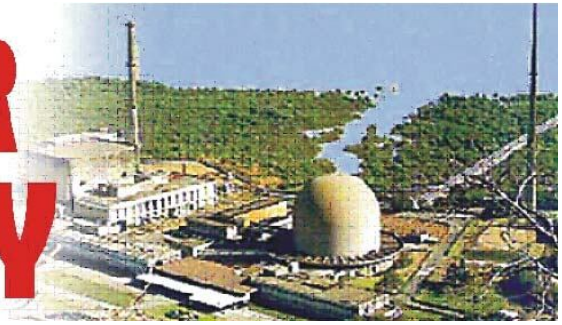


# NUCLEAR SECURITY



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

Vol 09, No. 05, 01 Jan. 2015

## OPINION – KS Parthasarathy

### Nuclear Power: Safe, Cost Effective, And Environment Friendly

Nearly seven years ago, in a news story published in *The Nav Hind Times*, Dr M V. Ramana listed what he felt as the ill-effects of nuclear technology. He said that nuclear power is costly; that reactors could lead to catastrophic accidents; the reactors produce radioactive waste and they are linked to nuclear weapons. These statements reflect many myths and a few realities.

Vaghan Scully of Standard and Poor's Equity Research states that the cost of building nuclear power plants and that for coal-fired plants in USA will be of the same order at \$ 2200 per kilowatt and \$ 2135 per kilowatt respectively, if the coal plant uses advanced technology to gasify coal before combustion and stores the carbon dioxide generated underground.

Anti nuclear activists ignore the impact of copious amounts of carbon dioxide, a well known green house gas from fossil fuel stations. They are indulgent towards coal-fired power station because opposition to nuclear power is an article of faith for them. The radiation dose to population from coal stations are hundred times more than that from

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nuclear power stations. This is because coal contains uranium, thorium, etc. The dose in the case of coal stations or nuclear power stations is too small to be of any health consequence

Apart from uranium and thorium coal contains ten other elements such as mercury and arsenic. In spite of these adverse impacts coal-fired stations will continue to serve us for the next several decades as our annual power deficit is about 12-13%. When he expressed his views, the tariffs for nuclear power in India were not unduly high. It was 93 paise per unit for Unit 1&2 of Tarapur Atomic Power Station (the

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cheapest non-hydel power in India); Rs 2.79 for Units 2, 3 & 4 of Rajasthan Atomic Power Station and Units 1&2 of Kaiga; Rs 2.65 for Tarapur 3&4; Rs 2.04 for Units 1&2 of Kakrapar; Rs 1.91 for Units 1&2 of Narora and Rs 1.81 for Units 1&2 of Madras Atomic Power Station.

Nuclear power is cheaper than power from four power stations using liquid fuel (Rs 7.18 to 7.94 per unit) and the five stations using RLNG-re-gasified liquid natural gas- (Rs 4.14 to 4.75) and two non-pit head generating stations (Rs 3.07 and Rs 3.36) and a gas based station (Rs 3.57)

Two reactor accidents (Three Mile Island, Chernobyl) particularly the one at the Three Mile Island in 1979 did not cause death or injury to anyone. Chernobyl was a flawed reactor and was operated by over-zealous operators. Design flaws combined with unpardonable operator errors and sloppy procedures caused the accident.

These accidents led to unprecedented safety reviews of nuclear power plants worldwide; the safety performance of reactors improved. In spite of public concern about nuclear accidents fanned by anti nuclear propaganda, 439 nuclear power reactors in 30 countries currently produce 16% of world's electricity. France produces 78.4% of its electricity from nuclear reactors and export large amounts of power to some European nations enabling them to take anti-nuclear postures. Japan which suffered from

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**Since it is an unforgiving technology, we must regulate it stringently. We must choose only reactors of proven technology. We must build them at the right site, following sound quality assurance procedures. We must provide diverse and redundant reactor control and protection systems of high reliability. Other steps include defence in depth philosophy; proven operating procedures by qualified and trained staff; continuous safety review and operating experience; well-rehearsed emergency preparedness plans among others.**

atomic bombing produces 30% power from nuclear reactors.

No country abandoned nuclear power because of nuclear accidents. Fifty out of the 104 reactors operating in USA were connected to the grid after 1979, the year in which the accident occurred at the Three Mile Island, 19 of them after 1986, the year in which Chernobyl accident took place. All Canadian reactors came on line after 1979. Similarly French electric companies connected 53 out of the 58 reactors to the grid after 1979.

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We mine uranium ore and process it. We fabricate fuel elements, design, construct and operate reactors. We developed nuclear waste management technology. We are one among the few countries which reprocess spent fuel. Nuclear power is safe, cost effective and

environment friendly.

Source:<http://ksparthasarathy.wordpress.com/>, 16 December 2014.

**OPINION – Manpreet Sethi**

**India-Russia Nuclear Vision Statement: See that it Delivers**

As expected, Russian President Valdimir Putin and Indian Prime Minister Narendra Modi covered all the usual areas of cooperation during the former's visit to New Delhi on 11 December, 2014. Russia has been India's close partner over decades and the latter has reiterated the importance of the relationship in contemporary times too. The Druzhba Dosti Vision Statement (VS) covers the period of the next decade, anchored in a special strategic partnership.

Obviously, the nuclear component of this relationship, which traverses the entire range of activities from fuel fabrication to plant decommissioning, is especially noteworthy. Building on the agreements signed by both in 2008 and 2010, the 2014 Strategic Vision for Strengthening Atomic Energy Cooperation envisages the construction of a dozen nuclear power reactors over the next 20 years. It may be recalled that Kudankulam (KK) 1, India's first Russian reactor, attained full-rated power in 2014, and KK 2 is nearly ready too. Meanwhile, a General Framework Agreement was signed in April 2014 for the construction of KK 3 and 4 at the same site.

The next tranche of Russian nuclear reactors will require fresh site(s). The 2014 nuclear cooperation VS mentions that the construction of future nuclear plants would take into account "India's demand for power, the then available nuclear technologies including those that may be developed jointly, mutually acceptable technical and commercial terms, and the prevalent electricity tariffs." Evidently and wisely, a lot has been left to the consideration of factors prevalent in the future.

The Agreement also emphasises the involvement of Indian suppliers of manufacturing equipment,

fuel assemblies and spares for Russian reactors to be constructed in India. Indeed, one of the hallmarks of India's decision to import reactors from the international nuclear market has been the insistence on including a large local component into their construction. Even before Modi vocalised 'Make in India', the nuclear sector has always been bound by this dictum. In fact, until 2008, it did not have the option of foreign material, technology or components. Retaining that focus while realising the ambitious national nuclear expansion plans would certainly open employment opportunities for the millions of young engineers and technicians passing out of the Indian education system annually. In fact, another important aspect of the VS in this context is the prospect of exploring

"opportunities for sourcing materials, equipment and services from Indian industry for the construction of the Russian-designed nuclear power plants in third countries.

Given that the Russian nuclear industry is keen on exports, this would enhance the capability and capacity of the Indian nuclear industry through necessary transfer of technology. The Statement also mentions joint extraction of natural uranium through

technical cooperation in mining activities, "within their own territories and in third countries." This would be significant for India if it is to fulfill its nuclear expansion ambitions without having to worry about the availability of fuel. At the same time, collaboration on radioactive waste management, research and development on fusion reactors etc. are all forward-looking aspects of the VS.

So, what stands in the way of realising the potential of the vision of the statement? A few issues must be given due consideration. First, the identification of fresh site(s) for the new Russian reactors may not be as easy as it sounds. Given that public acceptance issues have acquired a worrisome dimension in the post-Fukushima environment, the acquisition of necessary land will call for much

**Given that public acceptance issues have acquired a worrisome dimension in the post-Fukushima environment, the acquisition of necessary land will call for much greater investment, and not just monetary, by the nuclear establishment to reach out to the constituencies to inform and educate them with the objective of winning them over.**

greater investment, and not just monetary, by the nuclear establishment to reach out to the constituencies to inform and educate them with the objective of winning them over.

Second, the Indian nuclear liability law will require amendments to become palatable to the nuclear industry anywhere, at home or abroad. While rather cryptically, Russian government officials have "in principle" agreed to the Indian nuclear liability law, this has been done after factoring in the costs involved in the process. According to some reports, the first and second units of the Kudankulam nuclear power plants had cost India \$1 billion each, but new units will cost triple the amount in view of India's nuclear liability law. Even if this may be an exaggeration, it must not be forgotten that any nuclear industry, including Russian, is in the business of doing business. The cost will be handed down to India only.

In such a situation, critics of nuclear power will jump at the opportunity to drum up opposition to construction of new nuclear plants on the ground of the high costs. Economics of nuclear reactors has always been a matter of concern. In the past, the NPCIL has contended that its PHWR have been comparable in cost to other sources of electricity. But, a high cost of imported reactors, owing to the nuclear liability law imposing a huge burden on any nuclear industry, would put a black mark against nuclear power.

Therefore, it would be a good idea to take a fresh look at the issue so as to be able to make use of the opportunities that have opened up for India in the field of international nuclear commerce. Amendment of the law is not to appease outsiders but to make nuclear power an implementable viable option for India itself. A VS may be crafted when the decision-makers see potential, but it can only be realised when they also see and address the challenges that stand in the way.

Source: [www.ipcs.org](http://www.ipcs.org), 15 December 2014.

OPINION – Saira Bano

**Pakistan is Learning the Wrong Lesson: Tactical Nuclear Weapons in South Asia**

The renowned philosopher, George Santayana, said, "Those who cannot learn from history are doomed to repeat it." Pakistan is repeating the US decision to deploy tactical nuclear weapons during the Cold War and which has limited applicability in South Asia. NATO's perceived military inferiority against the Soviet Union is often cited to justify Pakistan's pursuit of tactical nuclear weapons against the conventionally superior India.

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By deploying tactical nuclear weapons, the US's goal was to deter any conventional attack by the Soviet Union on Western Europe. The US also wanted to prevent any European conflict from developing into a full fledge nuclear war between the two superpowers. These weapons proved to be useless militarily and most of them were withdrawn from Europe in 1991. The US strategists

learned that nuclear use at the tactical level would lead to a strategic response and an uncontrollable escalation. Pakistan, however, has embraced this discarded strategy by testing the SRBM, the Nasr (Hatf IX) on April 19, 2011 and has repeated tests four times since then. India, on the other hand, has tested a short-range ballistic missile on July 21, 2011.

In response to cross-border terrorism, allegedly supported by Pakistan, the Indian army developed a "Cold Start Doctrine" in 2004. This doctrine is based on rapid, limited conventional military operations against terrorist organizations in Pakistan. It calls for quick penetration into Pakistan in response to cross-border terrorist strikes and the seizing of territory to negotiate the end of a terrorist attack on Indian soil. Empirical developments since 2004 show that India has not implemented this doctrine. Indian officials and policymakers have either denied the

existence of this doctrine or have not endorsed this adventurous strategy. A classified document released by WikiLeaks dated February 16, 2010 revealed that Tim Roemer, then US Ambassador to India, described Cold Start as “a mixture of myth and reality.” He further argued, “While the army may remain committed to the goals of the doctrine, political support is less clear.” India did not apply Cold Start in the wake of the 2008 Mumbai attack, which calls into question the political will for this doctrine.

Cold Start is designed to punish Pakistan in a limited military operation without triggering a nuclear response. However, one can never be sure whether Pakistan will refrain from using nuclear weapons. To counter the potential for limited Indian intrusions along the line of this doctrine, Pakistan has begun to develop Nasr under the rubric of “full spectrum deterrence.” In the 2008 Mumbai attack, however, India was deterred from initiating cross-border retaliation without the presence of TNWs on Pakistan's side. Pakistan's strategic weapons were enough to deter

India. During the Cold War what deterred the Soviet Union from attacking NATO countries was not the possession of tactical nuclear weapons but the risk of escalation to the strategic level once tactical weapons were used.

Pakistan seems to imply that actions at the tactical or operational level have no strategic implications and a limited nuclear war will not escalate into a full fledged nuclear war. India threatens massive retaliation against the use of tactical nuclear weapons. Shyam Saran, former foreign secretary and the current Chairman of India's National Security Advisory Board said that if India is attacked with nuclear weapons “it will engage in nuclear retaliation which is massive and designed to inflict unacceptable damage on its adversary. The label on a nuclear weapon used for attacking

India, strategic or tactical is irrelevant from Indian perspective.”

The deployment of tactical nuclear weapons may lead to loosening the highly centralized command and control mechanism. Battlefield nuclear weapons require local commanders to have authority and capability to arm and launch nuclear weapons. This raises the risk of unauthorized use during a crisis or inadvertent escalation during a

conventional conflict by a local commander of a nuclear-armed unit who might feel it necessary to use the weapons in order to avoid defeat. A positive sign is that Pakistan has not deployed the weapons in forward positions yet and has not delegated the authority to local commanders.

The idea of using nuclear weapons at the operational level on Pakistani soil will cause significant civilian casualties due to the dense population along the Indian and Pakistan border. This will also have a damaging effect on Pakistan's own military forces and render the land uninhabitable. In 1955 NATO conducted a military

exercise to test its ability to defend West Germany by employing nuclear weapons. The results estimated that 1.3 millions Germans would have died, 3.5 millions would have been seriously injured and a large territory would have become uninhabitable.

More tactical nuclear weapons in Pakistan also increase safety and security problems. The safety of Pakistan's nuclear weapons program has been a major concern in the international community in the wake of terrorist organizations operating in the country. Political instability and terrorist attacks on the military installations, including army headquarters in Rawalpindi, a naval base in Karachi, and an air base in Kamra with inside support, have exacerbated these concerns.

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TNWs carry the risk of preemptive strikes. During the Cold War the Soviet Union monitored all the nuclear sites in West Germany. Any movements on those sites including preparations to launch nuclear weapons, mating of warheads to missiles and uploading would have prompted the Soviet Union to strike preemptively. There was a strong temptation to destroy the weapons before they were launched. In the case of India and Pakistan the short flight times of ballistic missiles exacerbate these tensions by sharply reducing decision-making time for leaders during a crisis.

The Indians and the Pakistanis have a practice of using their missiles for both conventional and nuclear weapons, which further increases the risk of misperception and unintended escalation. The real lessons to be learned from the Cold War experience is not to develop tactical nuclear weapons but to imitate the US and USSR's experience about enhancing strategic stability by increasing transparency and using diplomacy to alleviate an arms race. The lesson of the Cold War is not to rely on nuclear weapons, but to find ways to reduce reliance on tactical nuclear weapons and place a crises stability mechanism and a confidence building mechanism in South Asia. ...

Source: <http://www.internationalpolicydigest.org/>, 27 December 2014.

**OPINION – Josh Rogin, Eli Lake**

**North Korea's Nukes are Much Scarier than its Hacks**

While the world's attention focuses on North Korea's cyber war with Sony Pictures, the Hermit Kingdom is rapidly increasing its stockpile of nuclear weapons material, with real little

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**A new analysis of North Korea's nuclear program by a group of top US experts, led by David Albright, president of the Institute for Science and International Security, estimates that North Korea could have enough material for 79 nuclear weapons by 2020.**

pushback from the US. A new analysis of North Korea's nuclear program by a group of top US experts, led by David Albright, president of the Institute for Science and International Security, estimates that North Korea could have enough material for 79 nuclear weapons by 2020.

Albright said the North Korean government is ramping up its production of plutonium and highly enriched uranium, speeding toward an amount that would allow it to build enough nuclear weapons to rival other nuclear states including India, Pakistan and Israel. "North Korea is on the verge of being able to scale up its nuclear weapons program to the level of the other major players, so it's critical to head this off," Albright said in an interview.

He added, "It is on the verge of deploying a nuclear arsenal that would pose not only a threat to the United States and its allies but also to China." According to the analysis, which included the input of a team of former government officials, nuclear experts and North Korea-watchers, the regime now has as many as four separate facilities churning out nuclear weapons material or preparing to do so. The best-known one, at Yongbyon, has a functioning 5-megawatt plutonium reactor, a uranium enrichment grid with thousands of centrifuges and a light-water reactor that could be used for either military or civilian purposes.

The US intelligence community also believes the North Koreans have a second centrifuge facility they have never acknowledged. Even if that second uranium facility is taken out of the equation, Albright's team projects that North Korea will have enough material for 67 bombs in five years time. The light-water reactor at Yongbyon

is not online yet, but it should be soon. Even if that reactor is never turned on or limited to civilian purposes, North Korea could still have 45 bombs by the time the next US president is finishing up his (or her) first term.

North Korea is estimated to have 30 to 34 kg of weapons-grade plutonium now, enough for around nine nuclear weapons, depending on the size of each bomb. Last year it conducted its third nuclear weapons test. Albright acknowledged that the secrecy of the North Korean program makes exact projections impossible and therefore his estimates all have a range to account for known unknowns, such as secret facilities. According to the detailed intelligence community budget leaked to the Washington Post in 2013 by former National Security Agency contractor Edward Snowden, North Korea's nuclear program remains one of the hardest targets for US spies as well.

**Why does a targeted cyber-hack draw a tougher response from Obama than the amassing of a small nuclear arsenal? The message it sends to Pyongyang is that they can threaten their entire region with nuclear weapons, just so long as they don't touch Hollywood.**

But there's no doubt about the North Korean government's intentions, Albright said, to produce as much nuclear-weapons material as possible before it is forced to stop either by coercion or the resumption of a diplomatic negotiations with the West. ... For Albright as well as other Korea experts, the North Korea policy of US President Barack Obama's administration, often referred to as "strategic patience," has not only failed to stop this nuclear buildup, it has encouraged Pyongyang to increase its aggressive behavior, as shown by the brazen attack on Sony's computer systems. "When you leave North Korea alone like that, they engage in this kind of reckless behavior," he said. "It tends to go on until there's some meaningful engagement."

Obama is said to be considering a range of "proportional responses" against North Korea, possibly including counter cyber-hacks, financial sanctions or placing North Korea back on the State Department's list of state sponsors of terrorism. But none of those steps is likely to be effective, according to experts and lawmakers.

Representative Adam Schiff, a Democratic member of the House Intelligence Committee, told

that the intelligence attributing the attack to North Korea has "a level of certainty that you normally don't see." Schiff worried, however, that responding to North Korea with a cyber-attack may backfire: "They can do a lot more damage to us in a cyber battle, given our exposure and given that their infrastructure is already so dilapidated," he said. Instead, Schiff said, Obama should consider financial measures. "There are ways the administration to turn up the economic heat, both as a way of punishing this rouge regime and its cronies and as a way of deterring further attacks of this kind," he noted.

Joel Wit, a former State Department official who runs the North Korea information website 38North, also participated in Albright's latest analysis. He said all of the "proportional responses" Obama is likely reviewing now, such as putting the regime back on the terrorism-sponsors list, are likely to fail in terms of the overall goal of deterring

North Korean belligerence.

...The environment may not be ripe for engagement, but that doesn't mean the Obama administration should just sit on its hands and respond piecemeal to each individual provocation, Wit said. It needs a new comprehensive policy to deal with the security threat from North Korea. Albright and Wit said the administration should come up with terms for a resumption of dialogue that the North Koreans and the US can both accept. US officials have said repeatedly they are open to talks, but they are demanding several preconditions that Pyongyang has repeatedly rejected.

... "We have this reactive approach and it's ad hoc," Wit added. "The North Koreans aren't taking us seriously. They feel they are in the driver's seat here. It's wrong to assume they are taking these steps like this Sony hack out of weakness. They are taking these steps because they feel there's nothing we can do to them." And this raises an uncomfortable question for the White House. Why does a targeted cyber-hack draw a tougher response from Obama than the amassing of a

small nuclear arsenal? The message it sends to Pyongyang is that they can threaten their entire region with nuclear weapons, just so long as they don't touch Hollywood.

Source: *The Japan Times*, 26 December 2014.

**OPINION – Muhammad Sahimi**

**US Iran Hawks Try to Sabotage Nuclear Deal**

As the prospects of a comprehensive nuclear agreement between Iran and the P5+1 brightens, Washington's hawks seem to have gone into panic mode. They do not seem to want any agreement unless Iran says "uncle," gives up its sovereignty and national rights within the NPT, and completely dismantles its nuclear infrastructure. They're asking Iran to capitulate, not to negotiate. That's an unrealistic goal—and in their dogged pursuit of it, they have overlooked serious steps Tehran's taken that demonstrate a desire for compromise.

We see this unfortunate dynamic in an article in December 2014 by Mark Dubowitz, Executive Director of the Foundation for Defense of Democracies, published in the *National Interest*. Dubowitz's main premise is that it was the economic sanctions imposed by the United States and its allies that brought Iran to the negotiation table, and only more economic sanctions will induce it to surrender. The premise is false. While the sanctions did play a role, they were not the most important reason, or even one of the primary ones. Iran is negotiating because that is what it has wanted—contrary to Dubowitz's assertion that "Iran does not appear to be ready to compromise."

President Hassan Rouhani, Foreign Minister Mohammad Javad Zarif, and their diplomatic team have always been interested in a compromise.

Between February 2003 and August 2005, Rouhani was Iran's chief nuclear negotiator under former president Mohammad Khatami. Zarif was the senior diplomat taking part in the negotiations between Iran and three European Union powers, Britain, France and Germany (the EU3). At that time, Iran proposed to limit the number of its centrifuges to three thousand, put Iran's nuclear program under strict inspections by the IAEA, and impose other limitations. In return, Iran asked only for security guarantees by the United States and the EU3. The proposal was rejected by the George W. Bush administration and the EU3.

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Earlier, in May 2003, the Khatami administration had proposed a comprehensive plan for addressing all the major issues between Iran and the US, including strict limits on Iran's nuclear program. But, that proposal too was rejected by the Bush-Cheney team that was still drunk on "mission accomplished" nonsense, and less than a year prior had been crowing that "real men go to Tehran." The opportunity slipped away.

Since Rouhani and his team have long been interested in a compromise, it's no surprise that they're seeking one again. But the facts on the ground have changed since 2003. So have Iran's conditions for a compromise. Whereas Iran did not have a single centrifuge operating in 2003-2005, it now has nearly ten thousand centrifuges spinning and producing low-enriched uranium, with another ten thousand centrifuges waiting to be started. The Rouhani administration will not go back to its 2003 proposal. In fact, even if President Rouhani did want the same deal, Tehran's hardliners would immediately impeach him. But Iran has stated repeatedly that it could live with an agreement whereby Iran's current operating centrifuges will continue to work, but no new centrifuges will be installed for the duration of the agreement. Iran's desire for a deal is genuine.



Dubowitz also suggests that the US has made all sorts of concessions to Iran, that even “the goalposts [of a final deal] appear to be moving,” while Iran has held fast. This is completely false. In fact, Iran has made five major concessions. One is agreeing to limit the number of its centrifuges for the duration of the comprehensive agreement. By doing so, Iran has temporarily given up its rights under the NPT....

The second concession is about Iran’s uranium enrichment facility built under a mountain in Fordow, near the holy city of Qom. It was a thorny issue for a long time. The United States had demanded that Iran dismantle the facility altogether. The facility is, however, suited neither for military purposes nor large-scale industrial use. It was built by Iran to preserve its indigenous enrichment technology in case the larger Natanz enrichment facility was destroyed by bombing—a threat that multiple states have made. Abbas Araghchi, Iran’s deputy foreign minister and a principal nuclear negotiator, has emphasized repeatedly and emphatically, “Iran would not agree to close any of its nuclear facilities.” Iran has agreed to convert the site to a nuclear research facility, representing a major concession.

Iran’s third concession is about the IR-40 heavy water nuclear reactor, under construction in Arak. When completed, it will replace the Tehran Research Reactor (TRR), a forty-seven-year-old reactor that produces medical isotopes for close to one million Iranian patients every year. The US had demanded that Iran convert the IR-40 to a light-water reactor, due to the concerns that the reactor, when it comes online, will produce plutonium that can be used to make nuclear weapons. But Iran refused to go along. Why? Because, first and foremost, all the work on the reactor has been done by Iranian experts and thus the reactor is a source of national pride. Second, Iran has already spent billions of dollars to design and begin constructing the reactor, and the West is not willing to share the cost of the reactor conversion to a light-water one. On its own initiative, Iran has agreed to modify the design of the reactor so that it will produce much smaller amounts of plutonium. Iran has also agreed not to

build any reprocessing facility for separating the plutonium from the rest of the nuclear waste.

The fourth concession is agreeing to stop enriching uranium to 19.75% (commonly referred to as 20% in the Western media, although the seemingly minor difference is actually quite important). In 2009, the IAEA, under pressure from the West, refused to supply Iran with fuel for the TRR, in violation of its obligations. Thus, Iran was forced to begin producing the 19.75 percent uranium that the TRR uses as its fuel. Tehran agreed to stop producing the fuel, however, and has done so.

Iran’s fifth major concession is related to the issue of inspections of Iran’s nuclear facilities by the IAEA. Iran has almost completely lived up to its obligations under its original safeguards agreement with the Agency, signed in 1974. But IAEA Director-General Yukiya Amano ... has insisted that Iran allow many more inspections. The demanded visits include nonnuclear sites, which would be tantamount to implementing the provisions of the Additional Protocol (AP) of the safeguards agreement.

Iran signed the AP in 2003 and, without its parliament ratifying it, implemented it voluntarily until February 2006. Then, Iran set aside the AP after the EU3 reneged on promises made to Iran in the Sa’dabad Declaration of October 2003 and the Paris Agreement of November 2004. But, Iran and the IAEA reached an agreement in November 2013 and another one last May, according to which Iran allows much more frequent and intrusive inspection of its nuclear facilities. Such visits are way beyond Iran’s legal obligations under its safeguards agreement. Since then, the IAEA has repeatedly confirmed that Iran has lived up to most of its obligations under the additional agreement.

Most importantly, Iran recently invited the IAEA to visit the Marivan site in the province of Kordestan in western Iran. In its November 2011 report, the IAEA had alleged that Iran might have carried out experiments with nonnuclear high explosives in Marivan that are used for triggering nuclear reactions. But, the IAEA turned down the invitation, presumably because it is unsure of its own information.

What has the United States given in return for these major concessions by Iran? Very little. It has released a small amount of Iran's own money, frozen in foreign banks as the result of the illegal sanctions. The US has also lifted its (also illegal!) ban on the export of petrochemical products and a few other minor items. As President Obama stated, 95 percent of all the sanctions are still in place.

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In his article Dubowitz also claims that Ayatollah Khamenei "has made it clear that any deal Tehran signs must not cross 'his red lines,' which include increasing Iran's uranium enrichment capacity to nineteen times what it is today." This is a misrepresentation. What Khamenei was referring to was Iran's eventual enrichment capacity in the relatively distant future. This capacity is to be achieved after the expiration of the comprehensive agreement when Iran's nuclear program will be free of limitations.

Dubowitz also states a discredited story. Specifically, he refers to "cheating" by Iran after the November 2013 Geneva Accord was signed. What is the alleged cheating about? The IAEA had reported that Iran "had 'intermittently' been feeding natural uranium gas into a single so-called IR-5 centrifuge at a research facility." IR-5 is a more advanced version of Iran's currently operating centrifuges. David Albright, head of the Institute for Science and International Security in Washington, had interpreted it as "cheating" by Iran. The reality is that the Geneva Accord and its Joint Plan of Action permit Iran to continue its research on more advanced centrifuges. Iran's obligation, which it has lived by, is not installing such centrifuges. After this was pointed out, Albright retreated, declaring that the test was in violation

**The Chinese are set to acquire a reliable, hard-to-destroy sea-based deterrent. A cluster of 12 JL-2 missiles, with a strike range of around 7,350 km, are being mounted on its JIN class of submarines.**

of the "spirit" of the Accord. Who is moving whose goalposts, again?

Washington's hawks risk missing another chance at a sensible nuclear agreement or détente with Iran, one that would dramatically change the dynamics of the turbulent Middle East for the better. Instead, they seem to think they can drive a proud nation to surrender. They've been wrong before—and their latest salvo suggests they don't realize they may be wrong

again.

*Source: Muhammad Sahimi is the editor and publisher of the website, Iran News and Middle East Reports. <http://nationalinterest.org/>, 24 December 2014.*

## NUCLEAR STRATEGY

### CHINA

#### China Readies Sea-Based Nuclear Deterrent Against US

China is set to reinforce its nuclear second-strike capability by mounting on some of its submarines long-range ballistic missiles, which could target the US. So far, China could strike the US only with land-based intercontinental ballistic missiles. But with western advancements in surveillance that could track their location and movements, these weapons had become vulnerable to a US first strike, gravely undermining Beijing's nuclear deterrence.

However, China is on the verge of a course correction, says a report submitted in November 2014 to Congress by the US-China Economic and Security Review Commission. The commission has concluded that the Chinese are set to acquire a reliable, hard-to-destroy sea-based deterrent. A

cluster of 12 JL-2 missiles, with a strike range of around 7,350 km, are being mounted on its JIN class of submarines.

China has three JIN-class nuclear-powered submarines, which began entering service in 2007. Despite their fairly high noise level, their lethality has now multiplied, following the integration of the new missiles, giving China a credible second-strike capability. The JL-2 missiles will have an array of strike options, depending on whether the submarine chooses to fire its weapons close to Chinese shores or from areas deeper in the sea. Alaska will fall within their ambit if the missiles are fired from waters near China. Hawaii can be targeted if these weapons are launched from waters south of Japan. Western continental US and all the 50 US states are endangered if waters west or east of Hawaii are chosen as the launch pads.

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The impending addition of a third dimension of deterrence by China is a vast improvement over the past. The Chinese deterrent had so far depended on the liquid-fuelled DF-5A missiles, which can be fired from fixed silos. However, China's nuclear armoury was beefed up in 2007, when the mobile, solid-fuelled D-31A missiles were inducted into its arsenal. But both these weapons have their limitations.

The DF-5A is vulnerable in its pre-launch phase because it takes a lot of time to fuel its liquid engines, giving ample scope for detection and consequent destruction. The induction of the D-31A was a significant improvement over its predecessor, but with breakthroughs in surveillance, including the arrival of RQ-4 Global Hawk drones, hiding them has become more difficult, notwithstanding their mobility.

China's anxieties are fuelled by the presence of 3,60,000 personnel in the theatre under the US Pacific Command (PACOM). Besides, PACOM has positioned 200 ships, which include five aircraft carrier strike groups, concentrating enormous

capacity to project power in the region, with China and North Korea as the prime concerns. Nearly 60 per cent of US forces will deploy under the PACOM's wings, as the "Asia Pivot" unfolds.

...The Chinese have also invested heavily in the CJ-10 LACMs, capable of striking US forces in South Korea and Japan. But the Americans can still block the sea lanes radiating towards the Strait of Malacca, which are China's economic and energy lifelines. Consequently, the Chinese, under President Xi Jinping, are relentlessly pursuing the development of the Silk Road Economic Belt — a land corridor that would establish trade linkages with Europe — to lessen dependence on the more vulnerable sea routes....

*Source: The Hindu, 26 December 2014.*

## **INDIA**

### **India's First Nuclear Submarine Heads for Sea Trials**

Over 40 years after India began its hunt for nuclear submarines, the 6,000-tonne INS Arihant quietly sailed out of the harbour at Visakhapatnam on a misty morning to begin its extensive sea trials. While it was "a baby step" towards making the country's first indigenous nuclear submarine fully-operational, given that INS Arihant will now first undergo a whole host of surface sorties and then "dived" ones with test-firing of its ballistic missiles over the next 18 months, it did mark a significant milestone towards building a long-awaited credible nuclear weapons triad.

India has the Agni ballistic missiles and fighters jury-rigged to deliver nukes but the triad's underwater leg has remained elusive so far. It will be in place only once INS Arihant followed by its two under-construction sister submarines - one christened INS Aridhman and the other just S-4 at present - are ready to undertake "deterrent patrols" by prowling underwater for months at end ready to let loose their missiles if required.

The launch of INS Arihant's sea-acceptance trials (SATs), which were flagged off by defence minister Manohar Parrikar and Navy chief Admiral Robin Dhowan, comes a day after TOI reported the submarine was all set for them with its 83 MW pressurized light-water reactor attaining 100% power and the completion of its long-drawn harbour-acceptance trials (HATs).

The real test during the SATs will be the test-firing of its K-15 SLBMs, which has so far been tested only from submersible pontoons around a dozen times. The 750-km range K-15 - INS Arihant can carry 12 in its four silos — is dwarfed by the well over 5,000-km SLBMs present with the US, Russia and China. But an over 2,000-km range K-4 SLBM, tested for the first time in March this year, is also in the works.

The criticality of SLBMs for deterrence can be gauged from the fact that even the US and Russia are ensuring that almost two-thirds of the strategic warheads they eventually retain under strategic arms reduction agreements are such missiles. Already armed with five nuclear and 51 conventional submarines, China too is now on course to induct five JIN-class SSBNs (nuclear-powered submarines armed with long-range ballistic missiles) with 7,400-km range JL-2 missiles.

The Indian Navy, in turn, wants at least three SSBNs and six SSNs in the long-term. It currently operates one SSN in the shape of INS Chakra, obtained on a 10-year lease for Russia for around \$1 billion, while negotiations are underway to acquire another such boat. While these submarines have short-range cruise missiles, they are not armed with nuclear missiles because of international treaties like the MTCR.

Source: Rajat Pandit, *The Times of India*, 15 December 2014.

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**The adoption of the RS-24 ICBM with multiple re-entry warheads has increased the combat capabilities of the Strategic Missile Forces assault group to overcome missile defense systems, thus strengthening the nuclear deterrent of Russian strategic nuclear forces," Col. Yegorov said. The RS-24 carries up to ten independently targetable warheads.**

## BALLISTIC MISSILE DEFENCE

### RUSSIA

#### Russia Tests 10-Warhead Ballistic Missile

Russian Defense Ministry announced the successful test of the RS-24 "Yars" ballistic missile on 26 December 2014. "Test warheads hit their targets in the Kura testing range on the Kamchatka peninsula with pinpoint accuracy," said Col. Igor Yegorov a spokesman for the ministry. The missile was launched at 11:02 Moscow time Yegorov said.

"The adoption of the RS-24 ICBM with multiple re-entry warheads has increased the combat capabilities of the Strategic Missile Forces assault group to overcome missile defense systems, thus strengthening the nuclear deterrent of Russian strategic nuclear forces," Col. Yegorov said. The RS-24 carries up to ten independently targetable warheads. Russia's strategic nuclear forces are actively rearming with the new RS-24 "Yars" missile, which replaces two older models that have been in use for more than 50 years. The ballistic missile uses solid fuel and has a range of 7,500 miles. It can be launched either from a silo or from a road-mobile launcher.

Source: <http://www.worldbulletin.net/>, 26 December 2014.

### USA

#### US Scrambles to Test Anti-Intercontinental Ballistic Missile

The US will conduct testing of its anti-intercontinental ballistic missile system, or ICBM, in 2015. The US is very much capable of warding intercontinental ballistic missile fired by potential enemies, but the state desires more capability and more capacity, Missile Defence Army Vice Admiral

James Syring said in his keynote speech at the Center for Strategic International Studies.

The ICBM tests shall challenge accuracy and capability of the US Ground-Based Midcourse Defense system. The US will also conduct a series of seven-missile testing from 2014 up until 2024 and will finish installation of 14 ground-based interceptors by 2015. Once completed, there will be 44 US GBIs capable of intercepting missile attacks from adversaries.

In a separate announcement, the US Army will be set afloat a 250-foot blimp-like aerostat vehicle at an elevation of 10,000 feet, subject to a three-year evaluation period. The aerostat is equipped with the JLENS, capable of tracking cruise missile threats launched by potential enemies. The detection capability of JLENS covers a vast distance, an area comparable to upstate New York to the south of Norfolk, Virginia, when taken into perspective.

The aerostat will be strategic in monitoring the vicinity of the area it is protecting as compared to ground-based radar systems. A system afloat as high as the aerostat will be more strategic to detect all possible threats, the US Army said in its announcement.

Furthermore, setting the aerostat afloat for 30 days will be more cost efficient than deploying a manned E-3 Sentry with the Airborne Warning and Control System or the E-2 Hawkeye with an airborne warning system, commander of the 263rd Army Air and Missile Defense Command Major General Glenn Bramhall told press.

JLENS aerostats will specifically monitor cruise missiles and strobe lights, immediately notifying US aircrafts of the location which the threat is coming from. The efficiency of the aerostat provides army personnel the advantage of earlier enemy detection, giving them an ample time to strategize their defence....

Source: Athena Yenko, <http://au.ibtimes.com/vv>, 18 December 2014.

**NUCLEAR ENERGY**

**INDIA**

**Nuclear Energy Sector Saw Some Steady Progress in 2014**

From ratifying the additional protocols of the IAEA to signing of the nuke deal with Australia and agreements for building units 3 and 4 for Kudankulam Nuclear Power Plant (KKNPP) with Russia, the nuclear energy sector saw steady progress in 2014. However, unlike 2013 which saw commencing of commercial operation of the KKNPP unit 1, there wasn't much in terms of actual energy generation from the new plants. India ratified the Additional Protocol of the IAEA, a mandatory action under the Indo-US nuclear cooperation agreement, which enabled the international nuclear energy watchdog to have better access of India's civilian nuclear facilities. The move will also make India's bid for securing membership of the NSG stronger.

According to experts, the Indian uranium reserves are not only of low quality but are unable to quench the thirst of power reactors, thus impacting the nuclear energy production. In 2014, India and Australia signed a nuclear cooperation agreement. The deal will also help in procuring uranium for power reactors, which have been running with low capacity due to the lack of fuel.

Similarly, India and Russia sign the agreement to construct unit 3 and 4 for the KKNPP in Tamil Nadu, sorting out the contentious issue of liability. However, there were lows in the atomic energy sector as India could not clinch the nuke deal during PM Modi's visit to Japan. Had the deal been struck, India would have been in a position to import equipment required for nuclear power reactors, built with foreign collaboration.

There has also been little progress on the Jaitapur Nuclear Power Plant (JNPP), which is to come with

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French collaboration. The 9900 MW Jaitapur plant (1650 MW x 6) is to be build with Areva's EPR technology on the coastal village in Ratnagiri district in Maharashtra. The NPCIL and Areva are still in discussion over the techno-commercial aspects.

A year after signing the agreement for conducting feasibility study for the Chaya Mithi Virdhi project, a nuclear plant which to come up with American company Westinghouse Co in Gujarat, there has not been much progress. During Modi's visit to the US this year (2014), both the countries set up a contact group to advance the implementation of Indo-US nuclear cooperation agreement.

In terms of energy production, unit 2 of KKNPP has still not started generating power. This is more than a year after the unit 1 was connected to the southern grid in October (2013). Even the unit 1 of the KKNPP was down due to technical glitches in the turbine and became operational early Dec 2014. Despite these lows, unit 5 of the Rajasthan Atomic Power Station (RAPS) created a record after it become the second longest running reactor in the world by being in operation for 765 days continuously.

Source:<http://articles.economictimes.indiatimes.com>, 25 December 2014.

### India Tables Nuclear Power Insurance Plan, Hoping to Attract US Firms

India is offering to set up an insurance pool to indemnify global nuclear suppliers against liability in the case of a nuclear accident, in a bid to unblock billions of dollars in trade held up by concerns over exposure to risk. PM Modi's government is hoping the plan will be enough to

convince major US companies such as GE to enter the Indian market ahead of President Barack Obama's visit at the end of January 2015.

Under a 2010 nuclear liability law, nuclear equipment suppliers are liable for damages from an accident, which companies say is a sharp deviation from international norms that put the onus on the operator to maintain safety. From the

1950s, when the US was the only exporter of nuclear reactors, liability has been channeled to plant operators across the world. India's national law grew out of the 1984 Bhopal gas disaster, the world's deadliest industrial accident, at a factory owned by US multinational Union Carbide Corp. which Indian families are still pursuing for compensation.

The law effectively shut out Western companies from a huge market, as energy-starved India seeks to ramp up nuclear power generation by 13 times, and also strained US-Indian relations since they reached a deal on

nuclear cooperation in 2008. GE-Hitachi, an alliance between the US and Japanese firms, Toshiba's Westinghouse Electric Company and France's Areva received a green light to build two reactors each. They have yet to begin construction several years later, according to India's DAE.

Even Indian suppliers refused to sell equipment until the law is amended or they can be sure they are indemnified against any liabilities. "We are working fast to address the concerns of suppliers. We are working on a solution with the insurance companies," R.K. Sinha, Chairman of India's Atomic

Energy Commission, told Reuters.

State-run reinsurer GIC Re is preparing a proposal to build a "nuclear insurance pool" that would indemnify the third-party suppliers against

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**State-run reinsurer GIC Re is preparing a proposal to build a "nuclear insurance pool" that would indemnify the third-party suppliers against liabilities they would face in the case of an accident. Under the plan, insurance would be bought by the companies contracted to build the nuclear reactors who would then recoup the cost by charging more for their services.**

liabilities they would face in the case of an accident. Under the plan, insurance would be bought by the companies contracted to build the nuclear reactors who would then recoup the cost by charging more for their services. Alternatively, state-run operator NPCIL would take out insurance on behalf of these companies.

Sinha said New Delhi believed the insurance plan was the best option given how tricky changing the law would prove, and that the proposal should be ready within the next two months. Details of the plan have yet to be thrashed out, and Sinha said the government was considering how it would better capitalize NPCIL.

...GE declined to comment on the Indian proposal to offer insurance cover. Westinghouse said it needed more information before it could comment. Areva said in a statement that the creation of an insurance pool was an "encouraging signal," and that the government appeared committed to working out a comprehensive solution soon.

However, India's nuclear liability regime remained open to interpretation and an Areva spokeswoman said the company needed more clarification to make the legal framework acceptable. One Indian company said it was ready to return to the 2,800 megawatt Gorakhpur nuclear power project in the northern state of Haryana it abandoned, once the insurance cover is in place.

The insurance scheme would convince Walchandnagar Industries Ltd, which makes heat exchangers for reactors, to restart supplying equipment for Gorakhpur, managing director and CEO G.K. Pillai told Reuters. Moves to win over the Americans coincide with Russia's push to build more nuclear reactors in India. ...[The] US and Indian nuclear affairs officials, as well as representatives from the NPCIL Ltd, Westinghouse and GE-Hitachi met to advance implementation of the nuclear deal, an Indian foreign ministry official

said.... Creating the insurance scheme to help projects get off the ground is GIC's "top priority," chairman Ashok Kumar Roy said in an email, although he cautioned that the timing, coverage and level of participation were yet to be finalized.

Source: <http://www.japantimes.co.jp/>, 22 December 2014.

### **India to Complete Process of Placing Nuclear Power Reactors under IAEA Safeguards**

Paving the way for having imported fuel for its nuclear power reactors, India will complete the process of placing its civilian reactors under IAEA safeguards [before the end of 2014]. Sources said the last lot of the two reactors - units 1 and 2 of the Narora Atomic Power Station in Bulandshahar in Uttar Pradesh - will go under safeguards of the IAEA in the next two days [29-30 Dec 2014] and necessary paper work is under process.

Until now 20 facilities have gone under IAEA safeguards.

This includes unit 1 and 2 of

Tarapur Atomic Power Station (TAPS), units 1 to 6 of Rajasthan Atomic Power Station, units 1 and 2 of Kudankulam Nuclear Power Plant, units and units 1 and 2 of Kakrapar Atomic Power Station. These reactors are eligible for using imported uranium India is procuring from different countries.

Apart from it, Nuclear Material Store, Away from Reactor (AFR) Fuel Storage Facility, both at Tarapur, Uranium Oxide Plant, Ceramic Fuel Fabrication Plant, Enriched Uranium Fuel, Enriched Uranium Oxide Plant, Enriched Fuel Fabrication Plant and the Gadolinia Facility - all the Nuclear Fuel Complex in Hyderabad - have been placed under the IAEA safeguards. The new reactors, which will come up with the help of foreign collaboration, will automatically be placed under the IAEA regards safeguards.

**Until now 20 facilities have gone under IAEA safeguards. This includes unit 1 and 2 of Tarapur Atomic Power Station (TAPS), units 1 to 6 of Rajasthan Atomic Power Station, units 1 and 2 of Kudankulam Nuclear Power Plant, units and units 1 and 2 of Kakrapar Atomic Power Station. These reactors are eligible for using imported uranium India is procuring from different countries.**

Unit 1 of the two PHWR - each with a capacity of 220 MW- was commissioned in January 1 while the second unit was commissioned in July 1992. Indian power reactors have been running below the capacity "due to the mismatch of power and supply demand of uranium". The two reactors, which have been running below their capacity, will get much needed fuel. ...

Source: *The Economic Times*, 28 December 2014.

## **PAKISTAN**

### **SHC Allows Karachi Nuclear Plants to Start Construction**

The Sindh High Court (SHC) on disposed off the petition against the construction of two nuclear power plants in Karachi, passing the order that the Pakistan Atomic Energy Commission (PAEC) can now begin work on the projects. The Sindh Environmental Protection Agency (SEPA) has also been directed by the court to review the revised Environmental Impact Assessment (EIA) as per the 2014 regulations preferably within 90 days

In the meantime, the PAEC has been allowed to commence work on the project to the extent already allowed by the Pakistan Nuclear Regulatory Authority (PNRA). PAEC counsel Anwar Mansoor Khan continued presenting his case laying down facts about the legitimacy of the projects and that they adhered to the environmental laws of the country. The court finally decided to allow construction of the two plants and also ordered that the petition be disposed off. The construction of the two plants is expected to begin soon. ...

... The bench headed by Chief Justice Maqbool Baqar and comprising Justice Shahnawaz Tariq was judging the petition filed by Sharmeen Obaid-Chinoy, Dr Pervez Amirali Hoodbhoy, Dr AH Nayyar and Arif Belgaumi. The petitioners had challenged the EIA report of the SEPA, which had given the green signal for the construction of the two plants.

The respondents included the PAEC, PNRA, SEPA, Pakistan Environmental Protection Agency (PEPA) and the environment and alternative energy department of Sindh. The petitioners claimed that the two power plants, K-2 and K-3 were not in compliance with the rules. On the other hand, the PAEC maintained that the project was duly approved by the respective authorities.

Source: <http://www.dailytimes.com.pk/>, 23 December 2014.

### **Dar Briefed on K2, K3 Nuclear Energy Projects**

SPD Director General Lieutenant General Zubair Mahmood Hayat called on Federal Minister for Finance Ishaq Dar and briefed him about the financing mechanism of K2 and K3 nuclear energy projects. Secretary Economic Affairs Division (EAD) Nargis Sethi and DG SPD gave a joint briefing to the minister about the status of the project and what is the future plan to take this project ahead.

The aforementioned energy projects will be a part of Pak-China Energy Corridor and will be jointly financed by China (EXIM Bank) and Pakistan in a ratio 82 and 18 percent respectively. Gen Hayat told the minister that the project when completed would be the cheapest source of energy. This project will help a long way in overcoming the energy crunch which is experienced now by the country, he added. It was also briefed to the minister that the project would use very secure and highly efficient third generation equipment to make cheapest electricity.

The minister appreciating the efforts of EAD and Pakistan Atomic Energy Commission (PAEC) in making a plan for this project said that the PML-N government would take the country where the rest of the developed world stands now. ...The minister directed that another meeting should be held on the same projects next week in which all the relevant stakeholders from EAD, Finance, SPD and PAEC should be invited to make presentations

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of the project details and what steps are to be taken by the government to help make this project a reality.

Source: <http://www.pakistantoday.com.pk/>, 28 December 2014.

## **TURKEY**

### **Nuclear Plant Construction to Begin March 2015**

Cooperation between Turkey and Russia for the construction of the first nuclear power plant is ongoing and work on the Akkuyu site in Turkey's Mersin Province is expected to start early next year. ... The two governments signed a cooperation agreement in May 2010 for the construction and operation of the nuclear power plant at an estimated cost of \$20 billion. The plant will have a total producing capacity of about 35 billion kilowatt-hours per annum.

After a meeting with Sergei Kirienko, the head of Russia's nuclear corporation Rosatom, Yildiz said some problems exist but the project will be implemented as planned. He said the outcome of the meeting was positive and developments will be closely monitored. Turkey's Energy Minister gave its green light to the project on 01 Dec 2014 and the Rosatom also announced on the same day that construction could begin by March 2015. Ankara wants to build two other nuclear plants. One will be in partnership with Japan and France before finally building the other on its own. ...

Source: <http://me-confidential.com>, 11 December 2014.

## **USA**

### **With US Nuclear in Decline, Scientists and Analysts Urge Support for Next-Generation Technologies**

The global nuclear industry is in steady decline. Since hitting a peak in 1996 at nearly 18 percent of global energy production, the industry's share has dropped down to less than 11 percent. Even

with countries like China and India looking to boost their low-carbon energy supplies with nuclear, project developers around the world have faced long delays, cost overruns, and strong competition from natural gas and distributed resources, as well as policies designed to phase nuclear out entirely.

America is facing its own imminent decline in nuclear generation. With a wave of aging plants slated for closure in the coming years and almost no plans to replace them, some worry that the country will reverse the recent decline in emissions, potentially even hurting a long-term global deal to reduce carbon pollution.

**America is facing its own imminent decline in nuclear generation. With a wave of aging plants slated for closure in the coming years and almost no plans to replace them, some worry that the country will reverse the recent decline in emissions, potentially even hurting a long-term global deal to reduce carbon pollution.**

Nuclear currently makes up 19 percent of the country's generation. If enough plants end up retiring all at once, the government warns that emissions could climb by 4 percent per year. (The actual change will also depend on how many coal plants are retired, how much natural gas is consumed, and how quickly renewables ramp.)

Worried about how the deterioration of America's nuclear fleet will impact climate goals, a group of scientists and energy analysts urged a rethinking of US nuclear policy. The separate calls, all made within days of each other, came from a leading Washington-based think tank, 73 conservation scientists and the International Energy Agency (IEA).

...A comprehensive federal plan, says IEA, is the only way to keep the industry relevant. Low natural gas and wind prices are challenging the economics of nuclear plants in the US forcing some plant operators to consider retiring older plants ahead of schedule. "The domestic nuclear industry is therefore at a critical juncture as a consequence of its declining economic competitiveness, and existing market mechanisms do not favor investment in high capital-intensive nuclear technology," concluded the IEA. Articulating that strategy will not be easy.

On a levelized-cost-of energy basis (an admittedly limited metric), distributed renewables are competing with nuclear plants, adding to the pain inflicted by low natural gas prices. Both free-market advocates and renewable energy proponents say new nuclear shouldn't be built if it can't compete in today's market.

Cost overruns are also hurting the industry's image. The first US nuclear project to be built in 30 years, the Vogtle power plant in Georgia, is now \$1.5 billion over budget and getting more expensive. Angry about rate increases caused by Vogtle, the Green Tea Party and environmental groups were able to force Georgia Power to support half a gigawatt of new solar in the state — much of it procured for 6.5 cents per kilowatt-hour.

Source: Stephen Lacey, Senior Editor at Greentech Media. <http://www.greentechmedia.com/>, 19 December 2014.

## URANIUM PRODUCTION

### ASIA

#### Uranium Rallies as Asia Warms to Nuclear Energy

Uranium prices are defying the broad commodities selloff that has battered oil and gas as Asia's biggest economies increase their reliance on nuclear energy and move away from coal-fired plants. Uranium has jumped 35% since May 2014, and the market got a further boost after Japan moved closer to restarting its nuclear reactors, which were all idled following the Fukushima Daiichi power-plant disaster in 2011. Also spearheading demand is a Chinese plan to build nuclear-

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power plants to combat smog by relying less on coal.

The uranium rally marks a sharp turnaround from May 2014, when prices slumped to about \$28 a pound—their lowest level in nine years. Prices have since rebounded to about \$38 a pound, just off their peak for the year in November 2014, but still about half of where they were in early 2011, before the Fukushima accident. Three reactors melted down following an earthquake and tidal wave.

...Growing use of nuclear power in China, India and Japan is sending the price of Uranium surging as demand grows for the radioactive fuel. John Borshoff, Chief Executive Officer of Paladin Energy Limited, a uranium miner, speaks with the WSJ's Jake Lee. Demand from Japan ground to a halt after the accident. Investors worried that Japan would sell large amounts of the fuel.

...The rally in uranium has also been fueled partly by fear of tougher Western sanctions against Moscow. Russia produces only 5% of the world's uranium but is a leading provider of enrichment services to many Western utility companies. The market for uranium is small and illiquid compared with those for other energy commodities, though uranium futures are traded by specialized intermediaries, utilities and miners. Investors can also get exposure to uranium through shares of uranium companies or the Global X Uranium exchange-traded fund, which invests in a basket of uranium-related shares. Another option is Canada-listed Uranium Participation Corp., which buys and stores different types of uranium.

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Despite the recent gains, the price of uranium isn't considered strong enough to boost output from

existing mines. "The near-term outlook for uranium is mixed, with production costs higher than selling prices—an unsustainable condition," said Rick Rule, the San Diego-based founder of Sprott Global Resources Investments, a subsidiary of Sprott Inc., an asset manager.

...Alexander Molyneux, chairman of Azarga Resources Ltd., a private uranium-development company that has invested in six uranium deposits including in the US, Turkey and Kyrgyzstan, estimates only a price of around \$70 a pound will make uranium mines sustainable. "At the current price of around \$38 per pound, the mining industry will continue to cut production," he said. The total amount of uranium traded this year is about 180 million pounds, equivalent to \$6.8 billion at current prices, according to Mr. Molyneux. The amount is expected to increase to between 230 million pounds and 250 million pounds by 2020. ...Currently, nuclear energy accounts for 2% of China's power mix, but the proportion is expected to increase to around 3%-4% by 2020, says Ray Tay, a senior analyst with Moody's Investors Service....

Source: *Biman Mukherji, Rhiannon Hoyle and Mari Iwata contributed to this article. <http://www.wsj.com/>, 18 December 2014.*

## **INDIA**

### **Decline in India's Uranium Production**

At a time when India is trying to ramp up its uranium import, its own domestic production of the yellow cake has declined by 10-15 per cent after operations in the country's oldest and richest uranium mine in Jaduguda in Jharkhand has been stopped by the state government. DAE sources said it has taken steps to increase the production from other mines to maintain the supply and

demand, but the low quality of ore from other mines have led to increase in the production cost.

...Jaduguda uranium mine, the deepest operating underground mine of the country, is in uninterrupted operation since 1968. It has a depth of nearly 3000 feet, one of the deepest in the country. Of its daily production of 5000 tonnes, UCIL mined 700 tonnes of ore from Jaduguda mine.

**The near-term outlook for uranium is mixed, with production costs higher than selling prices — an unsustainable condition.**

**The total amount of uranium traded this year is about 180 million pounds, equivalent to \$6.8 billion at current prices, according to Mr. Molyneux. The amount is expected to increase to between 230 million pounds and 250 million pounds by 2020.**

Although, UCIL has other mines in Bhatin, Narwapahar, Bagjata, Turamdih, Bandhuhurang, Mohuldih in Jharkhand and Tummalapalle in Andhra Pradesh, ore from Jaduguda has high content of uranium. On a stretch of 60 kms, there are six mines in and around Jaduguda of which five are underground. ... "The mines at Narwapahar and Bagjata have ore, but it is 15-20 per cent less rich than Jaduguda," he added. According to a report by IAEA, UCIL mines 1500 tonnes of ore everyday from the Narwapahar mine and 500 tonnes from Bagjata.

The Jharkhand government stopped mining of uranium from Jaduguda since 06 September 2014 this year as UCIL's lease got over. It had been renewed twice before. UCIL stopped mining activities following a state government directive which was taken in

light of recent amendments in the Mineral Concession Rules - 1960, forbidding mining under deemed extension. ...

Source: <http://articles.economictimes.indiatimes.com/>, 21 December 2014.

## **NUCLEAR COOPERATION**

### **CHINA-KAZAKHSTAN**

#### **Kazakhstan and China Agree to Cooperation in Nuclear Power**

Kazatomprom and China General Nuclear Power Corporation (CGNPC) on 14 December 2014

signed an agreement on "extensive and more intensive mutual cooperation" in nuclear power. The agreement was signed during a meeting of the Kazakh-Chinese Business Council by Kazatomprom CEO Nurlan Kapparov and CGNPC general manager Zhang Shanming. "The agreement makes provisions for the development of strategic cooperation in the fields of uranium resources development, nuclear fuel production, peaceful uses of nuclear power, and transiting of uranium products through China and Kazakhstan," Kazatomprom said.

The accord also foresees establishment of a joint venture for the production of fuel assemblies in Kazakhstan for the needs of Chinese nuclear power plants. Fuel assembly manufacturing output is expected to reach 200 tonnes "expressed as enriched uranium", with further expansion of production for third countries. ...

*Source: World Nuclear News, 15 December 2014.*

#### **CHINA-CZECH REPUBLIC**

##### **China Ready to Boost Czech Nuclear Power Development**

China is ready to help the Czech Republic to develop its nuclear industry and expand its power stations.... The Czech Republic is working on a long-term energy strategy that is expected to count heavily on nuclear power even after the official cancellation of the planned expansion of a nuclear power plant in the south of the country. ... China said it would create a new investment fund of \$3 billion (2.4 billion euros) targeting central and eastern Europe." ... Czech Industry Minister Jan Mladek said in October 2014 that China had shown interest in building nuclear reactors in the Czech Republic, which is looking to expand its two nuclear power plants owned by majority state-owned utility CEZ....

*Source: <http://af.reuters.com/>, 17 December 2014.*

**The agreement makes provisions for the development of strategic cooperation in the fields of uranium resources development, nuclear fuel production, peaceful uses of nuclear power, and transiting of uranium products through China and Kazakhstan**

#### **INDIA-SOUTH KOREA**

##### **India, South Korea to Operationalize Nuclear Deal**

With Japan continuing to stall a nuclear deal with India, New Delhi is getting ready to operationalise a three-year-old nuclear pact with South Korea.

The two countries have held their first nuclear talks.

India and Korea signed a nuclear agreement in July 2011 but did not take the next steps to operationalise it. This was partly due to India concentrating its energies on a Japan nuclear agreement, and respecting sensitivities in Japan regarding the Korean Peninsula. ... Korea has worked on its nuclear power sector and

is now the only credible alternative to Japan. In 2010, Korea stunned the nuclear world by bagging a \$20 billion contract to build nuclear reactors in the UAE from under the nose of market leader Areva. Korea has a similar number of reactors as India in the civilian sector, but produces one-third of its electricity. Like India, Korea plans a 59% jump in nuclear power capacity by 2035. Interestingly, Korea is the only other country that has built supplier liability in its nuclear legislation, though their way of working it is very different from India's. ...

*Source: Indrani Bagchi, The Times of India, 01 December 2014.*

#### **INDIA-RUSSIA**

##### **Russia may Set Up 20-24 Nuclear Energy Units in India**

Russia may set up a total of 20-24 nuclear energy units in India against previously agreed 14-

16 plants as both countries are likely to come out with a roadmap for cooperation in the crucial energy sector during Russian President Vladimir Putin's visit to Delhi for annual summit talks in December 2014.

Russian ambassador Alexander Kadakin said both countries are likely to start negotiations for setting

up of unit five and six at the Kudankulam nuclear power complex soon and may sign a technical pact for unit 3 and 4 during Putin's visit. ... Kadakin said trial run for unit 2 of Kudankulam nuclear power should start in March and that technical glitches in unit one are being resolved. "Russia had agreed to help India build 14-16 nuclear units. Now it seems that the demand of India is much bigger and this may rise to 20-24 units," he said.

Asked about escalation of cost in setting up of nuclear power plants, he chose not to link it to clauses in India's nuclear liability laws and only said prices have gone up everywhere. "Cooperation between the two countries in peaceful uses of nuclear energy will prominently figure at the Summit level talks. More than that a very serious and important document is on the anvil which relates to our common vision of joint work in our efforts to satisfy India's requirement in energy through building a series of nuclear plants," the envoy said. He said Russia was also expecting from the Indian side the name of the new site for another "cascade of nuclear power units". ...

Source: *The Times of India*, 08 December 2014.

## **NUCLEAR PROLIFERATION**

### **IRAN**

#### **Iran's Nuclear Issue at Crucial Juncture**

With the extension of the deadline for a comprehensive deal on Iran's nuclear issue, the 12-year-long diplomatic efforts over Iran's controversial nuclear program has come to a historical juncture. In a recent letter to his counterparts of the P5+1 bloc, Iranian Foreign Minister Mohammad-Javad Zarif said Iran is confident that "a comprehensive agreement is imminently within reach."

On Nov 24, 2013, an interim deal, which included initial reciprocal measures to be taken by both sides for a duration of six months, was signed in

Geneva, demanding that Iran suspend some sensitive nuclear activities in exchange for limited sanction relief to boost diplomatic efforts to resolve the issue. Before the six-month deadline, Ali-Akbar Salehi, head of Atomic Energy Organization of Iran, said that Iran planned to drastically reduce plutonium output at the Arak heavy water reactor in a bid to dilute western doubts over the country's controversial nuclear activities.

In July, Iran's Supreme Leader Ayatollah Ali Khamenei said Iran's uranium enrichment capacity was one of the major differences between Iran

and the West. ... Also in July, after months of intense talks, negotiators gave themselves four more months until Nov. 24 to strike a deal to scale down Iran's nuclear activities. In August, Iran said it had started to modify its Arak heavy water reactor and limit its plutonium output. Foreign ministers from Iran and the P5+1 group agreed on Nov. 24 to extend the

deadline of nuclear talks to July 1, 2015, in an attempt to secure the prospect of a deal. On Dec. 17, a fresh round of the nuclear talks was held in Geneva at deputy foreign ministerial level without deals.

A recent report by the IAEA said that Iran was continuing to meet its commitments under the Geneva interim nuclear deal as the country was not enriching uranium above 5 percent, and had not expanded its activities at its enrichment facilities and the Arak heavy water reactor. However, IAEA Director General Yukiya Amano urged Iran last month to fully implement the practical measures agreed upon and cooperate with his organization in a timely manner. "Iran has implemented most of the practical measures agreed under the framework, but not all of them," said Amano, adding that the IAEA cannot conclude that all nuclear materials in Iran are for peaceful purpose.

Despite those doubts and criticism, Iran remains optimistic about the future of the nuclear talks. ...

**Iran was continuing to meet its commitments under the Geneva interim nuclear deal as the country was not enriching uranium above 5 percent, and had not expanded its activities at its enrichment facilities and the Arak heavy water reactor.**

The most important achievement in the talks was the common understanding that negotiations, rather than exertion pressure, are the only way to a final deal, he added....

Source: <http://news.xinhuanet.com>, 30 December 2014.

## NUCLEAR SAFETY

### INDIA

#### Health Hazards in Jaduguda not Linked to Radiation

UCIL started operating the first uranium mine in India at Jaduguda in Jharkhand in 1967. During late 90s, there were media reports that persons residing close to the uranium mines and milling facilities were suffering from adverse health effects including deformities among children and infertility amongst women in the area. Some activists alleged that these were related to radiation.

**The environmental radon and gamma radiation levels around uranium mining and milling complex at Jaduguda are comparable with national and global averages the radioactivity and chemical pollutant levels in surface and ground water are well below the prescribed limits. The radiation dose due to UCIL operations in the region is negligible as compared to natural background radiation.**

The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) which publishes exhaustive reports on the health effects of radiation periodically has never found that low dose of radiation can cause such symptoms. Do the operations of the UCIL cause spread of radioactive contamination in surrounding areas? Miners access the ore body which is divided into vertical spans of nearly 65-metre depth. They drill holes into the ore body, place explosives in them and blast the ore face. They take the broken ore from all sections to an underground crushing station. A conveyer belt carries the ore to the mill for further processing. After extracting uranium by a standard ion exchange process, UCIL separates the tailings into coarse grains and fines in a hydrocyclone; the former (about 50% of tailings) goes back to the mine for filling the voids and the fines are sent to the Tailings Ponds.

An Environmental Survey Laboratory set up in Jaduguda by BARC has been surveying the environment since 1965; the lab regularly collects samples of mine and mill effluents, surface water samples of streams starting from tailings pond discharge to several kilometers downstream, ground water samples from wells and tube wells near the facilities, samples of soil, grass, vegetables and other food stuffs and aquatic organisms for analysis.

The lab also measures gamma radiation and environmental radon levels near the tailings ponds and other locations around the complex and natural gamma radiation levels up to about 25 km using state-of-the-art methods. In an exhaustive report titled "Environmental and in Plant Monitoring at and around Jaduguda Mining and Milling Complex during 1995-2004", AH Khan and his colleagues concluded thus: "The environmental radon and gamma radiation levels around uranium mining and milling

complex at Jaduguda are comparable with national and global averages.

The radioactivity and chemical pollutant levels in surface and ground water are well below the prescribed limits. The radiation dose due to UCIL operations in the region is negligible as compared to natural background radiation". "Radiation at such low level are not expected to have any discernible health impacts in the public domain as well as to the occupational workers", the report added.

In 2002, in a report titled "Mining and Milling of Uranium Ore by UCIL at Jaduguda and its Radiological Impact on the Environment", Dr K C Pillai, formerly Head of the Health Physics Division, BARC clarified thus: "Beyond the fenced area around the Tailings Pond, there is no

additional external exposure to persons living in the villages. The additional exposure to the population living close by could only be of the order of 0.05mSv per year from radon arising from UCIL operations. (Sv is a unit for biologically significant radiation dose; an mSv is one thousandth of a Sv; skin dose in a chest x-ray examination is about 0.1 mSv)

The intake of water from the Gara river and food items from the area contributes nearly 0.1 mSv per annum. The annual exposure to the individual members of the population in these villages is estimated to be 1.72 -3.14 mSv with a mean of 2.49 mSv per annum". The report noted that 65% of the world population receives an annual dose of 1-3 mSv per annum. This arises from natural background radiation present everywhere. In Radiation Protection dosimetry (2010) journal, Dr R M Tripathi and others from BARC estimated that the radiation dose to members of the public residing around uranium mining complex, Jaduguda are very low.

Responding to the claims of adverse health effects, the DAE organized several health surveys. In a major health survey, medical teams examined over 3000 inhabitants from nearby villages and short listed several cases for further review by specialists. After reviewing the instances, the specialist team concluded thus: "The consensus of all the doctors was that the cases examined had congenital limb anomalies, diseases due to genetic abnormalities like Thalassemia Major and Retinitis Pigmentosa, moderate to gross Splenomegaly due to chronic malarial infection (as this is a hyperendemic area), malnutrition, post encephalitic and post head injury sequel. The team was convinced and unanimously agreed that the diseases pattern cannot be ascribed to radiation xposure in any of these cases".

Twenty-six specialists including physicians, scientists and academic staff, many of them from outside the DAE carried out three separate health surveys in Jaduguda. They concluded that the alleged health effects are not caused by radiation. One medical team noted that the problems they have, can be seen in any village in India with similar socio-economic parameters/conditions.

Dr. B L Wadehra filed a petition (188/1999) in the Supreme Court of India, claiming that those living in the villages around the Jaduguda uranium mine suffer from "cancer, tuberculosis, impotency, physical deformities and constant fevers and body pains rendering the whole area unfit for human habitation". He sought judicial intervention. The Hon'ble Supreme Court dismissed the petition as the court did not find any merit in it.

After reviewing the report from DAE, the Ministry of Health and Family Welfare, Government of India expressed the view that that there is no need for any survey by another fact finding team. The claim of radiation related adverse health effects in villages near

Jaduguda due to uranium mining and milling has no scientific basis. This is a settled issue. UCIL must continue to comply with all safety provisions. The nation benefits from mining uranium. Let us not be scared by another report in the next few months!

*Source: KS Parthasarathy, www.pdb.in, 21 December 2014.*

## **SOUTH KOREA**

### **South Korean Nuclear Operator Hacked Amid Cyber-Attack Fears**

South Korea's nuclear plant operator has said its computer systems have been breached, raising fears that hackers, including those with possible North Korean links, could shift their focus to key

**The claim of radiation related adverse health effects in villages near Jaduguda due to uranium mining and milling has no scientific basis. This is a settled issue. UCIL must continue to comply with all safety provisions. The nation benefits from mining uranium. Let us not be scared by another report in the next few months.**

infrastructure. The violation prompted a safety drill on at nuclear plants around the country. The precautionary exercise comes days after the US blamed Pyongyang for hacking Sony Pictures, which led the company to cancel the release of a Hollywood satire about the fictional assassination of the secretive state's leader, Kim Jong-un.

**Officials in the South Korean capital, Seoul, said only noncritical data about nuclear plants had been leaked, adding that they were confident they could fend off any attempt to compromise the safety of the country's atomic facilities.**

...Officials in the South Korean capital, Seoul, said only noncritical data about nuclear plants had been leaked, adding that they were confident they could fend off any attempt to compromise the safety of the country's atomic facilities. "It's our judgment that the control system is designed in such a way – there is no risk whatsoever," Chung Yang-ho, deputy energy minister, said.

...The energy ministry and officials at Korea Hydro and Nuclear Power (KHNP), a nuclear plant operator that is part of the state-run Korea Electric, made no mention of North Korea as a possible suspect. The latest attack resulted in the leak of personal details of 10,000 KHNP workers, designs and manuals for at least two reactors, electricity flow charts and estimates of radiation exposure among local residents. There was no evidence, however, that the nuclear control systems had been hacked.

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"A two-day drill is under way through simulators to ensure the safety of our nuclear power plants under cyber-attacks," a KHNP spokesman said. KHNP operates 23 nuclear reactors that provide almost a third of South Korea's energy needs. ...The vice-minister for energy, Lee Kwan-sup, confirmed the leaked information appeared to be from the Gori and Wolsong plants south-east of Seoul. The government has been handling this case with extreme care, he said, adding that

the leaks posed no safety risk. Nuclear officials also sought to allay security fears. ... The safety drill came soon after Barack Obama said it had been confirmed that North Korea had hacked Sony Pictures, allegedly because Pyongyang was angered by the portrayal of its supreme leader in *The Interview*, starring Seth Rogen

and James Franco. ...

*Source: The Guardian, Justin McCurry in Tokyo and agencies, 23 December 2014.*

## NUCLEAR WASTE MANAGEMENT

### USA

#### Talks to Continue on Burying Tennessee Nuclear Waste in Nevada

Nevada and the federal Energy Department announced they've formalized a panel to study contentious issues including whether radioactive material from a World War II-era plant in Tennessee will be buried at a former nuclear weapons proving ground north of Las Vegas. Gov.

Brian Sandoval and Energy Secretary Ernest Moniz announced that more than a year of negotiations yielded a signed agreement to continue "senior-level" talks by a group of state and federal employees dubbed the Nevada National Security Site Working Group.

Sandoval called the agreement a milestone achievement, and aides said a conversation that began about shipments from

Oak Ridge, Tennessee, broadened into a commitment to address a range of state concerns about what the federal government does at the vast former Nevada Test Site.

...Drozdoff and other Sandoval administration officials said the agreement to keep talking didn't represent a softening of the state's staunch opposition to the Yucca Mountain nuclear waste



repository at the western edge of the former Nevada Test Site. ... A top priority remains resolving a dispute over whether 403 baseball bat-sized canisters of solid radioactive waste should be buried in 40-plus foot trenches and then topped by shipping containers full of uranium-contaminated worker uniforms, machine parts and other waste overtopped by 8 feet of dirt about 65 miles from Las Vegas.

**A top priority remains resolving a dispute over whether 403 baseball bat-sized canisters of solid radioactive waste should be buried in 40-plus foot trenches and then topped by shipping containers full of uranium-contaminated worker uniforms, machine parts and other waste overtopped by 8 feet of dirt about 65 miles from Las Vegas.**

and that the 2,000-mile shipments would be handled by armed guards from the Office of Secure Transport.

Moniz noted in August 2013 that the state doesn't have jurisdiction over the shipments. But the Energy Secretary said his agency was reshaping plans in response to state concerns, including questions about the safety of transporting the waste in and around Las Vegas. The agreement pledges to improve

...The materials, about 100 shipments, have been designated by the Energy Department as low-level radioactive waste. Trucks were ready to roll in mid-2013 when the state balked at the plan, opponents called for a full-scale National Environmental Policy Act review, working group participants began meeting, and the Energy Department began hosting town hall-style public meetings to describe the burial plan. The six-page Sandoval-Moniz agreement, signed, notes that no new full-scale National Environmental Policy Act review will be required,

communication and information about the security site and to "identify areas of improvement and resolve key concerns." ... Key elements include a review "by an independent scientific body" about how radioactive waste is classified, and a promise to provide time to review any proposed changes before they are finalized. It does not identify what body should conduct the review.

*Source: <http://www.lasvegassun.com/>, 23 December 2014.*



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