibility for the environment and the future, freedom for all, and caring for other people."

About a third of Finland's electricity is generated by four reactors at two nuclear power plants, with a new plant under construction by Fennovoima. The candidates noted that the Fennovoima project has divided Green party members. It is expected to go on line by 2025, with Russian state nuclear corporation Rosatom owning a 34% share in the project.

Source: <http://www.neimagazine.com>, 19 April 2017.

## INDIA

### More Delays for India's Fast Reactor

India's DAE told the *Deccan Herald* on 18 April that the middle of 2018 was now being looked at as a more realistic target for commissioning the

500MWe PFBR under construction at the Madras Atomic Power Station in Kalpakkam.

The IGCAR began to design the sodium-cooled fast reactor in 1980 and construction began in 2004 by BHAVINI, a government enterprise set up under DAE to focus on FBRs. It was originally expected to be commissioned in September 2010, which was later rescheduled to September 2014 and then to September 2016. In October 2016, the Atomic Energy Commission announced that it would be commissioned in 2017, with six more breeder reactors planned. However, criticality has now been delayed until October 2017, for commissioning the following year.

The PFBR is seen as launching the second stage of India's three-stage nuclear power programme as envisioned by Homi Bhabha. The long-term goal is to develop an advanced heavy-water thorium cycle to make use

of India's abundant resources of thorium. The first stage uses fuelled by natural uranium, and light water reactors, which produce plutonium in addition to their prime purpose of electricity generation. Stage two uses fast reactors burning the plutonium with a blanket around the core having uranium as well as thorium, so that further plutonium is produced as well as uranium-233. In stage three, AHWRs will burn thorium-plutonium fuels to breed U-233 which can eventually be used as a self-sustaining fissile driver for a fleet of breeding AHWRs.

The PFBR is a pool-type reactor with 1750t of sodium as coolant. It will initially burn MOX fuel. It has a blanket with uranium and thorium to breed fissile plutonium and U-233. It has two primary and two secondary loops, with four steam generators per loop. It is designed for a 40-year operating life at 75% load factor. Two more such 500MWe fast reactors have been announced for construction at Kalpakkam, but slightly redesigned

**DAE officials said the main reason for the delay is the over-cautious attitude of scientists because of the nature of the technologies involved. "The policy adopted is that we will be slow and steady, but sure. That is the way, it is going on. If some problem comes in rushing through it, then it will be questioned all over the world," DAE secretary Sekhar Basu wrote to a panel of the lawmakers, who reviewed the PFBR project.**

by the Indira Gandhi Centre to reduce capital cost. Then four more are planned at another site.

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The caution may arise from India's past experience with its small, pilot-scale FBTR. The budget for the FBTR was approved by DAE in 1971, with a planned commissioning date of 1976. It finally attained criticality in 1985, and it was eight more years before its steam generator began operating. The final cost was more than triple the initial estimate. Its operation has been interrupted by several accidents and the associated delays have been long. As of 2013, the FBTR had operated for only 49,000 hours in 26 years, or barely 21% of the maximum possible operating time.

Source: <http://www.neimagazine.com>, 19 April 2017.

### **NITI Aayog Bats for More Nuclear Capacity**

NITI Aayog has called for 'actively pursuing' works on new nuclear power projects and suggested fresh capacity addition of 2.8 GW by the year 2019. For this to be achieved, the Aayog states that work on new nuclear power projects under construction at existing location and Kudankulam Phase 3 and Phase 4 would have

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to be actively pursued. In its draft three-year Action Agenda from fiscal 2017-2018 to 2019-2020, circulated for views, the Aayog has said that by, "By 2032, India wants to increase the nuclear power capacity from 5.8 GW to 63 GW."

Source: <http://www.thehindu.businessline.com>, 28 April 2017.

## **NUCLEAR COOPERATION**

### **CHINA-IRAN**

#### **China, Iran Sign First Contract for Arak Redesign**

China and Iran have signed the first commercial contract for the reconstruction of Iran's Arak heavy water reactor. The core of the reactor was removed as part of an international agreement limiting Iran's nuclear program in return for the lifting of economic sanctions.

The contract - signed in Vienna - is mainly related to the design concept of the transformation of the Arak reactor and some preliminary design-related consulting services. Under the contract, China National Nuclear Corporation will complete the design concept for the renovation of the Arak reactor within the next eight months.

The Atomic Energy Organisation of Iran said, "The first primary phase of the reactor's design has been accomplished by Iranian experts over the past year and, through signing this contract, the performed design will be reviewed, confirmed and adjusted to international nuclear safety standards by the Chinese side." It noted that Iranian experts

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have already started work on the detailed design of the reactor.

According to Iranian news agency IRNA, copies of documents related to the design concept of the Arak reactor, which “are significant for the next phase of the reactor’s redesigning”, will now be delivered to the Chinese side. It noted that Iran and China have held several rounds of talks over the past year to discuss technical details about the contract. The contract, it said, is the first of a number of “more comprehensive contracts to be inked for completion and re-installation of the Arak reactor in the future”.

Under the Joint Comprehensive Plan of Action agreed between Iran and the E3/EU+3 (China, France, Germany, Russia, the UK and the USA, plus the European Union) in July 2015, Iran agreed to limit its uranium enrichment activities, eliminate its stockpile of medium-enriched uranium and limit its stockpile of low enriched uranium over the next 15 years. In addition, Iran also agreed indefinitely not to build any new heavy water reactors or stockpile heavy water, and that the Arak reactor will be redesigned and all used fuel will be shipped out of the country.

Source: <http://www.world-nuclear-news.org>, 24 April 2017.

## **RUSSIA–JAPAN**

### **Tokyo Ready to Cooperate with Russia on Fukushima Nuclear Power Plant**

The Japanese government is committed to large-scale cooperation with Russia to deal with the aftermath of the Fukushima nuclear power plant disaster. However, it would like to study in detail both technological legal aspects of such cooperation, a source in the Japanese Agency for Natural Resources and Energy at the Ministry of Economy, Trade and Industry informed TASS

speaking on condition of anonymity.

“The issues related to cooperation in dealing with the aftermath of the accident at the Fukushima nuclear power plant have been discussed extensively, including during the visit of head of the Rosatom, Alexey Likhachev, to Tokyo in April,” the source said. “We appreciate this corporation’s rich experience and would like to make use of it. However, Japan believes it would be useful to discuss the legal aspects of this issue as well.

For example, when studying Russia’s technologies for radioactive waste disposal, it is necessary to coordinate the issue of the extent to which Russia’s rules coincide with those of Japan.”

“That’s why we believe it would be useful to hold a large-scale seminar in Tokyo where Russian experts could give

comprehensive answers to questions from representatives of the Japanese government agencies and private businesses,” the source noted. He emphasized that cooperation between the two countries in the nuclear sphere is just beginning, even though it relies on a solid basis. The foundations for this cooperation were laid by the framework agreement between Russia and Japan on cooperation in the peaceful use of nuclear energy signed in 2009. It paved the way not only to joint work at the Fukushima, but also, in particular, to supplies of Russian nuclear fuel to Japanese nuclear power plants.

Source: <http://tass.com>, 25 April 2017.

## **RUSSIA–IRAN**

### **Russia to Build 2 Nuclear Power Plants in Iran**

Russian experts will help the Atomic Energy Organization of Iran (AEOI) construct two new nuclear power plants in the country’s southern city of Bushehr, according to Iran’s Energy Minister Hamid Chitchian. “The contract has been signed

**Cooperation between the two countries in the nuclear sphere is just beginning, even though it relies on a solid basis. The foundations for this cooperation were laid by the framework agreement between Russia and Japan on cooperation in the peaceful use of nuclear energy signed in 2009. It paved the way not only to joint work at the Fukushima, but also, in particular, to supplies of Russian nuclear fuel to Japanese nuclear power plants.**

between the AEOI and Russia, and includes building two 1,000-megawatt nuclear power plants, the construction of which is about to start," said Chitchian. The minister added that the construction of a third joint power plant with Russia, with the capacity of 1,400 MW, has already begun. Last year, the Iranian vice president and head of the country's Atomic Energy Organization, Ali Akbar Salehi talked about the plans to construct two new nuclear units in cooperation with Russia. He stressed that the process could take up to ten years and would cost \$10 billion.

Earlier this year, Russian Energy Minister Alexander Novak said Moscow wanted to finalize the agreement with Iran and help the country build more power plants. Moscow and Tehran have been deepening ties in a number of sectors, including oil, defense, and fisheries. Following a decade of total economic isolation energy-hungry Iran is eager to start building power plants and update its energy infrastructure. Russian companies are likely to be among the preferred bidders. Russian energy major Gazprom has sealed a cooperation agreement with its Iranian counterpart for the development of local gas deposits. During his visit to Moscow last month, Iran's President Hassan Rouhani highlighted the importance of the energy sector in bilateral relations and the possible creation of a free trade zone between Iran and the Eurasian Economic Union that includes Russia, Belarus, Armenia, Kazakhstan, and Kyrgyzstan.

Source: <https://www.rt.com/>, 20 April 2017.

## **URANIUM PRODUCTION**

### **IRAN**

#### **Iran Foresees Sharp Rise in Uranium Production**

Iran's nuclear chief says the country is to produce about 40 tonnes of uranium this year, more than half the total amount yielded over the preceding years. Ali Akbar Salehi, the head of the Atomic

Energy Organization of Iran, made the remarks in a televised interview. Over 70 percent of the country's terrain has been subjected to aerial prospecting for uranium, he said, adding, "Contrary to our previous perception, our country is not poor in uranium resources, and we will be able to satisfy our needs over the next several years."

Should the country fail to produce its uranium, it will come under pressure in the process of obtaining it from foreign sources, Salehi said. The official said that since the conclusion of the nuclear accord between Iran and the P5+1 countries — the US, the UK, France, Russia, and China plus Germany — in July 2015, the Islamic Republic has purchased 360 tonnes of yellowcake — a type of uranium condensate powder. As a member of the Procurement Working Group of the Joint Commission monitoring the implementation of the nuclear agreement, the UK prevented Iran from further purchases of 900 tonnes, Salehi said. "This is while it is up to us to decide how much (yellowcake) we need. Therefore, we have to show to the opposite side that we are self-reliant so they do not make up excuses."

Salehi said the Bushehr Nuclear Power Plant in southern Iran and two other facilities which are to be built over the next 10 years will need a total of 600 tonnes of uranium a year for their operation. Iran's nuclear reversibility: Salehi said if the Iranian committee, tasked with observing the nuclear accord, decides that the other party has violated the deal, Tehran will roll back its nuclear program in such a way that it will surprise the opposite side. As per the agreement, Iran is forbidden from producing uranium and plutonium metals over the next 10 years, the official said, adding, "Of course, we have produced uranium metal in the past and know the way to produce it."

**Small Nuclear Reactors:** Salehi said Iran has to build smaller reactors in the 100-megawatt range in the country's central parts because big reactors

need to be built near the sea for cooling. According to the official, the construction of a 1,000-megawatt power plant similar to Bushehr requires some \$5 billion of investment and involves energy waste during power transmission, while the cost of a 100-megawatt facility is significantly lower. Salehi said negotiations have been held with the Chinese to build two 100-megawatt power plants in Iran, while nuclear agreements have been signed with the Czechs and Hungarians. Iran is further working with Slovakia and France since becoming a member of Euroatom, he added.

'Building nuclear hospital afoot': Austrian experts, Salehi said, would come to Iran over the next weeks to break the ground on a "nuclear hospital." The facility, which would be unique in West Asia, would take four years to build and revolutionize the country's medical equipment. Iran and China are also expected to finalize an agreement on redesigning Arak heavy water reactor in the upcoming weeks, Salehi said. The 40-megawatt Arak reactor is intended to produce isotopes for cancer and other medical treatments. Iran is redesigning the planned research reactor to sharply cut its potential output of plutonium. Salehi has said the amount of plutonium the reactor will be able to yield will be reduced to less than 1 kg a year from 9-10 kg in its original design. Iran has removed the sensitive core of the Arak nuclear reactor and UN inspectors have visited the site to verify the move crucial to the implementation of Tehran's nuclear agreement with major powers.

Source: <http://www.presstv.ir>, 10 April 2017.

## NUCLEAR SAFETY

### CHINA

#### Draft Law Strengthens China's Nuclear Safety

Nuclear facility operators must take full responsibility for safety, according to a draft law

submitted to China's top legislature for a second reading on 24 April 2017. The "full responsibility" is an update from the previous "major responsibilities."

It requires operators to regularly monitor and report the types and density of radioactive elements in their surroundings to environmental authorities regularly. The new draft was submitted to the National People's Congress Standing Committee at the start of its 4-day bi-monthly session. Compared to the first draft's concise provisions on handling radioactive waste, the new draft dedicated a whole chapter to the safety of nuclear material and radioactive waste.

**Radioactive waste should be minimized and treated properly to ensure permanent safety, said the draft. On emergency response, the draft proposes a committee at national level to organize and coordinate emergency management, as well as an emergency response fund to ensure financial support in case of accidents. Nuclear accidents were also added to a list of information that must be disclosed to the public, in addition to the general safety situation and the radioactive environment quality.**

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be disclosed to the public, in addition to the general safety situation and the radioactive environment quality. When decommissioning nuclear facilities, operators must reduce radiation level of buildings, systems and equipment to a safe level.

The draft also details the responsibilities of staff and supervisory bodies, and sanctions for those who fail in their duties. The legislation will enable China to use nuclear energy safely; ensure the security of facilities and materials; and deal with accidents while protecting employees, the general public and the environment.

China currently has 36 operational nuclear reactors and is building 20 more. By the end of 2020, China aims to have 58 million kilowatts of nuclear power capacity in operation and more than 30 million kilowatts under construction. The

safety of the country's nuclear facilities should be markedly enhanced by 2020, with fewer accidents and better emergency response and safety supervision, according to a plan published by the State Council, China's cabinet, in March.

Source: <http://news.xinhuanet.com>, 24 April 2017.

## **GENERAL**

### **IAEA to Streamline Submission of Safeguards Declarations**

The IAEA, in May, plans to launch a new web-based system streamlining the submission of safeguards declarations. The declarations form the basis for the IAEA's nuclear verification work, which provides assurances to the international community that nuclear material remains in peaceful use. The IAEA said the new State Declaration Portal, which will run on a secure online network, will save both time and effort in information exchange with member states. Safeguards declarations contain information about states' nuclear material inventories and other related activities.

The IAEA verifies the information in these declarations to determine if a state is fulfilling its safeguards obligations. Reports are currently delivered in a number of predominantly paper-based ways, such as post, fax, e-mail or in-person delivery to IAEA headquarters in Vienna.

Source: <http://www.neimagazine.com>, 17 April 2017.

## **NUCLEAR SECURITY**

### **AFRICA**

#### **IAEA Aims to Strengthen African Nuclear Security**

The IAEA this month launched a project to enhance regulatory frameworks for nuclear security in African countries. The project was launched during a regional workshop in Rabat, Morocco, on 3-7

April. The event - organised by the IAEA in cooperation with the Moroccan Nuclear and Radiological Safety and Security Agency (AMSSNuR) - was attended by 75 participants from 36 countries. During the meeting, regulators and legal experts from across Africa received information on international instruments for nuclear security, such as IAEA nuclear security guidance; the importance of adequate regulations for physical protection of nuclear material and nuclear facilities, other radioactive material and associated facilities; and regulations for nuclear and other radioactive material out of regulatory control.

The IAEA said enhancing nuclear security globally requires the development and implementation of stringent regulatory procedures at the national level. During the workshop, participants were urged to assess their own legal framework on nuclear security and to identify the current and future steps to be taken by their competent authorities to establish regulations and processes to enhance nuclear security.

The meeting also provided the opportunity to assess gaps in the national regulatory frameworks and

to carry out country-specific implementation plans for the development of nuclear security regulations, including interim measures. Support was provided for the drafting of regulations for the physical protection of nuclear and other radioactive materials and associated facilities, transport security, and for the security of nuclear and other radioactive material out of regulatory control. "The project will continue with tailored training activities on the drafting of nuclear security regulations based on specific country needs, national expert missions and the review of draft regulations," said Raja Abdul Aziz Raja Adnan, director of the IAEA's nuclear security division. The workshop will be complemented by two sub-regional training courses later this year.

AMSSNuR director general Khammar Mrabit said, "It is widely acknowledged that the threat of

**The declarations form the basis for the IAEA's nuclear verification work, which provides assurances to the international community that nuclear material remains in peaceful use. The IAEA said the new State Declaration Portal, which will run on a secure online network, will save both time and effort in information exchange with member states. Safeguards declarations contain information about states' nuclear material inventories and other related activities.**

nuclear terrorism is real and the response has to be global. Nuclear security is vital for African countries as most of them use radioactive sources that could be used for malicious acts.

Source: <http://world-nuclear-news.org>, 24 April 2017.

## **NUCLEAR NON-PROLIFERATION**

### **GENERAL**

#### **SCO Members Agree to Enhance Int'l Nuclear Non-proliferation Regime**

Foreign ministers of the Shanghai Cooperation Organization (SCO) agreed that their countries should work to enhance international nuclear non-proliferation regime and to promote cooperation in peaceful use of nuclear power. In a statement issued at a foreign ministers' meeting in the capital city of Kazakhstan, the senior diplomats said the SCO members should be committed to the regulations of the NPT, push forward the process of nuclear disarmament, strengthen the international nuclear non-proliferation regime and boost equal and mutually-beneficial cooperation in peaceful use of nuclear power. On the Syrian crisis, the ministers said the international efforts toward a peaceful settlement are very important, and stressed that the only correct path to ending the conflict in the Middle East country is through talks based on trust and mutual understanding.

They also believe that the SCO members should step up their cooperation in such fields as anti-terrorism, separatism, extremism, trans-national crimes, drug-trafficking, international information security, and emergency response. The ministers said the member countries should continue to implement the SCO long-term good-neighborliness treaty, and resolve border issues via friendly negotiations. Also according to the statement, the foreign ministers said they support

**The SCO members should step up their cooperation in such fields as anti-terrorism, separatism, extremism, trans-national crimes, drug-trafficking, international information security, and emergency response. The ministers said the member countries should continue to implement the SCO long-term good-neighborliness treaty, and resolve border issues via friendly negotiations.**

China for holding the upcoming Belt and Road Forum for International Cooperation next month in Beijing as it is important to further boost economic and trade cooperation within the SCO under the current global economic circumstances.

Source: <http://news.xinhuanet.com>, 22 April 2017.

#### **UN Institute Pleads for Global Nuclear Non-Proliferation"**

The lack of nuclear weapons use since Hiroshima and Nagasaki cannot on its own be interpreted as evidence that the likelihood of a detonation event is minimal," warns the UNIDIR, an autonomous institute within the United Nations based in Geneva. The Japanese cities of Hiroshima and Nagasaki, on which the United States dropped atomic bombs on August 6 and 9, 1945, embody the abhorrent humanitarian impact of nuclear weapons use, warning of the brutal consequences should such weapons of mass destruction be ever deployed again.

The fact that Hiroshima and Nagasaki have not been repeated yet does not remove the uncertainty that continues to plague existing understanding of nuclear weapon risks. "Variables include its critical role in deterrence doctrine as well as unknowns linked to the interaction of complex systems, the possibility of 'beyond design-basis' events, and the impact of stockpile aging," avers the report titled 'Understanding Nuclear Weapon Risks'.

"Nuclear deterrence works – up until the time it will prove not to work," argues the study edited by John Borrie, Tim Caughley and Wilfred Wan. "The risk is inherent and, when luck runs out, the results will be catastrophic. The arms races spawned by putting theory into practice create their own self-perpetuating dynamic. The more arms produced, particularly in countries with unstable societies, the more potential exists for terrorist acquisition and use of nuclear weapons."

Nuclear deterrence has also created the paradox of the commitment trap, adds the report. "For example, to deter most of the threats that the United States and its allies may face in Northeast Asia, particularly from the DPRK, nuclear use is neither entirely credible nor necessary. "Yet any weakening of the United States' nuclear umbrella could spur further adventurism by adversaries and proliferation by allies. Breaking out of the conundrum will require steady, collaborative and visionary leadership of a kind that is sadly rare today as major States increasingly turn inward." The UNIDIR study finds that "the substantial levels of investment in nuclear weapons and nuclear weapons systems and their modernization have enhanced rather than decreased the likelihood of an intentional or inadvertent detonation event."

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Other main findings of the report are:

- The secrecy associated with nuclear weapons programmes is an obstacle both for assessment and accountability pertaining to risk.
- Human judgment has been key in identifying and resolving past instances of false alarms. Greater reliance on automated systems can lead to misplaced confidence while introducing new points of vulnerability ("hidden interactions").
- Technological advance suggests a declining need for terrorists or other groups to directly access an actual weapon in order to effect a nuclear detonation event.
- Risk is an inherent characteristic of nuclear weapons. The only way to eliminate risk completely is to eliminate nuclear weapons completely.

The study urges all States to: intensify their efforts to implement the existing global nuclear non-proliferation and disarmament regime; strengthen national safety, security, and safeguards culture, including through outreach with pertinent members of civil society such as academia and the private sector; and address tensions in the international security landscape through greater transparency,

communication, and other confidence-building measures.

The authors suggest nuclear-armed States "refocus their efforts to exchange information on existing stockpiles and delivery systems, especially those deployed in foreign countries, to prevent misidentification that could prompt retaliatory attack." The study further calls for "action to extend decision timelines for policymakers in crisis situations, including reducing the alert status of nuclear-tipped missiles and migrating away from 'launch on warning' postures."

The UNIDIR report asks nuclear-armed States to refrain from developing new nuclear delivery

systems, such as air-launched cruise missiles, which would exacerbate ambiguity, eschew the use of rhetoric that normalizes the nuclear option or suggests the viability of limited nuclear war, and undertake a graded approach to cyber security that assesses the vulnerabilities in every layer of the nuclear weapons system complex. They should also "ensure a level of independent oversight and control within their domestic nuclear weapons complex in order to prioritize safety considerations and thoroughly investigate operational uncertainties," and "expand the nuclear security agenda to include the 83 per cent of fissile materials in non-civilian programmes."

Source: <http://www.indepthnews.net>, 17 April 2017.

## **NUCLEAR PROLIFERATION**

### **NORTH KOREA**

#### **Nuclear Tests will 'Never Stop,' North Korean Government Official Says**

A North Korean government official in a rare interview promised his country's nuclear tests would "never stop" as long as the US continued what they viewed as "acts of aggression." Speaking to CNN, Sok Chol Won wouldn't confirm

when the country's long-anticipated sixth nuclear test would take place but said it wouldn't be influenced by outside events. "The nuclear test is an important part of our continued efforts to strengthen our nuclear forces," he said. "As long as America continues its hostile acts of aggression, we will never stop nuclear and missile tests."

Sok's official title is director of North Korea's Institute of Human Rights at the Academy of Social Sciences, but he was authorized to comment to CNN on all matters. His comments came as top US Cabinet members put a stress on economic sanctions and diplomatic pressure to rein in North Korea, calling for a return to dialogue after a Senate briefing on the threat posed by Pyongyang's nuclear and missile program. The calmer tone came in contrast to US President Trump's tough rhetoric toward North Korea earlier.

**Tense Times:** Another nuclear test could further inflame an already tense situation on the Korean Peninsula, at a time when the Trump administration is moving large amounts of military hardware to the region. The USS Vinson aircraft carrier is currently on its way to the peninsula, while a nuclear-powered submarine, USS Michigan, arrived in a South Korean port. And the THAAD anti-missile system designed to mitigate the threat of North Korea's missiles will be operational "in the coming days," the top US commander in the Pacific said. Sok said the massive artillery drill, held on the 85th anniversary of North Korea's army, was a warning to the US President. "This exercise is a direct response to acts of aggression by the United States," he said.

But despite the dramatic drills and the deployment of military assets, analysts said that outright conflict between North Korea and the US and its regional allies was unlikely. "We are in a phony war phase," Euan Graham, director of the International Security Program at Sydney's Lowy

Institute, wrote for CNN. "If there's an underlying motive to Washington's increased belligerence ... it is to get the Chinese sufficiently rattled that they become serious about sanctions beyond tokenistic enforcement." Trump has repeatedly called on China, North Korea's only real ally and main economic benefactor, to do more to bring its neighbor into line. US calls for tighter sanctions, diplomatic pressure: The entire US Senate was briefed on North Korea in an unusual meeting at the White House. Some senators who attended the briefing said they were unimpressed with the lack of new information given the increasingly tense situation on the Korean Peninsula.

"We learned nothing you couldn't read in the newspaper," said Senator Jeff Merkley, an Oregon Democrat. A joint statement released after the briefing said the US was focused on stability and the peaceful denuclearization of the Korean Peninsula. "We remain open to negotiations towards that goal. However, we remain

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prepared to defend ourselves and our allies," the statement by Secretary of State Rex Tillerson, Secretary of Defense James Mattis and Director of National Intelligence Dan Coats said.

Source: <http://edition.cnn.com>, 27 April 2017.

## IRAN

### Iran's Top Diplomat Says You should Ignore Trump's Comments on the Nuke Deal

In a wide-ranging interview with the Associated Press published, President Trump suggested that Iran had broken the "spirit" of a nuclear proliferation deal agreed under President Barack Obama. Asked if he believed the United States would stay in the deal, Trump replied: "It's possible that we won't." The comment seemed to offer another hint that Trump may plan to upend the JCPOA approved in 2015. As a candidate, Trump

repeatedly criticized the “horrible” nuclear deal, pledging to “tear up” the accord if elected. But Iran’s top diplomat doesn’t seem to be worried. According to reports in the Iranian news media, Foreign Minister Mohammad Javad Zarif told reporters at the sidelines of a cabinet session that they shouldn’t take Trump’s comments seriously.

“Do not pay much attention to Trump’s words,” Zarif said, according to the semiofficial Tasnim news agency. Zarif may have a point. While Trump has talked tough about Iran since taking office in January, he has taken little action against the JCPOA. In fact, Secretary of State Rex Tillerson sent a letter to Congress earlier this month that clearly stated Iran was complying with the terms of the nuclear deal. Trump has been accused of walking back or reversing a number of his foreign policy positions from the campaign, including policies on Syria, China and NATO. However, Tillerson’s letter also suggested that the Trump administration is looking for other ways to target Iran, and Bloomberg reported that the president himself intervened to toughen the language of the letter. Trump also prompted Tillerson’s later comments at the State Department that sharply criticized the deal, the news agency reported.

Iran has been targeted in other ways, too. It was one of seven countries whose citizens were banned from entering the United States for 90 days under an executive order signed by Trump, though that order has since been suspended. After an apparent Iranian missile test, Trump’s then-national security adviser, Michael Flynn, declared that the United States was putting the country “on notice.” In English-language tweets, Zarif suggested that it

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might be the United States that ultimately failed to comply with the JCPOA. Notably, Iranians will vote in a presidential election on May 19, a vote that some are calling a referendum on the JCPOA. Zarif likely knows more than most that aggressive foreign policy rhetoric often plays well with a domestic audience, even if a more pragmatic approach can be taken diplomatically.

Source: <https://www.washingtonpost.com>, 26 April 2017.

**NUCLEAR WASTE MANAGEMENT**

**UK**

**Wiping the Slate Clean: Careers in Nuclear Waste Management**

The UK faces major challenges in dealing with nuclear waste, which means an abundance of opportunity in the industry. Last month, a £6.1bn deal to clean up the UK’s redundant fleet of Magnox nuclear reactors was pulled after the government mishandled how the work was awarded. Dr Paul Dorfman, University College London’s nuclear power expert, believed it was “inevitable” the deal would fail. He claimed the challenges of decommissioning nuclear plant and dealing with their waste have long been underestimated.

This has proven to be an expensive mistake. Taxpayers must now pay

**Taxpayers must now pay almost £100m in compensation to companies who bid for Magnox work in the UK but failed to get it. The main problem is nuclear power plants were built in a rush in the 1950s with little thought given to how they might be decommissioned. Each Magnox reactor is unique so taking each one apart has its own very specific challenges.**

almost £100m in compensation to companies who bid for Magnox work in the UK but failed to get it. The main problem, according to Dr Dorfman, is nuclear power plants were built in a rush in the 1950s with little thought given to how they might

be decommissioned. Each Magnox reactor is unique so taking each one apart has its own very specific challenges.

Dealing with these challenges requires a range of engineering and project management skills, many of which are transferable from other industries. Opportunities for engineers in the sectors are many and varied, and most recruiters have their own training schemes to develop the next generation of talent. With the government waking up to the scale of the problem, there has never been a better time for engineers to embark on careers in nuclear waste management and decommissioning.

Graduate schemes are one route into the industry. "The Office for Nuclear Regulation [ONR] is sponsoring me through a graduate scheme called nuclear graduates," said Samuel Harvy, a nuclear graduate with ONR. "This scheme will give me a great depth of experience of the nuclear industry by providing the opportunity to complete three secondments at different organisations over a period of two years. Alongside these secondments, there are numerous training and development opportunities, including training zones, professional courses and STEM engagement."

Graduate schemes can help provide an overview of the industry. But there are also other routes, including short courses. Birmingham University currently offers a Nuclear Decommissioning and Waste Management MSc/PG Diploma. This can be gained through one-year full-time study, or a two-year part-time course.

**Slated for Decommissioning:** Given the rapid nature in which its nuclear power plants were built, the UK has a varied portfolio of facilities to decommission. The ONR currently oversees the licensing of 17 nuclear sites that are slated for decommissioning and clean-up. These include

Bradwell, Berkeley, Dungeness A, Trawsfynydd, Hunterston A, Hinkley Point A, Oldbury, Chapelcross and Sizewell A. But by far the most complex is Sellafield perched on the Cumbrian coast.

Currently, Sellafield has one of the large stockpiles of untreated waste in the UK, including 140 tonnes of civil plutonium. That's more than 14,000 times the amount needed to make a nuclear weapon. Material at Sellafield is expected to remain radioactive for 100,000 years. In 2002 work began to make the site safe. This involved engineers using an automated dismantling machine alongside a remote-controlled manipulator arm and crane to take the site apart.

Engineers must now manage what is left from early nuclear research at the site. There are no blueprints making it even tougher for those involved. But from this challenge, UK engineers have become world leaders in decommissioning,

developing skills that they can export throughout the world.

In Cumbria, Sellafield is one of the region's main recruiters, with more than 500 engineering apprentices currently on its books along with hundreds of graduates and more than 10,000 employees in total. New recruits have a diverse range of skills, ranging from project management to chemical engineering and robotics. ...

**Complex Challenges:** In January, it was announced that funding of £3m will be offered by the UK Nuclear Decommissioning Authority (NDA) and Innovate UK to develop and demonstrate technologies that could help resolve some of the complex challenges associated with dismantling facilities at the Sellafield site. The Integrated Innovation for Nuclear Decommissioning competition will focus on robots and remotely operated equipment.

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Two of Sellafield's major facilities for reprocessing used nuclear fuel are set to close by 2020, when the site will move to full-scale decommissioning and waste management. Technical innovation manager Chris Hope, who is on secondment to the NDA's Technology Team from Sellafield, said: "The Thorp and Magnox reprocessing facilities are unique, contain hazardous environments and we know they will present major decommissioning challenges in the years ahead so we are aiming to encourage early solutions."

It's not just Sellafield where there are plenty of opportunities. The British nuclear decommissioning industry is currently worth more than £1.7bn of

business per year for UK companies, with around 21 per cent spent with SMEs. And many of the skills can also be transferred abroad. So far, nuclear power stations have been built in 31 countries, but only six have either started building or completed construction of geological disposal facilities.

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Regardless of the future of nuclear power, the need to manage radioactive waste will continue for many decades. Getting the skills to deal with it now could provide an innovative, rewarding and exciting career for engineers able to deal with the challenge.

*Source: Article by Evelyn Adams, <https://www.theengineer.co.uk>, 26th April 2017.*



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 Vinod Patney, SYSM PVSM AVSM VrC (Retd).

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