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**OPINION – Manpreet Sethi**

**India Should Not Be Sucked Into an Arms Race**

India closed 2016 with the successful test of its long-range ballistic missile, the 5,000-km-range Agni V. The country heralded the New Year with the test of Agni IV, a ballistic missile with a range of 4,000 kms.

Both these delivery systems are important constituents of India’s credible minimum deterrence. Since deterrence presupposes the capability to punish the adversary, it necessarily rests on the ability to threaten something that is dear enough to make its loss unacceptable. Agni IV and V bring the major cities of China within the range of India’s nuclear harm and thus are considered critical to deter China from indulging in nuclear blackmail or coercion.

The next milestone for India is an operational fleet of nuclear-powered submarines equipped with long-range missiles. This capability is a work in progress and is steadily moving towards enhancing India’s nuclear deterrent.

Do these successive developments amount to India being in an arms race? Not at all. In fact, India is building and testing these systems, which

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had been declared by the country in its draft nuclear doctrine of 1999. The developments taking place now are only translating the vision of the doctrine to build “sufficient, survivable and operationally prepared nuclear forces”. If India remains true to the doctrine of credible minimum deterrence, it is unlikely that it will feel the need to enter into a nuclear arms race with others. The same, however, cannot be said about Pakistan and China.

Pakistan appears to be in an arms race that it claims is with India. But the race to acquire more

fissile material capacities and stockpiles, nuclear warheads, types of weapons, and delivery systems, would be better attributed to its own vision of full spectrum deterrence. Egged on by the need to deter a conventionally superior India (that appears threatening because of its own pursuit of terrorism against India), Pakistan is engaged in an open-ended nuclear build up. It is a race it is running with its self-created phantoms, not India.

China, meanwhile, is in an arms race with the US. Having stayed with a minimalist vision of deterrence for about four decades after 1964, it has been over the last 10-15 years been engaged in building newer and more modern nuclear capabilities with an eye on the US ballistic missile defence. Fearing a degradation of its nuclear deterrent if the US could defend itself against incoming missiles, China is keen to flaunt a bigger and better (BMD - penetrating) nuclear weapons capability.

The US, meanwhile, after having been in a nuclear weapons reduction mode for sometime, appears to have stopped the trend. Rather, nuclear modernisation is the flavour of the moment. President Obama exits office after having approved a budget of \$1 trillion to be spent over three decades for the purpose. President-elect Donald Trump has indicated the intention to stay the course and even tweeted a challenge for an arms race. Russia has already been engaged in modernising its nuclear capabilities over the last few years.

Unless US-Russia relations improve in the coming years, it is clear that both countries have enough insecurities for their respective nuclear programmes to feed on. Their behaviour and actions will have an impact on the global nuclear picture because as China mirrors these developments, downstream ripples will be felt in India and Pakistan.

So, given the imminent nuclear mood, it is likely that the temptation of each nuclear player to take its cue from developments happening in its adversary is high. India too could be sucked into an arms race. The temptation to strive for capabilities being built by adversaries – missile defence, MIRVed missiles, hypersonic missiles, increased numbers of warheads and missiles – will be compelling. The intuitive response to these

developments, and indeed a persistent clamour from security hawks, would be to match every development of the adversary with action at our own end. Pakistan's tactical nuclear weapons and MIRVed capability of China are good examples of debates in Indian strategic circles on the need to build such capabilities.

However, the important point to remember before internalising the logic of mirror imaging any capability is to keep a clear

eyed focus on the role of nuclear weapons and the purpose of nuclear deterrence. Nuclear deterrence is a simple concept built on the promise of assured retaliation to punish the adversary enough to negate any gains he hopes to make.

Imposing punishment with nuclear weapons is not difficult. Given the destructive potential of the weapon (the huge damage caused to life and property by a single 15 kiloton weapon on Hiroshima may be recalled) and the densities of population in China, India and Pakistan, not many weapons would ever be needed to cause damage that a sane nation could find acceptable.

It is hoped, therefore, that even in the face of developments that seem to be moving towards an arms race in the region and beyond, India will be able to steer clear of unnecessary moves. The limited purpose of the nuclear weapon and its unlimited destructive power, as long as it can be credibly delivered, should be India's guide to capability development. Not the breathless madness we see around us. It will serve India well — for national and international security — to be the voice of nuclear sanity.

*Source: South Asia Monitor, 11 January 2017.*

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OPINION – Franz-Stefan Gady

**Is India Dropping Its Cruise Missile Program?**

India's nuclear-capable Nirbhay long-range cruise missile program will likely be shut down following yet another failed test launch, a source within the DRDO told local media. No official announcement has been made to date and the program reportedly will be reviewed momentarily by the Ministry of Defense, after which a decision will be made.

The project was originally launched in 2004 and projected to be completed by the end of 2016. The Nirbhay is a subsonic land attack cruise missile armed with a 300-kilogram warhead capable of reaching speeds of 0.6-0.7 Mach, and designed to be launched from air, sea, and land.

Since March 2013, three Nirbhay test launches have been classified as failures. "The project has been plagued with difficulties as the scientists are still struggling to fix the problems in the flight control software and navigation system while some others point fingers at the hardware," *The New Indian Express* reports. Following a test launch on 21 December 2016, which took place at the Integrated Test Range on Abdul Kalam Island off the coast of Odisha, the missile had to be destroyed mid-air after it strayed from its programmed course.

"The booster engine in Nirbhay's first stage started working. The missile lifted off from its launcher. But it started veering dangerously towards one side in less than two minutes of its lift-off," DRDO sources told *The Hindu*. "It could not be ascertained which is defective, whether the software or hardware, but Nirbhay missile failed in its fourth attempt," a DRDO source revealed to *The New Indian Express*. Only one missile test launch on 17 October 2014 met all test perimeters so far.

Various analysts have questioned the Indian military's requirement for a subsonic cruise missile given that the BrahMos supersonic cruise missile,

capable of traveling at speeds of up to Mach 3.0 and available in surface-launched, ship-launched, and air-launched variants, is already entering service.

However, in comparison to the Nirbhay, the BrahMos, a Indo-Russian joint venture, has a much shorter maximum range of 290 km. Nevertheless, in October, during the 16th Intergovernmental Commission on Military-Technical Cooperation,

India and Russia agreed to double the range of the BrahMos cruise missile to 600 kilometers, following India's accession to the MTCR. The cancellation of the Nirbhay program would in particular be bad news for India's first domestically developed and built SSBN class, the Arihant-class, which was slated to be fitted with India's domestically produced cruise missile.

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Source: *The Diplomat*, 28 December 2016.

OPINION – Farhad Rezaei

**Why Iran Wants So Many Ballistic Missiles**

Unlike Iran's nuclear program, the country's arsenal of ballistic missiles has received only scant scholarly attention. At best, some highly technical analyses have been offered. At worst, the missiles have been considered only as part of the nuclear project, designed to carry nuclear warheads. However, the missile program is a complex and sophisticated response to Iran's unique security challenges, and should be analyzed on its own.

The signing of the JCPOA in July 2015 has made this task more urgent. With the nuclear program rolled back, Iran's missiles have become a new target of international attention. The ballistic program is run by the Revolutionary Guards, which has been subject to numerous sanctions because of its alleged terror activities.

The focus is especially intense in Washington, where the Obama administration's drive to conclude the nuclear accord was divisive. For instance, some critics urged imposing a new round

of sanctions on Iran to curb its missile program. Others suggested using American anti-ballistic missile defense capabilities in the region to target Iranian ballistic trials. According to this rational, denying the Revolutionary Guards the ability to test missiles would disrupt its research and development opportunities.

Both courses of action have potentially far-reaching consequences. Slapping more sanctions may prompt Tehran to abrogate the JCPOA. Intercepting the missiles of a sovereign country violates international law and may lead to a huge conflagration in the Middle East and beyond. Given the high-level stakes of these policies, an analysis of Iran's rationale for developing its ballistic arsenal is in order.

Intentional-relations theory indicates that the decisions that drive the proliferation of nuclear weapons are quite similar to those that prompt the quest for a ballistic-missile program. Both nuclear weapons and ballistic missiles are instruments of power that may be used as deterrent or compellent threats. They both serve to enhance the security of a state through raw power. As John Mearsheimer, a leading realist theorist, put it, states always strive to maximize their power over their rivals, with hegemony as their ultimate objective.

A large body of research indicates that states make rational choices when deciding to proliferate or acquire a ballistic arsenal. In the case of Iran, however, discussions of the regime's motives are underpinned by rational choice theory of varying degrees of rigor. At best, some analysts seek to apply the restrictive mathematical basis of formal rational-choice models; at worst, it is a projection

of the authors' views of what rational behavior should be.

Absent conclusive evidence to prove or disprove either side, the discourse has turned into a profession of faith. As one observer put it, when it comes to Iran, rationality or lack of it is in the "eye of the beholder." Developing indigenous missile and anti-missile systems has been a key components of Iran's deterrence strategy. The regional tension between Iran and its powerful neighbors goes a long way toward explaining why Iran feels the need for greater defense capabilities. Iran was

forced to consider nuclear and ballistic options because of its long and bloody war with Iraq, which had a profound role in shaping Iran's strategic thinking.

The history of the bloody conflict between the two countries is well known. The second-longest war of the twentieth century, it has been frequently compared to World War I. Like the 1914 war, it relied on trench warfare, human wave attacks, indiscriminate assault on civilian populations and, most importantly, Iraq's use of chemical weapons against Iranian soldiers and civilians.

Although Iran's dedication to exporting its revolution, a goal that the regime was not willing to forgo in the face of extreme hardship, exacerbated the conflict, the war left deep and enduring scars on the Iranian collective psyche. Even a casual perusal of cultural narratives indicates a deep sense of insecurity and vulnerability.

Thus, the leadership concluded that Iran would need a powerful deterrent of some kind. But the

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embargo on weapon sales pushed by the US after activists seized the American embassy in Tehran in November 1979 proved to be a huge obstacle for obtaining a strong deterrent. Strained relations with the US even made it difficult for Iran to access technology needed to maintain its air force. Obtaining standard weapons and munitions on the black market involved extremely complex arrangements. Things got much worse when, at Iraq's request, the US launched Operation Staunch, a global ban on the sale of weapons to Iran in 1983.

The weapons embargo led the regime to believe that, ultimately, Iran must rely on its own resources for self-defense. From Tehran's point of view, such a decision was a highly rational step—one that met the criteria for many of Kenneth Waltz's proliferation factors. Struggling to rebuild a traditional army and air force in a dangerous neighborhood, they opted for a ballistic shortcut. Technologically, missile production, as envisaged by Hassan Tehrani-Moghaddam, the father of Iran's ballistic-missile program, was close to ideal for a country that had enshrined "self-sufficiency" in its security doctrine. A ballistic arsenal was also a rational response to Washington's long-standing policy of arming and protecting its allies in the region.

Even for a region known for its epic conflicts, the prodigious spending on the arms race stands out. Most striking is the growing level of sophistication in arms and related weapons technology among the Arab Gulf states. For instance, GCC member countries spend approximately \$98.5 billion on their militaries annually, compared to Iran's \$10.6 billion. Data released by the US Congressional Research Service indicates that the GCC acquired \$38.5 billion worth of new arms between 2004 and 2011, thirty-five times more than Iran's acquisition of \$1.1 billion for the same period. Similarly, data released by the Stockholm International Peace Research Institute indicates that the Gulf states have a massive lead over Iran

in terms of spending on military munitions.

In addition to cutting-edge military wares, the Gulf countries enjoy access to superior American training, Intelligence, Surveillance and Reconnaissance systems, and Command, Control, Communications, Computer, and Battle Management capabilities (C4I/BM). Because of American C4I/BM, the Gulf countries face virtually no technological risks when choosing combat systems. Iran, on the other hand, faces risks in performance, delivery delays and unanticipated costs in its self-produced systems.

Israel, another archrival of Iran and the only country in the Middle East believed to possess nuclear weapons, can fit its ballistic missiles with nuclear payloads, which is great concern for the Iranians. In addition to receiving total direct aid of over \$140 billion from the US since the October War in 1973, Israel enjoyed a joint American-Israeli project estimated at some \$3 billion, resulted in an integrated multilayered, anti-ballistic system: the short-range Iron Dome, the mid-range Jericho and the long-range Arrow. Linked to the FBX-T Raytheon radar systems, known popularly as the X-band, it is part of the Joint Tactical Ground Station Theater Warning System based in Europe but operated by American personnel in Netivot in the Negev.

Moreover, as part of a "compensation package" for the JCPOA, Israel demanded a squadron of advanced F-15 Strike Eagles and V-22 Osprey tilt-rotors planes, reportedly worth more than \$3.1 billion. It was reported that the Israelis asked for Boeing's F-15SE Silent Eagle derivative, equipped with Radar Cross Section reduction features and internal weapons bays housed inside the jet's conformal fuel tanks.

From Tehran's perspective, Washington's policy of arming its allies has threatened its security interests, not to mention its deterrent power. Seen within this context, Iran's effort to develop a nuclear arsenal is a rational response to a security

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dilemma. Suffering from extreme sanctions that eroded the economy and put the very legitimacy of the regime in peril, Iran's leaders decided to sign the JCPOA. With the nuclear option gone, at least for the duration of the accord, the importance of ballistic missiles for defense and power projection has increased.

But since ballistic missiles capable of carrying a nuclear warhead are an integral part of a nuclear arsenal, some critics argue that Iran's efforts to develop its ballistic-missile capabilities may reflect its desire to continue with its nuclear-weapons program. This is a justifiable suspicion because of Iran's record of conducting covert nuclear activities ("possible military dimensions") at nuclear sites such as Parchin and Kolehdoz military complexes.

If PMD tests are the nuclear equivalent of "smoking gun" evidence, ballistic missiles do not constitute equivalent proof, since they can be used in both a defensive and offensive capacity. Ballistic missiles can be equipped with conventional warheads, although it is assumed that

in long-range missiles, a conventional warhead is not cost effective. Medium-range missiles, however, pose a dual-use problem for intelligence analysts who investigate them, and for politicians who must devise ways to respond to them.

But perhaps the most important implication of the JCPOA and the IAEA verification process is that Iran's ballistic missiles will only be conventionally armed for a decade or more. If Iran does not have the fissile material to make a nuclear weapon and attach it to its missiles, they pose no threat to Iran's adversaries. Due to their poor accuracy, the military utility of Iran's missiles is limited, and they are therefore not likely to be decisive if armed with conventional warheads. Michael Elleman, an expert on missiles at the International Institute for Strategic Studies, noted that despite recent gains, Iranian missiles remain too inaccurate to

reliably destroy specific military targets. In the end, the function of the missiles may be more psychological than kinetic; if the regime believes that the missiles can deter and possibly intimidate its regional adversaries, securing the continuation of the program may help the moderate president Hassan Rouhani and his followers to maintain support for the JCPOA.

It is too early to speculate about the impact the 2016 election in the US will have on the future of Iran's missile program. President-elect Donald Trump had harshly criticized the JCPOA, but also indicated that he would not "tear it up." Of course, the US cannot unilaterally abrogate a multinational accord, but there are ways to tighten it. Most senior appointees in his administration,

including incoming National Security Adviser Michael Flynn; CIA director nominee Michael Pompeo; and John Bolton, a possible pick for Deputy Secretary of State, are bitter critics of the deal. There is little doubt that individually and collectively they would try to change the American terms of the accord. Israeli prime minister Benjamin

Netanyahu has already signaled his plans to suggest ways in which Trump can nix the accord altogether.

The Republican-dominated Congress presents even more of a challenge to the JCPOA. No Republicans voted in favor of the accord and it was only the threat of a presidential veto that made its passage possible. The pro-Israel lobby that led the fight against the JCPOA in 2015 has already mobilized for a new round of actions. In July 2016, Mark Dubowitz, the executive director of the Foundation for the Defense of Democracies, the think tank that led the anti-JCPOA fight, testified before Congress on the need for wide-ranging sanctions against Iran. Drafted by the FDD's Center on Sanctions and Illicit Finances, the proposal called to sanction the regime for human rights violations and terrorism financing, and

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expand sanctions against the Revolutionary Guards, among others.

In December 2016, Congress passed a ten-year extension to the Iran Sanctions Act. A new initiative known as the “Iran Ballistic Sanctions Act” is also in the works. The new legislation would “impose tough primary and secondary sanctions against any sector of the economy of Iran or any Iranian person that supports Iran’s ballistic missile program, as well as any foreign person or financial institution that engages in associated transactions or trade.” The proposed bill makes no distinction between short- and medium-range missiles and long-range and intercontinental ones.

There are certainly valid concerns about Iran’s long-range missiles, since the cost-benefit analysis does not justify mounting conventional payloads. However, sanctioning the entire missile program violates Iran’s right to self-defense, especially since it faces adversaries armed with cutting-edge ballistic hardware operating under an American umbrella. Clarifying and tightening Resolution 2231 would be a good place to start. Blanketing Iran with new sanctions, on the other hand, may achieve the opposite. Having created political momentum based on economic relief, President Rouhani is facing a tough bid for re-election in 2017. His hardline opponents have already announced that they will make “vanishing” economic benefits a major issue in the campaign. These hard-liners have all but promised to abrogate the JCPOA, a development that may further destabilize the Middle East.

Source: *National Interest*, 05 January 2017.

**OPINION – Mark Hibbs**

**Iran Nuclear Propulsion: IAEA Firewalls**

In December 2016 Iran raised the specter that it may expand the scope of its nuclear activities, especially if its interpretations concerning what constitutes non-compliance with the JCPOA do not

prevail. This was not the first time Iran has dropped this hint. In 2013 the head of Iran’s nuclear program, Fereydoon Abbasi-Davani, announced that Iran might need uranium enriched to about 50% U-235 to fuel future submarines and ships. He said that at a moment when IAEA board member countries were trying to persuade Iran to agree to halt production of uranium enriched to nearly 20% at the bunkered Fordow site. The conventional wisdom at the time interpreted Iran’s talk about future production of submarine reactor fuel as a tactical move in that negotiation.

In December Iran’s reiteration of its interest in marine propulsion was in some quarters also

brushed off as an empty gesture. After all, four years after Iran last raised this issue, Iran and the powers had settled their differences by concluding the “Iran deal.” Right? Not quite. At the beginning of 2017, the future of the JCPOA is on the line.

Questions loom about whether this year and beyond the six governments that negotiated it will remain united about what they believe Iran needs to do to comply.

During his election campaign US President-elect Trump vowed to terminate the JCPOA. If America’s strategic relations with China and Russia deteriorate further, that may influence these states’ resolve to hold Iran to the letter of its commitments. In this uncertain situation, Iran’s counterparts need to make clear to the IAEA and to Iran right now that the JCPOA gives Iran no wiggle room to negotiate with the IAEA an arrangement that permits Iran to initiate nuclear activities for the development of a future nuclear navy.

**What Paragraph 14 Says:** Like other non-nuclear-weapon states that are parties to the NPT, Iran has a safeguards agreement with the IAEA that follows from the IAEA document INFCIRC/153 (Corr.). Paragraph 14 concerns safeguards arrangements should a state wish to exercise the option to use nuclear material subject to

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safeguards as fuel for nuclear naval (i.e. military) submarines. This option accommodates the provisions of the NPT, which proscribes the use of nuclear material for nuclear explosive activities, but not its use for military activities in general.

Sub-paragraph a.(i) of paragraph 14 was included in INFCIRC/153 (Corr.) to address the possibility that a state exercising this option may have conflicting obligations such as those arising out of facility-specific, so-called INFCIRC/66-type, safeguards agreements that states concluded beforehand with the IAEA. These agreements obligate the state not to use material subject to those agreements for any military purpose. Sub-paragraph a.(i) implies that, should any such conflict arise, the state that seeks to use nuclear material for naval submarine fuel would have to provide assurances to the IAEA that any material that is covered by a blanket "no military use" obligation would not be used for submarine fuel. Iran, under one such INFCIRC/66 agreement, may have obligations not to use some previously-supplied US-obligated uranium for any military purpose. Following from sub-paragraph a.(i), in this case Iran would have to assure the IAEA that this material would not be used for submarine fuel.

More generally, sub-paragraph a.(i) establishes that any nuclear material subject to conflicting obligations cannot be used for naval propulsion. For Iran, this provision may be a show-stopper, because the JCPOA was expressly concluded to "ensure that Iran's nuclear programme will be exclusively peaceful."

If Iran's counterparts hold that to be true, they need to make clear to Iran and to the IAEA that

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**Rouhani's orders did not explicitly say that nuclear propulsion in Iran would be intended for naval vessels and Iran might argue instead that it aims to develop nuclear material exclusively for use in civilian marine craft. Provided that Iran does not use nuclear material in any preparations that remain on the drawing board, Iran wouldn't be contravening the terms of the JCPOA.**

any nuclear activities by Iran to develop a naval nuclear infrastructure would constitute non-performance under the JCPOA. Only last month, Iran's President Hassan Rouhani "issued an order" to Ali Akbar Salehi, head of the Atomic Energy Organization of Iran, "to begin planning for the development of marine nuclear propulsion engines and necessary fuel." Rouhani

told Salehi to "submit to me a plan and a timetable for realizing [the nuclear propulsion project] within a maximum of three months."

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But If Salehi tells the IAEA and the powers he plans to follow Rouhani's orders and get ready to build nuclear-powered ships, Iran's JCPOA counterparts should point out that, with the exception of a dedicated fleet of nuclear-fueled Russian icebreakers that ply Russia's Arctic coast, IAEA member states have long abandoned the use of nuclear power for any civilian vessels, in part for economic reasons and in part out of consideration of the difficulties in obtaining agreements from foreign governments and ports to allow nuclear-powered vessels to enter their domains.

Beginning in the 1970s, Germany and Japan each built and operated a nuclear-powered merchant vessel. The German Otto Hahn became too expensive to operate and was converted to diesel fuel in 1982. The Mutsu shortly after its launch experienced many problems and was decommissioned. The record of what

Iranian officials in the past have said about Iran's aspirations to launch nuclear-powered submarines should prompt the IAEA and the JCPOA parties to tell Iran that, should Iran move forward with plans to develop nuclear-powered civilian craft, they will be watching for any signs that such plans may be a cover for military nuclear activities.

Independent of the question of what the JCPOA proscribes, the record of the IAEA's involvement with nuclear propulsion issues strongly suggests that paragraph 14 of INFCIRC/153 (Corr.) does not provide any state a route to simply withdraw nuclear material from safeguards. After nearly half a century, no IAEA member state has ever successfully invoked paragraph 14. Canada abandoned preparations for such step during the late 1980s. Brazil, which plans to build and operate a land-based demonstration submarine reactor before embarking on the use of nuclear fuel at sea, has not told the IAEA it intends to withdraw any nuclear material from safeguards for this program. All the nuclear fuel used in the German and Japanese merchant vessels was under IAEA safeguards 247.

**Board of Governors Must Approve:** Were Iran or any other state to invoke paragraph 14 to withdraw nuclear material from safeguards, that move would require approval of the IAEA Board of Governors. On July 3, 1978, in the document GOV/INF/347, the government of Australia told IAEA Director General Sigvard Eklund it wanted to "seek clarification" concerning the procedures that would be necessary in the case that a member state invoked INFCIRC/153 (Corr.) paragraph 14. Australia told Eklund that it believed that, in such a case, the matter must be approved by the Board of Governors.

Eklund assured Australia that its understanding was "correct." It is the Secretariat's view that any exercise by a State of the discretion referred to in paragraph 14 which comes to the knowledge of the Secretariat, and any notification received by the Secretariat under that paragraph as well as any arrangement made pursuant to that paragraph, must be reported to the Board of Governors, and it would be for the Board of Governors in each case

to take the appropriate action.

For the IAEA Director General to ring up the Board of Governors would be in the spirit of how the IAEA and its member states originally interpreted INFCIRC/153 (Corr.). The Safeguards Committee at the IAEA including member states that formulated INFCIRC/153 (Corr.) concluded at the time concerning paragraph 14 that "in no sense was it intended or could be construed as an opportunity to allow states to escape verification... [Member states and the IAEA Secretariat] desire to avoid a situation where withdrawals of nuclear material from safeguards for non-proscribed military use could become a loophole allowing use for nuclear explosive purposes, beyond the reach of [IAEA] verification activities."

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*Source: Arms Control Wonk, 04 January 2017.*

#### **OPINION – Zamir Akram**

#### **NSG Deadlock**

Despite trying to load the dice in India's favour, the Obama administration has failed to deliver on its promise to ensure NSG membership for India during its tenure which ends in mid-January 2017. Due to the principled position taken by China and supported by more than 10 countries, consensus has eluded the NSG so far with the result that the informal meeting scheduled for later this month [Dec 2016] has been postponed till early next year [2017]. Meanwhile, these are signs that after seeing the writing on the wall, even India has asked that consideration of its membership be put on hold. The result is a deadlock in the NSG in spite of desperate last ditch efforts by the US and other Indian allies.

The aggressive American campaign in collusion with the Indians, using a mixture of incentives and pressure, to bring NSG members on board was sustained and relentless. Even the NSG Chair, Ambassador Song of South Korea, and the previous Chair, Ambassador Grossi of Argentina, were willingly co-opted to pave the way for India. In their eagerness to appease Washington and New

Delhi, both Song and Grossi went so far to violate the very basis of their mandate, given to them by the Seoul NSG Plenary meeting in June 2016, to engage in a transparent consultation process with all NSG governments to develop objective and equitable membership criteria for non-NPT member states. Instead, they engaged secretly and surreptitiously with selected countries, mainly in India's favour, to develop membership criteria. They not only failed to take China's views into consideration despite the primary role being played by Beijing, but even ensured that the substantive criteria that they proposed placed no new requirements for India to fulfil.

The proposals have now been uncovered by several public sources, including Bloomberg News and the US-based Arms Control Association. They include undertakings already given by India to obtain the exemption from full-scope safeguards given at American behest in 2008. As Daryl Kimball of the Arms Control Association points out "this formula would not require India to take any additional non-proliferation commitments beyond the steps to which it consented in September 2008" for the India specific exemption for civil nuclear trade. He adds that "any further country specific exemption from NSG guidelines for trade and/or membership without compensating steps to strengthen non-proliferation and disarmament would increase nuclear dangers in South Asia, and weaken the NSG and the broader nuclear non-proliferation regime".

The worst aspect from Pakistan's perspective of this biased and preferential Grossi-Song formula is that it is designed to harm Pakistan's application for NSG membership. For instance, it advocates a sequential rather than simultaneous approach to membership by India and Pakistan which is obvious from the requirement that India, after becoming a member, would not object to membership requests from other countries – i.e., Pakistan. Even if India were to give such a commitment it would not be worth the paper it

would be written on. Moreover, there is absolutely no justification for taking such a sequential approach since Pakistan's credentials for membership are equally good if not better than India's and therefore, both country's applications should be considered concurrently and simultaneously.

Even worse is the Grossi-Song stipulation that even when Pakistan is admitted as a member, it will still need to obtain a waiver or exemption to be eligible for civilian nuclear cooperation, which potentially can be blocked by any NSG member, most likely India if it can get in the NSG.

It is not surprising, therefore, that several countries like China, Turkey, New Zealand, Brazil, Ireland, Austria, Belarus, Italy, Switzerland among others have raised objections to the proposed criteria developed by the Grossi-Song duo at Indo-American instigation. They have not only questioned the procedural aspects such as lack of transparency and selective engagement but also substantively the clear absence of impartiality and objectivity of the proposal. Even Russia, a close friend of India, has weighed in by calling for greater transparency and the need for due process of consultations.

Forced by this negative backlash, the Chair has now postponed the scheduled December informal NSG meeting till January-February 2017. During this period he intends to engage in further consultations in an effort to develop consensus – the only basis on which a decision can be made by the NSG. Meanwhile, India has also reportedly decided to ask for a pause in view of the negative response to the Grossi-Song proposal. Some realistic observers in India are also questioning the merits of pushing for NSG membership despite the clear opposition, pointing out that the 2008 waiver should suffice.

For its part, the Obama administration has recalled its team from Vienna, the NSG Headquarters,

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recognising that it will not be able to fulfil its promise to its Indian friends during the few days it has left in office. Now it will be up to the next US administration to decide whether or not to push for Indian NSG membership. For now,

Pakistan has scored a tactical success by working with principled countries to prevent yet another preferential waiver exclusively for India. But the struggle for equitable and impartial treatment as an aspirant for NSG membership is not yet over for Pakistan.

*Source: The writer is a former Ambassador of Pakistan. The Express Tribune, 30 December 2016.*

#### OPINION – Molly Lempriere

### Scrapping Monju: The Curtain Falls on Japan's EFBR

Japan has finally pulled the plug on Monju, an experimental fast breeder nuclear reactor that has been plagued by accidents, cover-ups and cost overruns. But why did Monju fail and is there still a future for fast breeder technology? ...The Monju power plant in Tsuruga, Fukui Prefecture, is one of two experimental nuclear reactors set up in the 1980s in Japan. The fast breeder reactor was designed to use the plutonium created as spent fuel by other reactors, thus maintaining a reliable power source for Japan's future. However, the expensive project endured a string of problems, only ever running for less than a year within three decades.

In a cabinet meeting in September 2016 the decision was finally made to shut Monju down. The owner Japan Atomic Energy Agency (JAEA), a government-affiliated company, has often been

**Japan has finally pulled the plug on Monju, an experimental fast breeder nuclear reactor that has been plagued by accidents, cover-ups and cost overruns. But why did Monju fail and is there still a future for fast breeder technology**

**Fast breeder reactors have long been a part of Japan's nuclear strategy, and continue to be. As it became clear that a sustainable alternative to fossil fuels was needed, Japan invested heavily in nuclear technology as a cleaner alternative to coal. The ability of fast breeder reactors to not only create energy but do so while using spent fuel from conventional reactors could help to protect Japan's energy security indefinitely and minimise the environmental risks of nuclear waste.**

accused of mismanagement due to the high number of failures and scandals surrounding the plant. The Nuclear Regulations Agency (NRA) suggested last November that the reactor be run by someone else or be closed,

but with no one apart from JAEA qualified for such a complex project and in the face of mounting expenses and safety concerns, there was no alternative but to close down the project.

Monju is a demonstration reactor, designed to be a small-scale example of the potential of the fast breeder technology. The National Nuclear Laboratory's chief technologist Dr Richard Stainsby explains that "fast breeder reactors use high energy, or fast, neutrons to enable nuclear fission" as opposed to conventional nuclear reactors which use slow, thermal neutrons. By using fast neutrons the reactors are able to utilise plutonium, which is otherwise discarded. "The advantage of using fast neutrons in fission reactions is that these reactions yield a surplus of neutrons, beyond the number needed to sustain the chain reaction," Stainsby says. "These surplus

neutrons are then used to convert the most abundant form of uranium (uranium-238), that cannot normally be used as fuel, into plutonium, which is a very good reactor fuel."

"Japan invested heavily in nuclear technology as a cleaner alternative to coal." Fast breeder reactors have long been a part of Japan's nuclear strategy, and continue to be. As it became clear that a sustainable

alternative to fossil fuels was needed, Japan invested heavily in nuclear technology as a cleaner alternative to coal. The ability of fast breeder reactors to not only create energy but do so while using spent fuel from conventional reactors could

help to protect Japan's energy security indefinitely and minimise the environmental risks of nuclear waste.

Monju was always going to encounter problems. As one of the first fast breeder reactors it was not designed to create large amounts of energy but to perfect the technology on a smaller scale. It was one of two fast breeder reactors constructed in Japan in the same decade, the second of which, JOYO has faced considerably fewer issues, although it is also currently non-operational. Monju is only one of eight fast breeders currently in existence around the world, but of these three are non-operational and a further two are experimental, leaving only three operational. In a controversial move, in September the Japanese Government also announced plans for a roadmap to build more fast breeder reactors to be released by the end of 2016.

**Why did Monju Fail?** Monju first reached criticality in 1994, before being shut in 1995 due to a sodium leak causing a fire. This was the first in a series of accidents which has kept the reactor closed for most of its life, including the discovery in 2012 that JAEA hadn't adhered to safety regulations, failing to check up to 10,000 parts. The plant's reputation has been further marred by the lack of public explanation for the failures throughout. Whilst Stainsby highlights that "overall and looking globally, nuclear power has a safety record at least as good as any other form of large-scale electricity generation," Monju's record is far from exemplary.

"Continuing to maintain the reactor would cost a further ¥500bn (\$4.2bn)." Although Japan has the third-highest number of nuclear reactors in the world, its reputation for nuclear power was hit hard following the 2011 Fukushima Daiichi nuclear disaster. Between 2011 and 2013 the percentage of the Japanese population who supported nuclear power at current or increased levels dropped from

50% to just 22%. This means it is now more crucial than ever for the country to maintain the safest of nuclear technology in order to prove its necessity.

The problems that hounded Monju have also been costly. The fast-breeder program was always expensive, and at its most recent estimate has cost a trillion yen (around \$8.5bn). Continuing to maintain the reactor would cost a further ¥500bn (\$4.2bn), as education minister Hirokazu Matsuno stated following the cabinet meeting. But decommissioning the plant is also expensive, costing an expected ¥300bn (\$2.5bn).

**Decommissioning:** Decommissioning will bring its own set of challenges, not least the large amounts of plutonium stored for use at Monju. Because fast breeder reactors use spent fuel from other nuclear reactors Japan has stockpiled 48 tons of plutonium, or enough to build 1000 nuclear weapons. Furthermore Japan has already begun building the Rokkasho reprocessing plant, designed to produce eight to nine tons of separated plutonium annually which would feed Monju. Ministers have affirmed that it will continue to be built, dramatically adding to a stockpile of plutonium Japan will struggle to get rid of.

"Removing the fuel removes almost all of the radioactivity from the plant and this can typically be done over two to three years," Stainsby explains. "Removing the fuel from a sodium cooled reactor typically takes somewhat longer than for a light water reactor as the sodium has to be kept pure and in its liquid state. This is then followed by a period of "care and maintenance" which extends over a number of years to allow residual radioactivity to decay and to reduce the radioactive classification of the resulting decommissioning wastes."

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There are a number of ways in which this plutonium could be used. "Some of the plutonium can provide fuel for JOYO, assuming JOYO's experimental programme is maintained," Stainsby says. JOYO will not use all of it, however, and it is more likely that the bulk will be used elsewhere."The rest [of the plutonium] could at some point be re-introduced into [Japan's] commercial fuel cycle as mixed-oxide fuel, MOX, for their light water (thermal) reactor fleet," Stainsby suggests. Alternatively it could be given or sold to other countries looking to run fast breeder reactors, but as of yet there is no clear plan.

**The End of Fast Breeder Reactors?** The failure of Monju will be a blow to the nuclear industry globally. As nuclear tries to brand itself as a clean energy alternative to fossil fuels the waste disposal promised by fast breeder reactors would bolster the industry. But Stainsby believes this will not have a long-term effect. "It will be a blow to international generation IV / fast reactor programmes to lose Monju, but the industry could survive such a blow."

**Fast breeder programmes are going to continue regardless of Monju's failures, and they will be able to take away valuable lessons from the experimental reactor. Stainsby emphasises that "one of the key pieces of learning has been to treat prototype reactors as experimental facilities and demonstrators." Monju was always supposed to be learning curve.**

He continues: "France closed their Superphenix commercial demonstration reactor in the late 1990s for a number of technical and political reasons. At the time this was considered by some to be the end of global efforts in fast reactors." But that has proved untrue, he adds, as "other countries, such as Russia, India and China followed by South Korea have pushed ahead with the technology and a few private companies in the US now have their own programmes for commercial reactors."

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treat prototype reactors as experimental facilities and demonstrators." Monju was always supposed to be learning curve..."But for Monju the educational journey is coming to an end, leaving just the decommissioning.

Source: <http://www.power-technology.com/>, 03 January 2017.

## **NUCLEAR STRATEGY**

### **PAKISTAN**

#### **Pakistan Attains 'Second Strike Capability' with Test-Fire of SLCM**

Pakistan successfully test-fired its first ever nuclear-capable submarine-launched cruise missile Babur-III, Director General ISPR Maj Gen Asif Ghafoor said. The range of the missile is 450 kilometres, the DG ISPR said. "The successful attainment of a second strike capability by

Pakistan represents a major scientific milestone; it is manifestation of the strategy of measured response to nuclear strategies and postures being adopted in Pakistan's neighborhood," the military said after the test.

Chief of Army Staff Gen Qamar Javed Bajwa congratulated the team

behind the launch and the nation on the development, Maj Gen Ghafoor said. The missile was launched from an undisclosed location in the Indian Ocean, Radio Pakistan reported. It was fired from an underwater, mobile platform and hit its target with precise accuracy. Babur-III is a sea-based variant of ground-launched cruise missile Babur-II, which was successfully tested earlier in December last.

According to Radio Pakistan, the newly-launched missile has been built with state-of-the-art technology, including underwater-controlled propulsion and advanced guidance and navigation features, augmented by global navigation and terrain and scene matching systems. Babur-III

also features terrain-hugging and sea-skimming flight capabilities to evade hostile radars and air defences, in addition to other stealth technologies. Chairman Joint Chiefs of Staff Committee Gen Zubair Hayat, Chief of Air Staff Air Chief Marshal Sohail Aman and Chief of Naval Staff Admiral Muhammad Zakauallah also congratulated the nation on this landmark achievement, the DG ISPR said.

Source: Dawn, 11 January 2017.

## RUSSIA

### Israeli Satellite Imagery Shows Russian Nuclear-Capable Missiles in Syria

High-resolution imagery confirms what Moscow-watchers and intelligence analysts have known since March of last year (2015): the deployment of Russian nuclear-capable ballistic missiles in Syria. Captured on 28 December 2016 by the Israeli-built Eros B satellite, the spy-quality images were posted Jan 2017 on the website of ImageSat International (iSi), a subsidiary of Israel Aerospace Industries (IAI), the state-owned firm that builds all of Israel's spy satellites.

In a section of the iSi website called Insights, the firm shows an image over Russia's Hmeymin base in Latakia, Syria of what it says are two Iskander-launching vehicles, each capable of deploying two of the 500-kilometer-range surface-to-surface missiles known to NATO as SS-26. Other images compare a shot captured in late November 2016, which shows six different "missile elements" under camouflage nets, to one taken of a nearby location, in which the two vehicles are exposed...The firm claimed that its satellite imagery "is the first visual evidence of the system's presence in Syria" and that its revelations were the first to reveal the system's deployment site.

**The newly-launched missile has been built with state-of-the-art technology, including underwater-controlled propulsion and advanced guidance and navigation features, augmented by global navigation and terrain and scene matching systems. Babur-III also features terrain-hugging and sea-skimming flight capabilities to evade hostile radars and air defences, in addition to other stealth technologies.**

But while the latter part of iSi's claim may, indeed, be true with regard to its imagery providing first public proof of the system's deployment site, it was the Russian military website [military-informant.com](http://military-informant.com) which first publicized back in March 2016 a spit-second video grab of the Iskander launch vehicles at the Hmeymim base.

Source: Barbara Opall-Rome, <http://www.defensenews.com/>, 06 January 2017.

## USA

### Fleet of 12 Nuclear Submarines in Line for Pentagon Approval

The new Columbia-class submarine is part of a trillion-dollar program to modernize the US's sea-air-land nuclear triad over the next 30 years, including maintenance and support. Obama has backed the effort, to the chagrin of some arms control advocates, and President-elect Donald Trump has seemed to signal his support.... The Navy is in contract talks with General Dynamics Corp., which will lead the program to replace aging Ohio-class submarines, with Huntington Ingalls Industries Inc. as the top subcontractor.

General Dynamics rose 1.4 percent to \$177.99 at 10:57 a.m. *The New York Time*. Huntington Ingalls rose 1.7 percent to \$195.16, after initially climbing as much as 2.8 percent, the most since Nov 10, 2016. Huntington Ingalls is the Pentagon's top shipbuilder and depends heavily on revenue from such contracts. The projected \$128 billion acquisition cost, an estimate that factors in expected inflation, puts the new submarines behind only the \$379 billion F-35 aircraft and the \$153 billion multiservice ballistic-missile defense network among the costliest US defense programs.

**Latest Estimate:** The final version of Kendall's memo includes the Navy's latest cost estimate for the submarine: \$13 billion in research and

development and \$115 billion in procurement. He directed that the 12 submarines be produced for an average procurement cost of \$8 billion each, which doesn't include equipment such as the nuclear reactors that would power the vessels and the weapons they would carry.

Approval for the submarine program to enter full development – known as “Milestone B” – is significant “in terms of the importance that the Navy has attached” to it, the program’s “tight development schedule” and concerns over its impact on other defense priorities, Ronald O'Rourke, a naval analyst with the Congressional Research Service, said in an e-mail. For the next decade, the military is budgeting \$193 billion to modernize nuclear delivery systems, including \$43.7 billion for the submarine program, up \$9.4 billion from the estimate last year, according to a congressionally mandated report to lawmakers late last year.

Kendall praised the Navy in a draft memo obtained by Bloomberg News, saying that “it is clear that significant achievements have been made to control current and future costs” and to ensure the submarine’s schedule will be met. “Despite tight schedule margins that leave little room for future issues, there are adequate plans in place to manage this risk,” he said. Still, “without additional resources, which have not been identified, the Navy will have to make substantial reductions in other parts of the Navy budget,” Kendall wrote.

**Bigger Navy:** Underscoring that theme, the Congressional Budget Office in a summary of its annual shipbuilding report that the bigger, 350-ship Navy like that endorsed by Trump – which would include the 12 Columbia-class submarines – could require \$25 billion a year, or about 60 percent above historical annual funding for Navy shipbuilding. More immediately, the Navy estimate sees procurement spending for the submarine program increasing to \$2.8 billion in fiscal 2019

from \$773 million this year. It would hit \$5.1 billion in 2022. That doesn't include long-range operating and support costs.

Source: Anthony Capaccio, [https:// www.bloomberg.com /](https://www.bloomberg.com/), 05 January 2017.

## **BALLISTIC MISSILE DEFENCE**

### **NORTH KOREA**

#### **North Korea 'Very Far Along' in Developing New Ballistic Missile**

North Korea got 2017 off to a menacing start. In his New Year's address, supreme leader Kim Jong Un warned that the nation was in the “final stage” of preparations to test an intercontinental ballistic missile. A day later, President-elect Donald Trump said the North would never develop a nuclear weapon capable of striking the US “It won't happen!” Trump tweeted. Bombast aside, independent arms control experts agree that North Korea is moving rapidly to develop an ICBM. And many suspect it will test a missile capable of reaching the continental US later this year.

Even with Failures, North Korea's nuclear program races ahead. “They are very far along in their ICBM testing project,” says Melissa Hanham, an East Asia researcher at the Middlebury Institute of International Studies at Monterey. “Probably we will see that they will do a flight test in 2017.” If the test were successful – a big if – North Korea would join a small club of nations with ICBMs, including superpowers like the US, Russia and China.

...North Korea is a notoriously closed society, but the government periodically releases images and videos of its missiles. Analysts pore over that scant material and use it to cobble together a mosaic of the North's weapons program. Those reports, combined with public statements by officials in South Korea and the US, provide some

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sense of the North's progress. ...The Musudan's range of up to 2,500 miles is short of what's needed to reach the US, but it appears to use some of the technology that would probably go into a larger ICBM. That ICBM has yet to be tested. Known to analysts as the KN-08 or KN-14, it first appeared in a military parade in 2012. Back then, the missile was so kludged together, it looked to some experts like it could be a decoy.

But in the years since, photos of the ICBM showed features that suggest it is becoming a real weapon. The missile began as a clunky, three-stage design, says David Wright, a rocketry expert at the Union of Concerned Scientists. It has since been redesigned as a simpler two-stage affair. With the new engines tested this year, it would have a range of about 7,500 miles, Wright says. "That would start to bring things like Washington, D.C., into range."

### **Can Trump Stop the Test?**

Neither Hanham nor Wright thinks there are easy solutions available to the president-elect. Attacking the missile before it's launched would be an act of war. If the ICBM is tested to the south, as happened with North Korea's space launches, then it will be out of range of the main US missile-defense system based in Alaska. Smaller ship-based interceptors are also unlikely to be able to shoot it down, Wright says.

That leaves diplomacy, says Hanham. But Kim Jong Un has shown little willingness to negotiate.

Source: <http://www.npr.org/>, 06 January 2017.

## NUCLEAR ENERGY

### FRANCE

#### **France Ready to Save Nuclear Group Areva Whoever Wins Presidency**

A government-led rescue of French nuclear group Areva and the wider atomic energy industry may cost the state as much as 10 billion euros (\$10.45 billion), but political support is almost certain

whoever wins the presidential election in May 2016.

While taxpayers will ultimately pick up the huge bill, the main election contenders - from the Socialists and conservatives to the far-right National Front - broadly back the bailout, which involves splitting up Areva. (AREVA.PA) On top of its dire financial state, Areva is beset by technical, regulatory and legal problems. But given its importance to a nuclear industry that generates three quarters of France's electricity and employs 220,000 people, the next government probably has little choice but to stand by the scheme hatched under outgoing Socialist President Francois Hollande.

France has a small but fierce anti-nuclear movement and some critics oppose investing billions in extending the life of ageing reactors. Nevertheless, nuclear energy is broadly accepted, even though neighboring Germany has

decided to ditch it altogether following the 2011 disaster at Japan's Fukushima plant. "I am convinced that the 21st century will need nuclear," said conservative presidential candidate Francois Fillon. "That is why we must support the industry during this difficult period," the former prime minister wrote in his manifesto.

Although Fillon is a frontrunner, the election outcome remains uncertain. However, even if National Front candidate Marine Le Pen pulls off an upset, she too has promised to stand by the nuclear industry...In her manifesto, she said nuclear was necessary in the medium term to meet targets for cutting carbon emissions and maintaining French energy independence.

The nuclear industry rescue also involves a cash injection for power utility EDF (EDF.PA), which operates France's 58 nuclear reactors and will buy part of Areva's business. But for all the domestic support, Brussels must also rule on whether the bailout complies with European Union rules on state aid. Shareholders of two companies that will emerge from the restructured Areva are due to

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vote on the plan on 03 February 2017. The timing of the EU decision is unknown, but an Areva spokeswoman said: "We hope for an answer from the European Commission within a timeframe that is compatible with the shareholder meetings."

...Once the champion of France's nuclear industry, 87 percent state-owned Areva has seen its equity wiped out by years of losses. Among its biggest problems is a nuclear plant it is building in Olkiluoto, Finland. Work is almost a decade behind schedule and huge cost overruns have led to Finnish utility TVO and Areva claiming billions from each other. A similar project in Flamanville, France is also running years late, with costs spiralling. Areva has also had to take heavy writedowns on its African uranium mines while foreign orders have generally slumped since the Fukushima accident.

**The government has been finding it difficult to reach a clear conclusion on Fukushima No. 2's fate, as it and TEPCo Holdings have been busy dealing with its older counterpart that suffered three reactor meltdowns following the March 2011 earthquake and tsunami.**

On top of this, US and other regulators are investigating possible safety problems related to the suspected falsification of documents at Areva's Le Creusot plant, which makes components for reactors worldwide. In a restructuring that means an end to Areva as an integrated nuclear group, the firm will sell its reactor unit Areva NP to EDF. The French state will effectively nationalize the Olkiluoto liabilities and Areva will receive a mainly state-funded cash injection of 5 billion euros (\$5.2 billion) to refloat it as a uranium mining and nuclear fuel group.

The government is also seeking Japanese and Chinese investors to buy minority stakes in the fuel group, provisionally called NewCo, for one billion euros. Such third-party involvement - which is likely to be crucial for winning EU state-aid clearance - could reduce the net cost to four billion, but the state's liabilities won't end there.

Areva's rescue closely involves 85 percent state-owned EDF. The utility has agreed to buy a majority stake in the reactor unit Areva NP based on a value of 2.5 billion euros. The hope is that outside investors will buy minority stakes in Areva NP too. Russian nuclear group Rosatom also expressed interest in participating in Areva's

restructuring. While EU sanctions on Russia would be a problem, Fillon has promised to pursue warmer relations with Moscow if elected.

EDF itself has been weakened by low power prices, high debt and a series of safety-related outages at its Areva-designed reactors. Now it is taking on more heavy spending commitments. In an 18 billion pound (\$22 billion) project approved last year, EDF plans to build two reactors at Britain's Hinkley Point plant. This was Areva's first reactor sale in almost a decade. EDF also needs to spend 50 billion euros on upgrading its French reactors and will sink billions more into helping to save Areva. To fund this, EDF plans a 4 billion euro capital increase in early 2017, to which the state will contribute 3 billion. The state has agreed to take EDF's dividend on 2015 earnings in shares, saving the utility

1.8 billion euros in cash, and will accept the same on 2016 and 2017 earnings.

So, combining the capital increases for Areva and EDF with the foregone dividend income on the 2015-17 earnings, the total cost to the state is set to add up to around 10 billion euros - although the exact amount will depend on the size of third-party investors' stakes in NewCo. In most countries such a bill would provoke a political row....

*Source: Reuters, 04 January 2017.*

## **JAPAN**

### **Fate of Fukushima No. 2 Nuclear Plant Remains Unknown**

The government is struggling to decide the future of Tepco's Fukushima No. 2 nuclear power plant, which has been suspended since the March 2011 disaster. There have been increasing calls for decommissioning the power plant located just a few kilometers south of the wrecked Fukushima No. 1 installation.

The government has been finding it difficult to reach a clear conclusion on Fukushima No. 2's fate, as it and TEPCo Holdings have been busy dealing with its older counterpart that suffered

three reactor meltdowns following the March 2011 earthquake and tsunami.

On 21 December 2016, the Fukushima Prefectural Assembly voted unanimously to adopt a resolution calling on the central government to decommission the No. 2 plant "at an early date," arguing that the facility is an obstacle to the prefecture's recovery from the 3/11 disasters. A temporary halt to the cooling system for a spent fuel pool at the No. 2 plant caused by an earthquake in November rekindled fears of another meltdown crisis.

In 2011, the prefectural assembly adopted a petition calling for decommissioning all reactors in Fukushima.

The assembly has also adopted a series of written opinions demanding the decommissioning of the No. 2 plant, which is located in the towns of Naraha and Tomioka. Demands from local communities "have been ignored by the central government," one person said. The central government's official position is that whether to decommission the plant is up to Tepco.

As the government has already lifted the state of emergency for the No. 2 plant, it has no authority to decide the decommissioning under current regulations. If an exception were made, the central government could receive a barrage of requests for decommissioning reactors all over the country, sources familiar with the situation said.

...Some people have called for creating a special law on decommissioning Fukushima No. 2, but others have raised concerns that such a step could infringe on Tepco's property rights, the sources said. Some officials in the central government have said that no one believes the No. 2 plant can continue to exist.

PM Abe and his Cabinet have left room for making a political decision on dismantling the facility, saying that the plant can't be treated in the same

way as other nuclear plants due to fear among Fukushima residents of another nuclear accident. Since the government effectively holds a stake of more than 50 percent in Tepco, it can influence the company's policy as a major shareholder. But Tepco now needs to focus on dealing with the No. 1 plant. ...The main opposition Democratic Party plans to pursue a suprapartisan law that would urge Tepco to decide to decommission the plant at an early date....

Source: <http://www.japantimes.co.jp/>, 03 January 2017.

## **NUCLEAR COOPERATION**

### **UK-CHINA**

#### **UK Approval for China-Built Nuclear Reactor to Take Five Years**

British nuclear regulators are expected to take five years to complete the approval process for the construction of China's third-generation "Hualong One" reactor in Britain, the China General Nuclear Corporation (CGN) said. The British government asked regulators to start the approval process for the proposed nuclear station at the Bradwell site in Essex, expected to be one of the first new UK plants in decades.

CGN, along with its partner France's EDF, is seeking permission from London to use its homegrown Hualong One advanced reactor technology for the project, also known as HPR-1000. The plant's "generic design assessment" will be based on unit three of CGN's Fangchenggang nuclear project in southwest China, which is currently under construction, CGN said in a statement posted on the website of China's state asset regulator.

EDF is currently building the \$24 billion Hinkley Point C nuclear reactor in southwest England, after the project was approved by Britain last September. CGN agreed to provide a third of the

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investment in the Hinkley Point C project on the understanding that the move would help it secure future projects in Britain. China's first Hualong One unit is scheduled to be completed by 2020 at the Fuqing nuclear project in Fujian province on the southeast coast, and is being built by CGN's rival, the China National Nuclear Corporation (CNNC).

The two state-owned reactor builders merged their two separate third-generation designs to create the Hualong 1 after the government urged them to work together on a unified Chinese brand that could compete more effectively in global markets. China is currently in the middle of a huge reactor-building boom that will see total domestic capacity rise to 58 gigawatts by the end of 2020. It also aims to become a leading global player in the nuclear sector and has already signed agreements to build reactors abroad, including in Argentina and Romania.

Source: <http://uk.reuters.com>, 13 January 2017.

## **USA-SOUTH KOREA**

### **US, Republic of Korea Nuclear Cooperation Benefits Both Countries**

The US and the Republic of Korea have enjoyed a close relationship on the research, development, and deployment of peaceful nuclear energy since the dawn of the nuclear era. In 1956, the two nations signed a Nuclear Cooperation Agreement on the Non-Military Uses of Nuclear Energy. Two years later, a research reactor was built using US fuel under President Dwight Eisenhower's Atoms for Peace Program.

In the ensuing decades, the nuclear alliance between the US and the Republic of Korea has grown steadily and produced economic, safety, technological, and nonproliferation benefits for both countries.

Today, the ROK is a country of more than 50 million

people with an advanced economy that is the eighth most energy intensive in the world. The nation has 25 operating nuclear facilities – the sixth largest nuclear reactor fleet in the world – which it relies on for one-third of its electricity generation.

The Republic of Korea's experience with nuclear energy has made it an international leader in the development and manufacture of commercial nuclear technology with domestic vendors and manufacturers capable of fulfilling almost any civilian nuclear order. The country also has a sophisticated nuclear energy research and development program.

The ROK's robust nuclear industry provides an important counterbalance to China, which is rapidly expanding its own expertise in the nuclear field, including their own reactor design for the global market and a colossal nuclear manufacturing capability. If left unchecked, China could quickly become the global

leader in commercial nuclear technology – a development that would enhance Beijing's political influence at US expense.

The decline of the US civil nuclear sector and Japan's shift away from nuclear energy on the heels of the 2011 Fukushima Daiichi accident make the Republic of Korea's leadership in the nuclear sector all the more important. A closer partnership with the US would further bolster research into advanced nuclear energy, promote US-ROK nuclear technology exports, and enhance the political influence of both countries in global nonproliferation and safety.

It would also allow the ROK to reduce its growing stockpile of spent nuclear fuel. The country's size and population density offer limited options for disposing of spent fuel, increasing its reliance on interim dry cask storage. Existing reactor sites are projected to run out of spent fuel storage capacity by 2024.

**The decline of the US civil nuclear sector and Japan's shift away from nuclear energy on the heels of the 2011 Fukushima Daiichi accident make the Republic of Korea's leadership in the nuclear sector all the more important. A closer partnership with the US would further bolster research into advanced nuclear energy, promote US-ROK nuclear technology exports, and enhance the political influence of both countries in global nonproliferation and safety.**

To address the growing challenge, Seoul is seeking approval from the US to recycle spent fuel to reduce waste and generate fuel for next-generation fast reactors under development. While the ROK's pursuit of advanced fuel cycle capabilities is controversial in nonproliferation circles, transparency and deployment of advanced technologies can ensure the continued peaceful use of nuclear power consistent with existing non-proliferation treaties. Enhanced bilateral cooperation would also promote safer nuclear power through the development of more secure reactor designs.

If the US wishes to counterbalance a likely Chinese monopoly on civil nuclear technology exports and what that could mean for geopolitics, Washington must take steps now to expand its existing civilian nuclear alliances. Given Japan's post-Fukushima struggles, the US should place its largest bet on the ROK, a country with shared common values and strategic interests.

With more than 50 years of peaceful nuclear energy cooperation and friendship, Washington should demonstrate that close bond by considering requests from Seoul to expand the terms of bilateral cooperation in civilian nuclear energy. With the decline of its own domestic civil nuclear program, the US needs Seoul's strategic vision and prowess to help maintain an influential voice in global nonproliferation and nuclear safety matters.

*Source: Jeffrey Crater and George David Banks. <http://www.realclearenergy.org/>, 09 January 2017.*

## **NUCLEAR PROLIFERATION**

### **NORTH KOREA**

#### **North Korea has Enough Resources for 10 Nuclear Weapons**

Kim has been accelerating North Korea's production of weapons-grade plutonium as well as its ballistic missile capabilities since the

collapse of an international non-proliferation agreement. And he has now amassed 50kg of plutonium since reactivating its Yongbyon nuclear power plant in 2013, according a report from the defence ministry in Seoul.

It comes after some serious sabre-rattling by Kim who boasted in his New Year address Pyongyang was in the "final stages" of test-firing a fully-fledged intercontinental ballistic missile. North Korea's ICBM has a range of 5,500 miles could cause world-wide devastation if its unhinged leader decided to launch an attack.

**North Korea was capable of producing 80kg of highly enriched uranium each year. With such an output Kim could expect three new nuclear weapons every 12 months and will have created an arsenal of 50 nuclear warheads by 2020. The latest South Korean figures do not take into account material generated by North Korea's programme of secretly enriching uranium which is beyond its capacities to estimate.**

Siegfried Hecker, a professor of nuclear physics at Stanford University in the US who has visited the Yongbyon plant, said North Korea was capable of producing 80kg of highly enriched uranium each year. With such an output Kim could expect three new nuclear weapons every 12 months and will have created an arsenal of 50 nuclear warheads by 2020. The

latest South Korean figures do not take into account material generated by North Korea's programme of secretly enriching uranium which, Seoul says, is beyond its capacities to estimate. The report also warned Pyongyang was developing submarine-launched ballistic missiles but said the technology was not yet ready for deployment. ...

*Source: Simon Osborne, <http://www.express.co.uk>, 12 January 2012.*

#### **Kim Jong-un Says North Korea is Preparing to Test Long-Range Missile**

North Korea's leader, Kim Jong-un, said that his country was making final preparations to conduct its first test of an intercontinental ballistic missile — a bold statement less than a month before the inauguration of President-elect Donald J. Trump. Although North Korea has conducted five nuclear tests in the last decade and more than 20 ballistic missile tests in 2016 alone, and although it habitually threatens to attack the US with nuclear weapons, the country has never flight-tested an

intercontinental ballistic missile, or ICBM.

In his annual New Year's Day speech, which was broadcast on the North's state-run KCTV.... Mr. Kim spoke proudly of the strides he said his country had made in its nuclear weapons and ballistic missile programs. He said North Korea would continue to bolster its weapons programs as long as the US remained hostile and continued its joint military exercises with South Korea. ... Analysts in the region have said Mr. Kim might conduct another weapons test in coming months, taking advantage of leadership changes in the US and South Korea. Mr. Trump will be sworn in on 20 January 2017.

...Mr. Kim's speech indicated that North Korea may test-launch a long-range rocket several times this year to complete its ICBM program, said Cheong Seong-chang, a senior research fellow at the Sejong Institute in South Korea. The first of such tests could come even before Mr. Trump's inauguration, Mr. Cheong said. Doubt still runs deep that North Korea has mastered all the technology needed to build a reliable ICBM. But analysts in the region said the North's launchings of three-stage rockets to put satellites into orbit in recent years showed that the country had cleared some key technological hurdles.

...North Korea has deployed Rodong ballistic missiles that can reach most of South Korea and Japan, but it has had a spotty record in test-launching the Musudan, its intermediate-range ballistic missile with a range long enough to reach American military bases in the Pacific, including those on Guam.

The North has also claimed a series of successes in testing various ICBM technologies, although its claims cannot be verified and are often disputed by officials and analysts in the region. It has said

it could now make nuclear warheads small enough to fit onto a ballistic missile. It also claimed success in testing the re-entry technology that allows a long-range missile to return to the Earth's atmosphere without breaking up....

*Source: Choe Sang-Hunjan, The New York Times, 01 January 2017.*

### **N. Korea SLBM with 1-Ton Nuclear Warhead Covers Entire S. Korea**

North Korea's SLBM is capable of reaching any target in South Korea if it is mounted with a 1-ton nuclear warhead, according to foreign missile experts. The claim was made in a report published in the December 2016 edition of *Korea Observer*, published quarterly by the Institute of Korean Studies. In the report titled "North Korean Ballistic Missile Program," Theodore A. Postol, a professor emeritus at MIT, and Markus Schiller, an aerospace engineer at the Munich-based ST Analytics, said the North's SLBM, called KN-11, is believed to have a range of 600 kilometers or more if it is armed with a 1-ton nuclear warhead. This puts all of South Korea within range of

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the missile in theory.

The experts also noted the possibility that the missile with a 1-ton warhead may have a range of 800 kilometers, though more details are necessary to determine the maximum range of the missile. They added that the missile with a 1.5-ton warhead may have a range of 450 kilometers.

... The report added that once the deployment is done, missile defense systems such as the US THAAD, which is scheduled to be deployed in South Korea this 2017, would not be able to readily engage such an "all azimuth" SLBM as it is mostly designed to shoot down North Korean missiles fired from a relatively well-defined direction from

the North. The report comes at a time when military officials here assess that the North's technology to miniaturize nuclear warheads has reached a "considerable" level.

They note that if a country miniaturizes a nuclear warhead to about 1 ton in weight and 90 centimeters in diameter, the development is considered a success. Pyongyang is known to have been working to reduce the weight of its nuclear warheads to less than 700 kilograms so it can fit them on its various ballistic missiles.

The weight of the warhead for the North's short-range Scud missile is about 770 to 1,000 kilograms, while the medium-range Rodong missile can carry a 700-kilogram warhead and the intermediate-range Musudan a 650-kilogram warhead, according to the Ministry of National Defense. The ministry assesses that the North has yet to perfect such technology, though some military experts claim Pyongyang has already reached that goal.

The isolated state also appears to have been advancing its SLBM technologies last year, during which it test-fired three SLBMs in April, July and August 2016. In the third test, the SLBM flew about 500 kilometers and splashed down in waters within Japan's Air Defense Identification Zone (JADIZ) in the East Sea, showing significant improvement from past tests. ...The North's KN-08 road-mobile ICBM with a range of more than 10,000 kilometers is capable, in theory, of hitting targets on the US mainland.

Source: Jun Ji-hye, <https://www.koreatimes.co.kr/>, 02 January 2017.

NUCLEAR NON-PROLIFERATION

IRAN

Iran to Get Natural Uranium Batch

Iran is to receive a huge shipment of natural uranium from Russia to compensate it for exporting tons of reactor coolant, diplomats say, in a move approved by the outgoing US administration and other governments seeking to keep Tehran committed to a landmark nuclear pact. Two senior diplomats said the transfer recently approved by the US and five other world powers that negotiated the nuclear deal with Iran foresees delivery of 116 metric tons (nearly 130 tons) of natural uranium.

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UNSC approval is needed but a formality, considering five of those powers are permanent Security Council members, they said.

...Tehran already got a similar amount of natural uranium in 2015 as part of negotiations leading up to the nuclear deal, in a swap for enriched uranium it sent to Russia. But the new shipment will be the first such consignment since the deal came into force a year ago.

The diplomats, whose main focus is Iran's nuclear program, demanded anonymity because they are not allowed to discuss

the program's confidential details. They spoke ahead of a meeting in Vienna of representatives of Iran, the US, Russia, China, Britain, France and Germany to review Iranian complaints that the US was reneging on sanctions relief pledges included in the nuclear deal.

The natural uranium agreement comes at a sensitive time. With the incoming US administration and many US lawmakers already

**The natural uranium agreement comes at a sensitive time. With the incoming US administration and many US lawmakers already skeptical of how effective the nuclear deal is in keeping Iran's nuclear program peaceful over the long term, they might view it as further evidence that Tehran is being given too many concessions.**

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The diplomats said any natural uranium transferred to Iran after the deal came into effect would be under strict surveillance by the IAEA for 25 years after implementation of the deal. They said Tehran has not said what it would do with the uranium but could choose to store it or turn it into low-enriched uranium and then export it for use as reactor fuel.

Without confirming the reported agreement, US officials argued that such shipments would neither endanger nor violate the Iran nuclear deal. State Department spokesman John Kirby told reporters there was no prohibition on such imports by Iran and noted natural uranium "cannot be used ... for a weapon" in its original form.

Despite present restrictions on its enrichment program, however, the amount of natural uranium is significant should Iran decide to keep it in storage, considering its potential uses once some limits on Tehran's nuclear activities start to expire in less than a decade. ... The swap is in compensation for the approximately 40 metric tons (44 tons) of heavy water exported by Iran to Russia since the nuclear agreement went into effect, said an official from one of the six powers, who also demanded anonymity citing confidentiality issues. Another 30 metric tons have gone to the US and Oman. Heavy water is used to cool a type of reactor that produces more plutonium than reactors cooled by light water. Like enriched uranium, plutonium can be turned into the fissile core of a nuclear weapon. Associated Press writers Matthew Lee and Josh Lederman contributed from Washington.

Source: George Jahn, <http://www.stripes.com/>, 09 January 2017.

## NUCLEAR SAFETY

### USA

#### Indian Point Nuclear Plant in New York will Close After Dozens of 'Safety Events'

New York City secured agreement with facility's operator for shutdown in about four years, following radioactive leak that contaminated groundwater last 2016. The Indian Point nuclear power plant in New York, which last year leaked radioactive material into groundwater near New York City, will close by April 2021, Governor Andrew Cuomo said....

..."For 15 years, I have been deeply concerned by the continuing safety violations at Indian Point, especially given its location in the largest and most densely populated metropolitan region in the country," Cuomo said. "I am proud to have secured this agreement with Entergy [the plant's operator] to responsibly close the facility 14 years ahead of schedule, to protect the safety of all New Yorkers."

The plant has had 40 "safety events", "operational events", and shutdowns since 2012. The shutdowns have exposed apparent fragility in the nuclear facility's workings: in December 2015 the plant was shut down for three days after droppings from a "large bird" caused an arc between power lines and a transmission tower. In April 2016, Entergy admitted it had found that bolts holding together the interior of one of Indian Point's reactors were damaged and, in some cases, missing.

Entergy also came under fire in 2016 after the Guardian published a safety assessment of proposed natural gas pipelines to be built by energy pipeline company Spectra on Indian Point property. The assessment, provided to the Guardian by engineer Paul Blanch and obtained through a freedom of information act (Foia), was partly hand-drawn and did not adequately account

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for the damage to the plant that could result from a breach of the lines.

Local environmental groups have made the plant a nemesis, though those who work at the facility in Buchanan, New York, want it to remain open. The plant employs just under 1,000 people; Entergy's chairman and CEO, Leo Denault, thanked Indian Point's employees in a statement on the coming closure and said the company was "committed to treating our employees fairly and will help those interested in other opportunities to relocate within the Entergy system" ....

Source: *The Guardian*, 09 January 2017.

## NUCLEAR SECURITY

### PAKISTAN

#### Pakistan Made 'Counterproductive' Moves Risking Nuclear War: US

US Vice President Joe Biden has singled out Pakistan along with Russia and North Korea and others for making "counterproductive" moves that only increased the risk that nuclear weapons could be used in a regional conflict. "Not just North Korea, but Russia, Pakistan, and others have made counterproductive moves that only increase the risk that nuclear weapons could be used in a regional conflict in Europe, South Asia, or East Asia," Biden said in his remarks on nuclear security.

Working with the Congress, the next administration will have to navigate these dangers and continue leading the global consensus to reduce the role of nuclear weapons in our world, Biden said a week before the end of eight years of the Obama administration.

"Even one nuclear bomb can still cause hideous damage. That's why, from the moment President Obama and I took office eight years ago, reducing

the threat of a nuclear attack has been a chief national security priority," he said adding that thanks to America's leadership, the international community is newly focused on preventing nuclear terrorism. "We know that terrorists have both the capacity and the goal of transforming nuclear materials into weapons to sow havoc. And we know that no nation acting alone can defeat this threat," he said.

Referring to the series of steps taken by the Obama administration in last eight years, Biden said these efforts have reduced the supply of nuclear weapons-usable material.

"And we've not only stepped up the physical protection of facilities where nuclear materials are stored we've greatly improved our ability to detect and seize unregulated nuclear and radiological materials being smuggled in secret," he said.

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Biden said as North Korea's nuclear and ballistic missile capabilities continue to expand, it poses a growing threat to international security and our own national defence. Nuclear weapons, the proliferation of this deadly knowledge to more nations, and the possibility of a terrorist obtaining nuclear materials, remain among the most

pressing security challenges, he said. "That's why we've been so vigilant in keeping the international community united to raise the costs on North Korea for its flagrant violations of nuclear norms," he said.

"Just last year, in response to two illegal nuclear tests by North Korea, the United Nations Security Council- including China and Russia-unanimously adopted two resolutions imposing the most far-reaching and comprehensive sanctions on North Korea to date," he said and called for enforcing these sanctions to ensure North Korea understands that we will continue to impose costs for their illegal behaviour. "North Korea's growing

capability is one of the most significant challenges the next administration will face.

There are no simple solutions. But any viable path forward must include standing with our Asian allies to send a clear message to Pyongyang: Attempts at coercion or intimidation will fail," Biden said. Security and international respect cannot be attained through illegal weapons. And as long as that is the choice North Korea's leaders continue to make, their country will remain economically isolated and an international pariah, he said.

Source: <http://www.ndtv.com>, 14 January 2017.

## **NUCLEAR WASTE MANAGEMENT**

### **USA**

#### **Idaho's Nuclear Waste: A Problem We're Leaving to Our Children**

Since the 1950s, the Department of Energy (and predecessor agencies) has been "storing" highly radioactive material – spent nuclear fuel – from the nuclear navy at the Idaho National Laboratory. As a result, Idaho has played a central role in keeping aircraft carriers, submarines and other ships on the high seas, enhancing our national security. No other state has played a bigger role.

The original decision to accumulate hundreds of tons of highly radioactive waste in Idaho was driven by a desire, as an admiral once told me, to keep the material out of

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construction jobs and obviously brings benefits to the local economy.

I certainly understand the difficulty of resisting a \$1.6 billion project, but by accepting DOE's plans Idaho has acquiesced to accepting – potentially permanently – significant additional amounts of highly radioactive waste piled on the tons that have accumulated over the last 60 years. In exchange for the temporary construction jobs at INL, here is what Idaho gets, and I'll quote DOE's own language. Infrastructure will be created "to

ensure the long-term capability of the (Navy program) to support naval spent nuclear fuel handling for at least the next 40 years." The decision allows DOE "to unload, transfer, prepare, and package naval spent nuclear fuel for disposal (emphasis added)..." until..."at least 2060."

There is perhaps no better illustration of the abject failure of the nation's nuclear waste management efforts than the accumulation of vast amounts of spent nuclear

fuel in Idaho, a situation I continue to believe most Idahoans find unacceptable.

By one measure, Idaho currently hosts 308 metric tons of spent nuclear fuel from the Navy, foreign and domestic research reactors, commercial reactors and the debris from the 1979 Three Mile Island accident. This includes 900,000 gallons of particularly dangerous liquid waste that remains untreated and buried in 50-year old tanks. The waste is perched above one of the largest freshwater aquifers in the world.

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1995 agreement mandating removal of all this material by 2035. DOE's stunning admission in the recent environmental impact statement that it is expecting to keep high-level waste in Idaho long beyond that deadline makes it absolutely essential that state officials vigorously enforce the Batt agreement, in federal court, if necessary. While it is true that Idaho has enjoyed

economic benefits from its relationship with the Department of Energy, it is also true that we never agreed to become a waste "disposal" site.

The unspoken decision to make Idaho a disposal site was thrust upon the state in the 1950s and perpetuated for generations because of the stunning failure by administrations of both political parties to create a permanent disposal site. DOE officials speak often of a "permanent" disposal facility outside of Idaho, but the sad truth is there is no permanent site and under even the best case there won't be one for years. Meanwhile, Idaho continues to assume the risks of having the waste here.

In fact, if the decision were left to Idahoans, I don't believe we would ever permit the state to effectively become a high-level nuclear waste disposal site, but the sad reality is that through neglect and incompetence, the federal government has essentially created just such a site in Idaho. Our children will likely be living with that reality long after many of us are gone.

The only protection we have against the waste remaining indefinitely in Idaho is Gov. Phil Batt's

*Source: <http://www.idahopress.com/>, 12 January 2017.*



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