



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

Vol 09, No. 09, 01 March 2015

**OPINION – Rohan Joshi**

**China, Pakistan, and Nuclear Non-Proliferation**

China's confirmation that it is involved in at least six nuclear power projects in Pakistan underscores long-standing concerns over both the manner in which both China and Pakistan have gone about engaging in nuclear commerce and the lack of transparency around China-Pakistan nuclear cooperation in general. The guidelines of the NSG, a 48-nation body that regulates the export of civilian nuclear technology, prohibit the export of such technology to states, like Pakistan, that have not adopted full-scope IAEA safeguards. Yet over the last decade, China has accelerated nuclear commerce with Pakistan while contending that its actions are in compliance with NSG guidelines, an argument that is not entirely convincing.

Today, China is not only a violator of global nuclear non-proliferation norms, but also presents the most convincing evidence of the non-proliferation regime's ineffectiveness. The pattern of its behavior on the nuclear front as it relates to Pakistan goes well beyond the scope of what may be construed as the state's legitimate ambition to be a leader in the supply of civilian nuclear technology.

Some writers blame the 2005 US-India nuclear agreement as having been a catalyst to China-Pakistan nuclear

**China is not only a violator of global nuclear non-proliferation norms, but also presents the most convincing evidence of the non-proliferation regime's ineffectiveness. The pattern of its behavior on the nuclear front as it relates to Pakistan goes well beyond the scope of what may be construed as the state's legitimate ambition to be a leader in the supply of civilian nuclear technology.**

**CONTENTS**

- ☞ OPINION
- ☞ NUCLEAR STRATEGY
- ☞ BALLISTIC MISSILE DEFENCE
- ☞ NUCLEAR ENERGY
- ☞ NUCLEAR COOPERATION
- ☞ NUCLEAR PROLIFERATION
- ☞ NUCLEAR SAFETY
- ☞ NUCLEAR WASTE MANAGEMENT

cooperation. But this is a false proposition, since China's nuclear relationship with Pakistan, both military and civilian, precedes the US-India nuclear deal by decades. Moreover, while the US-India agreement was aimed at bringing India into the mainstream of nuclear commerce and global nonproliferation efforts, the China-Pakistan relationship is designed to operate effectively outside of the mainstream.

As Ashley Tellis noted in 2010, "...the Bush administration spent considerable energy from October 2005 until the final extraordinary plenary in September 2008 – consulting with its NSG partners during eight meetings over four years...to finally secure the special waiver for India that

exempted it from the constraining condition of full-scope safeguards. The current Sino-Pakistani nuclear transaction could not be more different.”

Pakistan’s own interest in nuclear technology dates back to the 1960s. In March 1965, Pakistan’s then-Foreign Minister Zulfikar Ali Bhutto declared in an interview with the Manchester Guardian that if India were to produce a nuclear weapon, Pakistan “should have to eat grass and get one, or build one of our own.” A few months prior to India’s “Smiling Buddha” nuclear test in 1974, Bhutto met with top Pakistani scientists to begin work on a Pakistani nuclear device, codenamed Project 706. Bhutto enlisted the services of the now-infamous AQ Khan, who stole blueprints for centrifuge technology and contact information of vendors that sold centrifuge components from his employer, a research laboratory in the Netherlands.

...China’s assistance ultimately proved to be pivotal in Pakistan’s pursuit of the nuclear bomb. In 1982, according to AQ Khan, China provided Pakistan 50 kilograms of weapons-grade uranium, enough to make two nuclear bombs, as part of a “broad-ranging, secret nuclear deal” between Mao Zedong and Bhutto. The following year, China reportedly provided Pakistan the complete design for a 25 kt nuclear bomb. A State Department memo at the time concluded that “China has provided assistance to Pakistan’s program to develop a nuclear weapons capability. Over the past several years, China and Pakistan have maintained contacts in the nuclear field...[w]e now believe cooperation has taken place in the area of fissile material production and possibly also nuclear weapons design.”

The US Atomic Energy Act (1954) requires termination of US nuclear exports if countries are determined by the president to be assisting non-nuclear weapons states in acquiring nuclear weapons capabilities. Although successive US administrations were aware of Pakistan and

China’s clandestine nuclear cooperation, they did not sufficiently press either China or Pakistan nor threaten to terminate nuclear commerce with China.

China, for its part, continued to stringently deny any role in providing assistance to the Pakistani nuclear program. At a state dinner in Washington, D.C., Premier Zhao Ziyang declared, “We do not advocate or encourage nuclear proliferation. We do not engage in nuclear proliferation ourselves, nor do we help other countries develop nuclear weapons.” But by 1985, Pakistan’s Kahuta facility, as a result of technical assistance from China, had successfully been able to produce the quantities

of highly-enriched uranium needed to build a nuclear bomb. For the first time since discovering Pakistan’s nuclear ambitions and China’s illegal assistance, the US government refused to certify that Pakistan had not assembled a nuclear device in 1990, which resulted in the suspension of US military and economic aid to Pakistan per the Pressler Amendment.

**US pressure, however, did little to constrain Chinese assistance to Pakistan’s nuclear program, even as China moved toward becoming a signatory to the NPT. In January 1992, barely two months before it acceded to the NPT, China announced the construction of a nuclear power plant in Pakistan.**

US pressure, however, did little to constrain Chinese assistance to Pakistan’s nuclear program, even as China moved toward becoming a signatory to the NPT. In January 1992, barely two months before it acceded to the NPT, China announced the construction of a nuclear power plant in Pakistan. Concerns that Chinese safeguards were not tough enough to prevent a diversion of nuclear resources to Pakistan’s nuclear weapons program resulted in the US issuing a demarche to China.

China’s appetite for proliferation remained undiminished even after it acceded to the NPT. In 1995, it allegedly sold Pakistan 5,000 ring magnets needed for high-speed gas centrifuges, while a US intelligence report in 1997 held that “China was the single most important supplier of equipment and technology for weapons of mass destruction” in the world.

China’s civil nuclear trade commitments with Pakistan have gained considerable momentum

since Pakistan's nuclear tests in May 1998. The China-Pakistan Power Plant Corporation's Chashma-1 and Chashma-2 power reactors, which were under item-specific IAEA safeguards, were held not to be in violation of NSG guidelines as they were pre-existing commitments and thus "grandfathered" in at the time of China's induction into the NSG in 2004. However, China then entered into agreements in 2009 for the construction of two new 340 MW power plants (Chashma-3 and Chashma-4). There have since been reports of undertakings for the construction of additional plants in Chashma and Karachi.

Some in Pakistan have argued that these commitments date back to a 1986 agreement with China on cooperation in construction and operation of nuclear reactors for an initial period of 30 years, and thus not in violation of NSG guidelines. This spurious argument, if accepted, implies that China can continue to commit to any number of additional nuclear projects in Pakistan without any repercussions. It is another matter that the actual text of the so-called 1986 agreement remains unreleased and shrouded in mystery, thereby preventing the international community from validating Chinese and Pakistani representations.

China has demonstrated remarkable consistency over four decades in acting in ways that undermine with impunity the global non-proliferation regime. Its nuclear deals with Pakistan – both military and civilian – were conceived and executed in secrecy. The recent news articles now confirm that China remains committed to a long-term nuclear relationship with Pakistan under its own terms. This is a pattern of behavior that is unlikely to change without the application of sustained international pressure to bring China into compliance with the commitments it has undertaken.

Source: <http://thediplomat.com>, 16 February 2015.

OPINION – Daryl Kimball & Matthew McKinzie

### Nuclear Dangers: Myth, Reality, Responses

Since the 2014 ouster of Ukraine's pro-Russian President, Russia's destabilization of Ukraine has undermined European security and the rules-based international order. Even before the crisis in Ukraine, bilateral cooperation in the nuclear weapons arena had deteriorated, including US claims of Russian testing of a ground-launched cruise missile in violation of the 1987 INF Treaty, and highly visible patrols by Russian strategic forces. Moscow's actions have prompted calls from some to halt implementation of nuclear arms control agreements, including the 2010 New START, which verifiably limits Russian nuclear potential to no more than 1,550 strategic deployed warheads.

Some members of Congress have suggested the US accelerate nuclear weapons modernization, develop new

nuclear systems and pursue deployment of tactical nuclear weapons in NATO states on Russia's border. But rather than helping to protect Ukraine or NATO, these proposals would undermine strategic stability and increase nuclear dangers. Moscow's actions in Ukraine require a tough and unified US and European response involving diplomacy, economic sanctions and NATO conventional deterrence, but the challenge can't be effectively resolved with nuclear weapons or a US nuclear buildup.

As President Barack Obama declared in 2012, "[t]he massive nuclear arsenal we inherited from the Cold War is poorly suited for today's threats." The Pentagon and Joint Chiefs' 2013 review of US nuclear deterrence requirements determined the US could reduce its deployed strategic arsenal by up to one-third. In a joint statement delivered at the Third Conference on the Humanitarian Impacts of Nuclear Weapons in Vienna in December, the

**This spurious argument, if accepted, implies that China can continue to commit to any number of additional nuclear projects in Pakistan without any repercussions. It is another matter that the actual text of the so-called 1986 agreement remains unreleased and shrouded in mystery, thereby preventing the international community from validating Chinese and Pakistani representations.**

Arms Control Association along with four other US groups cited that Pentagon assessment and said Moscow and Washington could do more to reduce their nuclear excess and should pursue a further one-third cut in their strategic stockpiles. With New START verification tools in place, additional nuclear reductions can be readily achieved without a new treaty.

We noted that use of just a few hundred nuclear weapons, let alone more than 3,000, would have catastrophic global consequences. We cited a 2001 Natural Resources Defense Council (NRDC) study that shows that a “precision” attack against Russia’s nuclear forces would kill at least 8 million to 12 million people and injure millions more. In a “countervalue” attack on population centers, the United States could kill or injure up to 50 million Russians with a mere fraction of its arsenal.

In a Feb 9 *Defense News* oped, Matthew Costlow claimed that our Vienna statement calling for reducing Russian and US nuclear excess is “immoral” because it would require targeting cities. The implication he makes, that “counterforce” targeting somehow avoids damage to civilians and civilian objects, is preposterous. The effects of such attacks would cause widespread death and damage across either country – and beyond.

These findings were made public in the NRDC analysis but military planners and political leaders have been aware of the collateral effects of nuclear war since the early years of the Cold War. As President Ronald Reagan concluded in 1984, “a nuclear war can never be won and must never be fought.”

Furthermore, a purely hypothetical situation in which the US targets Russian nuclear forces and

risks only counterforce retaliation is nonsense. After a nuclear war starts all bets are off. Holding Russian nuclear force targets at risk means US (and Russian) cities are at risk in a retaliatory strike. If deterrence fails and there is a counterforce exchange, both sides are then left in the situation of city targeting by the remaining nuclear forces.

**A “precision” attack against Russia’s nuclear forces would kill at least 8 million to 12 million people and injure millions more. In a “countervalue” attack on population centers, the United States could kill or injure up to 50 million Russians with a mere fraction of its arsenal.**

In our Vienna statement, we questioned whether it is possible, given the indiscriminate effects of nuclear weapons, that US claims it “will not intentionally target civilian populations or civilian objects” with nuclear weapons would have any practical effect in avoiding the “collateral” damage prohibited by the Law of Armed Conflict.

Costlow is also dead wrong when he says we are proposing “unilateral” US disarmament. In fact, we specifically criticized Russia for saying “nyet” to Obama’s 2013 proposal for a one-third cut in both countries strategic arsenals. What’s more, in our Vienna statement, we also criticized other nuclear-armed states for pursuing unnecessary and destabilizing nuclear buildups.

**A purely hypothetical situation in which the US targets Russian nuclear forces and risks only counterforce retaliation is nonsense. After a nuclear war starts all bets are off. Holding Russian nuclear force targets at risk means US (and Russian) cities are at risk in a retaliatory strike. If deterrence fails and there is a counterforce exchange, both sides are then left in the situation of city targeting by the remaining nuclear forces.**

We proposed “making nuclear disarmament” a global enterprise. We called on all states to press China, India and Pakistan, in particular, not to increase their fissile material or weapons stocks. A unified push for further US-Russian arms cuts combined with a nuclear weapons freeze by other nuclear-armed states could create the conditions for meaningful nuclear risk reduction. The situation can and must be made safer,

beginning with a clear understanding of the risks and the elimination of excess nuclear forces. Doing nothing is not a responsible, or morally acceptable, option.

*Source: <http://www.defensenews.com>, 23 February 2015.*

**OPINION – Jonathan Power**

**North Korea's Nuclear Bomb Once Again**

If there is such a thing as “frozen conflict” the best place to look is not in Eastern Europe but in Korea where, after years of merciless war that ended in 1953, there was an armistice, a line was drawn across the Korean peninsular and its two halves went their separate ways – one, the south, to fast capitalist development and the other, the north, to stultifying dictatorship that seemed to do only one thing competently: build nuclear bombs. Today there is no war on the Korean peninsular but there is no peace.

Presidents Bill Clinton, George W Bush and Barack Obama have all tried to negotiate an end to North Korea's nuclear bomb programme and to bring to a close the military standoff between north and south. All their attempts have come to naught, not just because of North Korean stubbornness but also because of Republican majorities in Congress that have constantly undermined what seemed to be breakthroughs in negotiations.

Now Obama has summoned up the strength to return to the ring. The two countries' nuclear envoys have been discussing the idea of “talks about talks”. A majority of long time observers are doubtful that after two decades of on/off negotiations real progress can be made.

But they forget the major progress made by Clinton, which culminated in an unprecedented visit to Pyongyang by his secretary of state, Madeline Albright, which was meant to pave the way for Clinton's own visit that was very likely to lead to major changes in the relationship. The demands of the make or break Israel-Palestine-US negotiations in the last days of his administration meant it could not be fitted in. Then, after seven years of erratic US policies under President George W Bush, his

administration's negotiators ended up achieving almost the same as Clinton's, albeit with no plan to take the final, big step, as Clinton was prepared to do.

The negotiations were masterminded by Secretary of State Condoleezza Rice. Under her leadership, Pyongyang's twists and turns, and often appalling misbehavior, were more tolerated than before. In September 2005, the US formally offered a non-aggression pledge and an offer, in principle, to normalise relations. It also resurrected discussion

of the Clinton decision to help finance and build a ‘light water’ reactor that would help satisfy the North's domestic power needs, without producing more bomb-making material (the reactor sits half finished). In return, the North agreed to denuclearise and to open itself to international inspection.

Perhaps inevitably, both sides interpreted the agreement differently. The North again became intransigent. In October 2006 it exploded an underground nuclear device. Nevertheless, Rice managed to

persuade Bush to dilute the hostile rhetoric. The Rice push continued forward. Fuel aid and food were offered as carrots. Surprisingly, the offer bore fruit. The North agreed to disable its nuclear weapons and other important facilities at its Yongbyon nuclear complex. It also said it would allow back UN inspectors. However, when Washington stalled on removing the North from its terrorism list Pyongyang also stalled. Washington then capitulated on this. A deal was made, with the added bonus of the North agreeing to open up undeclared sites as well but with the proviso that inspections were agreed to by ‘mutual consent’.

The negotiations came to a shuddering halt when North Korea carried out a second nuclear test (Barack Obama had become president four months before). Later, it revealed that it had built

**Presidents Bill Clinton, George W Bush and Barack Obama have all tried to negotiate an end to North Korea's nuclear bomb programme and to bring to a close the military standoff between north and south. All their attempts have come to naught, not just because of North Korean stubbornness but also because of Republican majorities in Congress that have constantly undermined what seemed to be breakthroughs in negotiations.**

a uranium enrichment plant, albeit at that time only enriching uranium to the low requirements of producing electricity, not bombs. Obama tried to pick up the pieces. In February 2012, in return for 240,000 tonnes of food aid, the new North Korean regime agreed to allow UN inspectors to monitor its suspension of uranium enrichment. The North also agreed to a moratorium on nuclear and long-range missile tests. The agreement did not last long. In April, the North launched a rocket containing a satellite, arguing this was a scientific, not military endeavour (it broke up in mid-air). Obama, I think mistakenly, decided to cancel the agreement. The US was backed by all the members of the UN Security Council.

In December 2012, the North launched a missile that could possibly reach Los Angeles (but not able to carry a nuclear weapon). In February 2013, it carried out its third nuclear test. In one statement it said it was prepared to threaten a thermo-nuclear war. Now, apparently, Obama is prepared to try again. Can this frozen conflict ever be unfrozen? We know it can. The North, when it wants to, does negotiate, albeit erratically. Looked at from North Korea's perspective, Washington itself is erratic. Can Obama, this time, bring about an agreement that has eluded his predecessors? The odds are stacked against him but if he can replicate the determination of Clinton it could be done.

Source: <http://www.dailytimes.com.pk>, 18 February 2015.

**OPINION – Milton Caplan**

**How Can Nuclear Energy Build Trust in a Time When Denying Science is Rampant? Like it?**

Recent public outcry as a measles outbreak has managed to impact much of North America has once again showed the nature of public deniers of science. In this case it is concerns about

vaccinations that have led to numerous children falling sick with measles. While not considered a highly risky disease, some children get very sick and some may actually die. The main concern is that it is very contagious so that without vaccinations it moves quickly within a community to infect large numbers of people, greatly increasing the public risk.

This is only the most recent large scale public outcry where science is ignored. It is the same as those who deny climate change and those who deny the safety and benefits of nuclear power. The role of nuclear power in combating climate change has once again been demonstrated in the most recent update of the IEA Nuclear Power Roadmap.

Based on the 2 degrees Celsius (°C) scenario (2DS) – nuclear power would continue to play a major role in lowering emissions from the power sector, while improving security of energy supply, supporting fuel diversity and providing large-scale electricity at stable production costs. Global installed capacity would need to more than double from current levels of 396GW to reach 930 GW in 2050, with nuclear power representing

17% of global electricity production and a formidable growth for the nuclear industry. Governments have a role to play in ensuring a stable, long-term investment framework that allows capital-intensive projects to be developed and provides adequate electricity prices over the long term for all low-carbon technologies. Governments should also continue to support nuclear R&D, especially in the area of nuclear safety, advanced fuel cycles, waste management and innovative designs.

This means that a larger commitment to nuclear power is an important element of any strategy that has a chance of getting climate change under control. The report also notes that public

**Global installed capacity would need to more than double from current levels of 396GW to reach 930 GW in 2050, with nuclear power representing 17% of global electricity production and a formidable growth for the nuclear industry. Governments have a role to play in ensuring a stable, long-term investment framework that allows capital-intensive projects to be developed and provides adequate electricity prices over the long term for all low-carbon technologies.**

acceptance continues to be one of the major impediments to a stronger commitment to nuclear power in many markets. Concerns about safety, costs and waste disposal continue today; the same issues as they were back when I started work in this industry more than 30 years ago. While science can clearly demonstrate that nuclear power has benefited the environment, by avoiding significant amounts of pollutants and carbon emissions; is very safe; and that waste management is more of a social issue than a technical one: public attitudes remain very hard to change.

Generally the public has very different views on key issues than scientists. ... We in the nuclear industry are not the only ones to suffer from this lack of effective communication. ... When told the industry must better educate the public that in reality, the public does not want an industry science lesson which tends to be the approach most used in the past. In fact, when this approach fails, experts just shake their heads and try again. In reality what the public want to know is that the industry is safe, and that this safety is in the hands of experts that they trust to deliver upon this promise. We see that one of the largest impacts of the Fukushima accident in Japan is the loss of trust in both the utility and government by the population. The impact to the public of this is significant – the health impacts of the fear of radiation and the accident is far larger than the actual health impacts of any radiation to the public.

Trust is not something that is built overnight. It takes years, even decades to develop trust with the public – and only a moment to destroy it. People are skeptical (as they should be) and unfortunately are always ready to believe stories that discredit those they don't trust. ... There seems to be a large scale shift from public good to individual good in society these days. Trust in government, scientists and other institutions is very low. The public is not willing to accept that these institutions have their back so they quickly rush to beliefs that are not supported by science

with the resulting ultimate negative impacts on society. To be fair these beliefs come because many of these institutions that were trusted in the past have let the public down. And in this day of instant news and social media, it is easy to attack, but then interest is lost by the time the truth comes out and only a small subset of those who read the original story of concern remain interested enough to see the truth when it comes out. Trust – it is essential for the future of nuclear power. The public must trust the industry to deliver on its promise of developing and operating safe, reliable and economic nuclear plants. They must trust the government to provide a strong regulator to oversee the industry and ensure public safety. This industry is dependent upon this trust if it is to flourish.

Building trust in science is a task that goes well beyond the nuclear industry. Yes, scientists have much work to do to build that trust with the public and government, but governments must then ensure that they use science as a basis for policy. While it remains reasonable to question the results of science, it is not reasonable to base policy on the assumption that science is wrong. Government in all countries need science advisers in key positions to ensure that real science is heard when policy is being made.

**The public must trust the industry to deliver on its promise of developing and operating safe, reliable and economic nuclear plants. They must trust the government to provide a strong regulator to oversee the industry and ensure public safety. This industry is dependent upon this trust if it is to flourish.**

The media is also part of the solution. Poor reporting looking for the sensationalist point of view is not helpful. Science journalists must be the ones to cover science issues and they must take the time to report on them correctly. There was a fascinating editorial in the Canadian newspaper, the Globe and Mail when a reader complained about the lack of "balance" on the vaccination issue. The response by the Globe is important reading," The reader is correct that news stories should be fair and balanced, but if The Globe were to include someone "credible" from the anti-vaxxer community, that would be false balance.... False balance is when journalists twist themselves into a knot to try to balance scientific and expert views with someone whose views are

not fact-based, expert or scientific.... False balance is not only poor journalism, it can harm the readers' understanding because it suggests there is a balance between the views. In politics, for example, it is important and responsible to offer fair weight to different parties' views. It is not responsible to offer equal weight to science versus flimsy beliefs."

The issue is that most people today listen to those they are familiar with and trust and discount those they don't know. Therefore nothing is more important than the scientific community listening to and speaking with the public in a way that earns their trust. Getting this done is essential to all of our futures. The work ahead of us all to build trust in science is huge and it will take a long time but we must be relentless in our efforts to make this happen.

Given the public push back in this measles outbreak, we can ask – is this the beginning of a new opportunity for dialogue on issues that are supported by science? Is the public starting to understand that their beliefs may be hurting them more than helping? If so, then we need to ensure that the nuclear industry is continuing to deliver open, honest and transparent information in support of its benefits while clearly explaining the magnitude of the risks. Science is on our side. Now it's time to make a strong case to the public.

Source: <http://theenergycollective.com>, 24 February 2015.

**NUCLEAR STRATEGY**

**CHINA**

**Questions Raised Over China's THAAD Opposition**

China's dogged opposition to the potential deployment of an additional US missile defense asset to South Korea has raised questions over Beijing's true intentions, given that the interception system does not pose any serious security threat to China.

**Is the public starting to understand that their beliefs may be hurting them more than helping? If so, then we need to ensure that the nuclear industry is continuing to deliver open, honest and transparent information in support of its benefits while clearly explaining the magnitude of the risks. Science is on our side. Now it's time to make a strong case to the public.**

**THAAD is designed to intercept incoming missiles at altitudes of 40-150 km after detecting the missiles with land-based radar that has a maximum range of about 1,800 km. But China's long-range missiles would travel far above THAAD's maximum altitudes.**

Some assume the opposition to the Theater High-Altitude Area Defense system is intended to forestall any potential negative ramifications for China's security. Others say the dissent appears designed to weaken the South Korea-US alliance. Despite the fact that THAAD is a wholly defensive system capable of targeting only North Korean missiles directed at South Korea, top Chinese officials – most recently China's Defense Minister Gen. Chang Wanquan – have repeatedly voiced opposition to THAAD.

Military experts say that, contrary to lingering speculations, THAAD could not shoot down Chinese intercontinental ballistic missiles headed for the US mainland, or pose any missile threat to China, should it be based on the peninsula. "The THAAD interceptor has a range of 200 kilometers. Its range means that a THAAD interceptor – if based at Osan Air Base, a likely US option (for the potential deployment) – could not reach as far north as Pyongyang – it would fall about 65 kilometers short," said Bruce Bennett, a senior analyst at the US think tank RAND Corp.

"Thus, the THAAD interceptor's maximum range is only halfway to (China's northeastern border city of) Dandong. It cannot reach Chinese missile fields." THAAD is designed to intercept incoming missiles at altitudes of 40-150 km after detecting the missiles with land-based radar that has a maximum range of about 1,800 km. But China's long-range missiles would travel far above THAAD's maximum altitudes.

On top of this, THAAD is aimed at intercepting missiles falling toward Earth during their "terminal phase," not missiles flying far beyond the peninsula. Apart from the altitude issue, THAAD's operational range is too short to intercept Chinese or Russian missiles.



China may take issue with the radar system with the argument that THAAD could be used to gather intelligence about Chinese military activities. But China is already under the scrutiny of a host of US intelligence, surveillance and reconnaissance assets including military satellites, and vice versa. Then, what has been driving China's complaints about the potential deployment of THAAD to Korea? There may be several answers to the question that involve China's calculus of strategic national interests.

In recent years, China has been enhancing its military capabilities to keep any hostile forces potentially US troops at bay with cruise and ballistic missile, bombers, and other advanced weapons with longer operational ranges, and greater lethality, survivability and accuracy.

China's coastal regions are now strewn with state-of-the-art weapons systems, which have apparently signaled that any external forces that attempt to encroach upon its territory and hamper its advance farther into the Pacific would likely face strong military responses. US officials have described such capabilities to fend off hostile approaches and project power beyond its shores as "antiaccess/area denial" capabilities. China may think the deployment of THAAD to the peninsula could potentially weaken its A2/AD capabilities, observers noted.

"China views the introduction of THAAD in South Korea as a new capability that could potentially, in the long term, offset China's ballistic missiles that serve as power projecting platforms, while increasing Beijing's strategic and political leverage," said Michael Raska, research fellow at the Institute of Defense and Strategic Studies, affiliated with Nanyang Technological University in Singapore.

"Both China and US defense planners are currently conceptualizing long-term military hedging strategies that would mitigate each other's strategic options. The deployment of THAAD, while important, is only a part of many strategic calculations that shape their threat perceptions."

Antiaccess, or A2, refers to action that prevents a hostile military force from moving toward a specific operational area, while area denial, or AD, means action aimed at obstructing any maneuvering within the area. To overcome the A2/AD challenges, the US has been exploring and devising a set of "offsetting" concepts in recent years with the aim of creating an efficient joint force capable of handling evolving security threats in all domains – air, land, sea, space and cyberspace. Washington's offsetting concepts are aimed at countering military challenges not just from China, but from all potential adversaries including Iran and North Korea....

To weaken S. Korea-US alliance some experts speculate that China appears to have repeatedly voiced its opposition to THAAD as part of its campaign to weaken the long-standing alliance

between Seoul and Washington. China may also attempt to probe South Korea to see what strategic choices it will make to avoid compromising its relations with Beijing, a crucial partner for Seoul in terms of trade, tourism and efforts to denuclearize North Korea, they noted. Bennett said that the

"political rationale" of undercutting the alliance seems to be driving China's complaints about the potential dispatch of THAAD here.

Aside from the issue of THAAD, China has already pushed South Korea to make tough strategic choices on multiple fronts. Beijing has long objected to Seoul's security collaboration with Washington and Tokyo. Seoul's agreement last December to ink a trilateral military information-sharing arrangement with the two security partners has apparently unnerved Beijing.

Beijing has also pressured Seoul to participate in the Asia Infrastructure Investment Bank despite Washington's objections. The AIIB is seen as a scheme by China to lead the regional financial order, which has long been dominated by the US and Japan.

China's pressure on South Korea to take its side is expected to escalate as China seeks to build a

**China views the introduction of THAAD in South Korea as a new capability that could potentially, in the long term, offset China's ballistic missiles that serve as power projecting platforms, while increasing Beijing's strategic and political leverage.**

“community of shared interests and common destiny” with neighboring countries amid its stepped-up peripheral diplomacy. The US’ enhanced missile defense – irrespective of its locations on the US mainland or abroad – has been a source of concern for China as it could undermine China’s capabilities to ensure deterrence through the threat of a retaliatory nuclear strike....But the US’ fortified missile shield could complicate China’s nuclear strategy – deterrence with the threat of massive damage to its adversary through assured retaliation – and make the emergent Asian power more vulnerable to foreign attacks.

Robust deterrence can be established when there is a clear prospect that an act of aggression will lead to unacceptable damage in return. But when a potential adversary believes it has a defense mechanism strong enough to counter a retaliatory strike, deterrence could crumble.

During the Cold War, the prospects of nuclear retaliation – or a second strike – prevented the US and the then-Soviet Union from initiating a war and helped manage the “balance of terror” stemming from the shared view that any war would result in “mutually assured destruction.” The two foes also refrained from strengthening missile defenses to maintain “strategic vulnerability” to nuclear retaliation, thinking that the other side would avoid making an irrational decision due to the risk of a nuclear counterstrike.

Though it is still difficult to determine the true intentions behind China’s opposition to THAAD, China could think that setting up America’s beefed-up missile defense near its territory could further limit its retaliatory capability, or second-strike capability.

**The US’ enhanced missile defense – irrespective of its locations on the US mainland or abroad – has been a source of concern for China as it could undermine China’s capabilities to ensure deterrence through the threat of a retaliatory nuclear strike.**

**Though it is still difficult to determine the true intentions behind China’s opposition to THAAD, China could think that setting up America’s beefed-up missile defense near its territory could further limit its retaliatory capability, or second-strike capability.**

By and large, China’s nuclear strategy has been seen as deterrence-oriented due to its relatively small number of nuclear warheads. China possesses some 250 nuclear warheads – the lowest figure among the five officially recognized nuclear powers, according to the Global Nuclear Weapons Inventories in 2014, which was compiled by the Bulletin of Atomic Scientists. The US has about 7,500 nuclear warheads including more than 1,920 deployed strategic warheads. Given the imbalances in the nuclear quantities, ensuring a reliable and sustainable second-strike capability is crucial for an ascendant China, particularly amid its intensifying strategic rivalry with the US in the Asia-Pacific.

At the core of a nuclear power’s second-strike capability is submarine-launched ballistic missiles as these can be fired from undetectable locations at any time, making the launches almost unpreventable. Although there also has been an imbalance in the nuclear-armed submarine forces between the US and China, China has been pushing to bolster its sea-based nuclear deterrent to reduce the gap with other nuclear powers.

Whatever methods a nuclear power utilizes to secure its second-strike capability, what is evident is that no nuclear power can defend itself against massive nuclear strikes – a reason why the US missile defense program aims to defend against “limited” ballistic missile attacks. But the controversy surrounding the deployment of THAAD is likely to remain a source of diplomatic and military friction between Beijing and Washington, and between Beijing and Seoul, as long as the distrust between the two major powers continues.

*Source: <http://www.koreaherald.com>, 23 February 2015.*

**BALLISTIC MISSILE DEFENCE**

**RUSSIA-IRAN**

**Russia Offers Iran Latest ABM System, Tehran Considering Deal – Rostec CEO**

Russia's state-owned high-tech corporation Rostec has offered Iran the chance to buy its latest Antey-2500 anti-aircraft and ballistic missile system, instead of the older S-300 system, the company's CEO said... "We have offered Antey-2500 instead of S-300. They are thinking. No decision has been made yet," Rostec CEO Sergei Chemezov said....

Chemezov reminded that Antey-2500 is an improved version of the S-300, which Russia has stopped manufacturing. Under the US\$800 million contract signed in 2007 by the two countries, Russia was to deliver S-300 air defense missile systems to Iran. However, the deal was canceled in 2010 by then-Russian President Dmitry Medvedev, following UN sanctions imposed on Iran due to its disputed nuclear program. In turn, Tehran filed a currently pending \$4 billion lawsuit against Russia with Geneva's arbitration court. ...Speaking at the international arms show, Rostec CEO Sergei Chemezov said that Russian foreign arms sales are growing, and reached \$13 billion last year. ...

Source: <http://rt.com>, 24 February 2015.

**USA**

**Navy Flight Tests Trident II Ballistic Missiles**

Lockheed Martin reports two new successful flight tests of its Trident II D5 fleet ballistic missile by the US Navy. The tests of the missile were conducted in the Pacific Ocean from a submerged Ohio-class submarine. The unarmed missiles, manufactured by Lockheed Martin, were converted into test configurations using kits with range safety devices and flight telemetry instrumentation that were produced by the company.

**Russia's state-owned high-tech corporation Rostec has offered Iran the chance to buy its latest Antey-2500 anti-aircraft and ballistic missile system, instead of the older S-300 system.**

"These latest test flights demonstrate the reliability of the D5 missile and the readiness of the entire Trident Strategic Weapon System every minute of every day," said Mat Joyce, vice president of Fleet Ballistic Missile programs and deputy for Strategic & Missile Defense Systems, Lockheed Martin Space Systems. "The Navy program office, the submarine crews and the industry team never rest to ensure the safety, security and performance of

this crucial deterrence system." The two firings bring the number of successful flight tests of the missile since 1989 to 155, Lockheed Martin said. The Trident II D5 is a three-stage ballistic missile. It can travel more than 4,000 nautical miles and carries multiple, independently targeted re-entry bodies.

Source: <http://www.upi.com>, 25 February 2015.

**NUCLEAR ENERGY**

**AUSTRALIA**

**South Australia Considers Nuclear Industry Potential**

The question of nuclear power for Australia has been raised several times over the last 60 years, but usually on the conservative side of politics. Apart from anything else, there has not been a strong need – the country has abundant coal located close to main population centres, and in using this for more than 80% of the electricity, has enjoyed some of the world's lowest power prices. But climate change concerns have changed the outlook nationally, and South Australia has always been less well-off than the eastern states in electricity options. Half its 5.3 GWe capacity is gas-fired, and its average wholesale power prices are one third greater than in the eastern states. Grid connections eastward amount to only 680 MWe.

Now a left-of-centre Labor government in South Australia is setting up a royal commission into the potential

**Now a left-of-centre Labor government in South Australia is setting up a royal commission into the potential for nuclear power in that state, which already produces two thirds of Australia's uranium – all for export. The terms of reference are likely to include fuel cycle and high-level waste disposal.**

for nuclear power in that state, which already produces two thirds of Australia's uranium – all for export. The terms of reference are likely to include fuel cycle and high-level waste disposal. The inquiry is supported by the state Liberal (conservative) opposition and the federal Liberal coalition government, but not by the federal Labor party (though it supports uranium mining). However a former Labor Prime Minister, Bob Hawke, has been vocal in support: "I've always said that ignorance is the enemy of good policy and a royal commission will establish discussion free of prejudice," he said.

...The quasi-legal commission is to be headed by former governor of South Australia, Kevin Scarce, who said that he had an open mind on the issue. Media reports and editorials have been almost uniformly supportive. Assuming that the royal commission's findings are positive, the main question is: to what extent will they be accepted nationally? Certainly before any nuclear capacity was built anywhere, federal laws would need to be changed.

A previous Liberal coalition federal government commissioned a high-level inquiry into nuclear power and it reported positively in 2006 – the Uranium Mining, Processing and Nuclear Energy Review (UMPNER). That Review concluded that any long-term energy strategy for Australia should include nuclear power in the mix alongside coal, gas and renewable energy, and that commercial opportunities existed in uranium mining, processing and enrichment, and in developing storage solutions for long-lived radioactive waste – but much has changed since then, notably the uranium price. Its chairman, Dr Ziggy Switkowski, said that the new inquiry was "timely for a number of reasons" and that "nuclear power still offers the greatest option in providing cost-effective, clean, base-load energy".

To curb CO2 emissions Australia has a Renewable Energy Target (RET) which has since 2001 required retailers each to buy a certain proportion of the

electricity they supply from non-hydro renewable sources at whatever price they can, or incur a penalty by paying a shortfall charge. The target was increased in 2009 to 45,000 GWh in 2020, intended to be 20% of supply, and representing a major increase from non-hydro sources. With rising prices and declining power demand, this will now be more like 27-30% of supply, and will increase power costs further. Focusing on the purpose of the RET scheme, nuclear power would do the job better.

...In contrast with most G20 countries, the main driver for nuclear power in Australia is reduction of CO2 emissions, or costs arising from that. Apart from that, Australia's huge coal resources and significant natural gas underwrite energy security and provide low-cost power. The 2006 inquiry reported that nuclear power would be 20-50% more expensive than coal-fired power at that time and (with renewables) it would only be competitive if "low to moderate" costs were imposed on carbon emissions (A\$ 15-40 - US\$ 12-30 per tonne CO2)....

**Review concluded that any long-term energy strategy for Australia should include nuclear power in the mix alongside coal, gas and renewable energy, and that commercial opportunities existed in uranium mining, processing and enrichment, and in developing storage solutions for long-lived radioactive waste.**

The National Generators Forum published a report in 2006 on Reducing Greenhouse Gas Emissions from Power Generation which concluded that "Stabilising emissions at present levels and meeting base-load requirements could be achieved with nuclear power at comparatively modest cost." While electricity cost increases to 2050 were projected to be more than 120%, using nuclear power would halve the increase. "At \$20 per tonne of CO2 price, nuclear starts to become more cost-effective than current fossil fuel technologies."

Around 1960, nuclear power was considered for the large new power station at Port Augusta in SA, then in 1969 the South Australian government proposed a nuclear power plant in SA to supply the eastern states' grid. In 1976, the SA government in its submission to the Ranger Uranium Mine Inquiry said nuclear power appeared inevitable for SA, perhaps by 2000.

Insofar as the royal commission will direct future power investment in SA, the question of reactor unit size arises. At present the unit size of any generating unit there is regulated at 260 MWe, though modelling has shown 500 MWe units are possible. Small modular reactors would therefore be indicated. But if transmission links were expanded a SA nuclear power plant with large reactors could serve the eastern states. ...The royal commission provides an important opportunity to get past the accretion of folklore and negative impressions from distant events to grapple with technical, social and economic realities.

Source: <http://www.world-nuclear-news.org>, 17 February 2015.

## **FRANCE**

### **French Nuclear Industry Faces Shake-Up Amid Areva Loss**

The French have long prided themselves on their nuclear energy expertise that helped the country to claim partial independence in its energy supplies and allowed its industry and rail transport to prosper with relatively cheap power.

Now, however, the country's nuclear sector is going through a very difficult phase and may need a recapitalisation and restructuring. At the heart of the French sector is the nuclear research agency CEA with some four billion euro in annual budget. Then there is Areva that builds nuclear power stations and the recycling of spent fuel, the EDF electricity group and GDF-Suez. Due to a combination of technical complexities, mismanagement and a political fall-out against nuclear energy following the Fukushima disaster, Areva is now facing a big write-down and a loss for 2014 of some five billion euro. Their advanced technologies EPR nuclear stations are hitting delays on delays in Finland while other clients are getting cold feet post the Japan tragedy.

**The country's nuclear sector is going through a very difficult phase and may need a recapitalisation and restructuring. At the heart of the French sector is the nuclear research agency Due to a combination of technical complexities, mismanagement and a political fall-out against nuclear energy following the Fukushima disaster, Areva is now facing a big write-down and a loss for 2014 of some five billion euro.**

...Areva, due to publish its results on March 5, brought forward the loss estimate as its chairman Philippe Varin was due to meet with labour unions at the site of the La Hague recycling plant amid expectations of job cuts and wage freezes. The Areva drama comes at a difficult time. Royal, a former presidential candidate, has to keep the Green ecological party as friends now that the government's majority is fragile in the run-up to regional elections in March.

She has already bruised them with a decision to abolish a special ecology road tax and the greens are also not happy that Royal remains a supporter of nuclear energy. She said she wants France to abandon its "all nuclear" approach but not all its

nuclear activities. A reshuffling of the nuclear cards and a possible state aid package will put the green's loyalty to the government to the test. They are not part of the government.

For the government's economic team it will also be hard to find a few billion euro, shortly after a costly deal to take a stake in industrial power and rail group Alstom as part of an alliance with General Electric. France is already late in respecting EU debt criteria and has a tense relationship with Brussels about its budget, be it that they

have a compatriot at a key commission post and that the Greek situation has taken the spotlight away from its own weak financial scorecard.

If Areva needs fresh capital, then who will pay the bill? Private investors will want to see a convincing business plan that goes far beyond a hazy formula that "technical advance combined with leading industry position equals profits and jobs". EDF is not rich either, unless it could pass some of the costs to its own customers. The government cannot allow that either. There could be some scope for closer cooperation with GDF Suez and its Electrabel unit – but that would be a U-turn after the 2007 scission between de GDF gaz and EDF electricity activities. A once

envisaged nuclear pillar with Areva, Alstom and Bouygues had long been shelved before the GE deal of 2014 effectively buried it.

...In the end, France will have to curtail its ambitions, try to finish those projects that Areva has on its order book and make sure that the thousands of nuclear researchers in France will make further advances in next generation reactors. Only then can it take on any new big orders, if other countries than France get a renewed appetite for nuclear electricity.

*S o u r c e : <http://www.forbes.com/>, 23 February 2015.*

## **INDIA**

### **Nuclear Power Generation in India Doubles, Capacity Utilisation Up 83%**

Nuclear power generation In India has more than doubled in the last six years while the capacity utilisation of nuclear reactors in country has increased from about 50 percent to 83 percent, the government said adding that it was the result of the fruition of international cooperation in the field of nuclear energy.

"Following the fruition of international cooperation in the field of nuclear energy in 2008, nuclear power generation has grown from 14,927 million units (MU) of electricity in 2008-09 to 35,333 MU in 2013-14 and the numbers is slated to improve further in next few months," Minister of State for the DAE Jitendra Singh said in a written response to a question in Lok Sabha.

The target of nuclear power generation for the five years (2012-13 to 2016-17) in the year 2011 was 241748 MU. The generation of electricity from April 2012 to January 2015 has been 98686 MU. Replying to

another question on the Kudankulam Nuclear Power Project (KKNPP), he said that the Unit 3 and 4 of the KKNPP of 1000 MW capacity each are being prepared for launch in 2015-16.

The KKNPP 1 with 1,000 MW capacity has already been commissioned recently while Unit-2 (KKNPP-2) with 1,000 MW capacity is under commissioning. PM Narendra Modi led NDA Government in July 2014 had set a target of tripling the then existing nuclear power capacity of 4780 MW in the next ten years by 2024. Keeping up with that ambitious plan, various sites have been given "In-principle" approval for additional reactors to be set up in future....

*Source: The Indian Express, 26 February 2015.*

### **Budget 2015: Rs 5,900 Crore for Nuclear Power, Research**

Government has allotted Rs 5,900 crore for generation of nuclear power and carrying out research in atomic energy while the total money for the DAE is Rs 10,912 crore. In his Budget speech, Finance Minister Arun Jaitley also announced that the second unit of KKNPP was likely to be commissioned this year, raising the power generation capacity 1000 MW. In the interim budget, the government had allocated Rs 10,446 crore, but it was later revised to Rs 8916 crore. The total money allocated for the DAE for 2015-16 is Rs 10,912 crore.

Of the Rs 5,900 crore allocated for planned expenditure this year, which includes the on-going and new projects, a major share will go into research. Of the Rs 5,900 crore, Mumbai-based Bhabha Atomic Energy Commission and Kalpakkam based Indira Gandhi Centre for Atomic Research (ICGAR) have been allotted Rs 1,912 crore alone. These are known to be country's premier

**Nuclear power generation In India has more than doubled in the last six years while the capacity utilisation of nuclear reactors in country has increased from about 50 percent to 83 percent, the government said adding that it was the result of the fruition of international cooperation in the field of nuclear energy.**

**PM Narendra Modi led NDA Government in July 2014 had set a target of tripling the then existing nuclear power capacity of 4780 MW in the next ten years by 2024. Keeping up with that ambitious plan, various sites have been given "In-principle" approval for additional reactors to be set up in future.**

institutes in the field of nuclear research. For other research carried out by the DAE, the government has allocated Rs 200 crore for the financial year.

With the commercial operation of KKNPP unit one, the power generation has gone up to 5780 MW. The number is expected to go up by 1000 MW after unit 2 starts generating power. In the last budget, Rs 30 crore were marked for the country's first Prototype Fast Breeder test Reactor, but in the revised budget, no amount was allocated. This year, the government has allocated Rs 50 crore, which could also be subject to revision.

Source: <http://www.dnaindia.com>, 28 February 2015.

### **Why Electricity from Russian Nuclear Power Plants is Cheaper?**

... The energy produced in an American-designed NPP, will cost the consumer much more than electricity from the Kudankulam NPP, which is being built under an agreement with Russia.

"The estimated cost of one kWh of electricity, which will be produced by the nuclear power plant built in India using American designs, is about twice more than the same kWh produced in a Russian-designed nuclear power plant," says independent nuclear energy expert Alexander Uvarov. According to preliminary calculations, the cost of one kWh of electricity from a US nuclear power plant will exceed 6 rupees. As for the electricity already coming from the first power unit of the Russian-designed Kudankulam NPP, as well as from the second unit, which will be launched later this year, according to the rate established by the regulator, a kWh will cost only 3.5 rupees. "Electricity tariffs for power coming from third and fourth units also should not be much higher," said Sergei Dragolsky, director of the Energy Efficiency Center.

According to the expert, the reason for such a big difference in price between the American and Russian NPP projects lies in a number of factors.

Firstly, the Russian standard design is the result of vast accumulated experience in its construction, during which all possible cost-cutting measures were taken into consideration, and the entire project has been optimized. Secondly, the energy unit is built using the most advanced engineering technologies, including through the use of a unique system for managing complex projects – Multi-D.

The Russians are building power units in India that have already demonstrated their safety and efficiency in Russia and in other countries. The American nuclear industry, which for decades has been stagnating and gradually degrading, cannot offer a real power unit to Indian partners, and is

simply promoting its AR-1000 project, which exists only on paper. "In addition, during the many decades of cooperation, Moscow has proven to be a reliable partner and remains the only country actually working with India in the nuclear sphere," noted Sergei Dragolsky, director of the Energy Efficiency Center.

At the very end of 2014, the first unit of Kudankulam NPP in the state of Tamil Nadu started operating in the warranty mode. "Despite its relatively young history, the Kudankulam-1 has already achieved several key milestones. In October 2013, it was for the first time connected to the energy grid. In January 2014, the testing program was successfully completed at a power setting of 50%, in June – 75% and 100%, i.e., the unit had proven its ability to produce as much electricity as the design capacity of the project. Electricity from the Kudankulam NPP goes to the states of Tamil Nadu, Kerala, Andhra Pradesh, Karnataka, and Union Territory of Puducherry," explains Valery Limarenko, president of the united nuclear engineering company NIAEP-ASE. Since its first synchronization with the network, the energy unit has worked a total of 4,700 hours. During this time, India received more than 2.8 billion kWh of electricity.

**According to preliminary calculations, the cost of one kWh of electricity from a US nuclear power plant will exceed 6 rupees. As for the electricity already coming from the first power unit of the Russian-designed Kudankulam NPP, as well as from the second unit, which will be launched later this year, according to the rate established by the regulator, a kWh will cost only 3.5 rupees.**

At the end of December last year, during the visit of Russian government leaders to India, a number of agreements were signed to provide the legislative basis for future cooperation. In particular, documents were signed for the construction of the second phase of Kudankulam NPP as well as a "road map" for the construction of at least 12 units during the next 20 years. The partners agreed on exploring the necessary steps in the development of the nuclear fuel cycle, including the exploration for, and production of uranium, nuclear fuel, radioactive waste and spent nuclear fuel. In addition, Russia and India signed a contract for the supply of the main equipment for the third and fourth reactors of the Kudankulam NPP.

*Source: Article by Andrei Retinger, India & Russia Report, 27 February 2015.*

## **SOUTH AFRICA**

### **Govt in R1 Trillion Nuclear Strategy**

The Government is forging ahead with plans to spend as much as R1 trillion on new nuclear plants, ignoring objections from environmental activists, opposition parties, unions and even its own advisers. Bids would be sought from the US, China, France, Russia and South Korea to add 9 600 megawatts of atomic power to the national grid to address energy shortages in Africa's second-largest economy, President Jacob Zuma said in his annual State of the Nation address on Thursday. The first output was targeted for 2023, he said.

South Africa is turning to nuclear energy as an ageing fleet of coal-fired plants operated by state utility Eskom, the supplier of 95 percent of South Africa's electricity, are unable to keep pace with the power demand. Rolling blackouts this month have curbed output at mines and factories and

**South Africa is turning to nuclear energy as an ageing fleet of coal-fired plants operated by state utility Eskom, the supplier of 95 percent of South Africa's electricity, are unable to keep pace with the power demand.**

**The Senate Ways and Means Committee heard one bill that calls for a \$176,000 state study to identify possible locations for reactors that are about one-third the size of traditional nuclear plants, producing less than 300 megawatts.**

prompted a sell-off of the nation's currency and bonds.

The rand reached a 13-year low against the dollar on Wednesday and foreigners dumped R6.9 billion of South Africa's debt since February 3, when the outages began. Detractors of the nuclear plan argue that the plants will be too costly, take too long to build and that the bidding process will be vulnerable to corruption. The National Development

Plan, the government's blueprint for growing the economy, recommended that alternatives be investigated, including the use of gas plants, which would be easier to finance and build.

...A 20-year plan published by the energy minister in December 2013 said the decision on whether to build new nuclear plants could be delayed until at least 2025 to allow for a proper assessment of alternatives and likely power demand. Areva, EDF, Toshiba's Westinghouse, China Guangdong Nuclear Power, Rosatom and Korea Electric Power have expressed interest in building new plants

in South Africa....

*Source: Excerpted from article by Paul Burkhardt, Mike Cohen and Franz Wild, <http://www.iol.co.za>, 16 February 2015.*

## **USA**

### **Bills Promote Nuclear Energy, Smaller Reactors in Washington State**

Some lawmakers are pushing proposals to advance nuclear power as part of Washington's future energy mix. Bills sponsored by Sen. Sharon Brown, R-Kennewick, promote nuclear energy, focusing on small nuclear reactors that are designed to be built in factories, shipped to a site by truck or train and assembled on location.

The Senate Ways and Means Committee heard one bill that calls for a \$176,000 state study to



identify possible locations for reactors that are about one-third the size of traditional nuclear plants, producing less than 300 megawatts.

...Supporters say small modular reactors have reduced upfront building costs, offer more flexibility in location and can provide safe, reliable energy. They say the state is a leader in nuclear energy and the industry holds tremendous promise for new jobs in this state. Critics, however, say the small-scale reactors are still unproven. Because none have been built, questions remain about whether they're safer, more affordable or efficient. Opponents also dispute that it is clean or renewable energy because of the dangerous wastes created.

"The economics and the safety issues at this point are unproven, and it's premature for the state to make it part of its energy planning going forward," said Charles Johnson with Washington/Oregon Physicians for Social Responsibility.... Some mostly Republican legislators have touted nuclear power as a way to reduce greenhouse gas emissions in the state.

Brown is the prime sponsor of a handful of bills related to nuclear energy that cleared a key legislative deadline. Among them, Senate Bill 5114 provides a sales tax exemption for the production of small-scale reactors. Senate Bill 5113 requires the Commerce Department to coordinate and advance such reactors. Two other bills, 5090 and 5089, would modify the state's renewable energy standard so that nuclear energy from small

**Senate Bill 5114 provides a sales tax exemption for the production of small-scale reactors. Senate Bill 5113 requires the Commerce Department to coordinate and advance such reactors. Two other bills, 5090 and 5089, would modify the state's renewable energy standard so that nuclear energy from small reactors could count toward meeting goals. Environmental groups have opposed modifying that standard. In 2013, the Legislature set aside \$500,000 for a study by the Tri-Cities Economic Development Council.**

reactors could count toward meeting goals. Environmental groups have opposed modifying that standard. In 2013, the Legislature set aside \$500,000 for a study by the Tri-Cities Economic Development Council. That report in September concluded, among other things, that siting a small nuclear reactor at Hanford was technically feasible.

The whole idea is for them to be assembled, shipped and installed at location, and "we think that we have a good location for assembly," said Carl Adrian, the council's president and CEO.

*Source: <http://seattle.cbslocal.com>, 24 February 2015.*

**NUCLEAR COOPERATION**

**HUNGARY-RUSSIA**

**Russia, Hungary to Cooperate In Nuclear Staff Training**

Russia and Hungary have signed a MoU on cooperation in the training of nuclear energy personnel. The agreement was signed in Budapest by Sergey Kirienko, director general of Russia's Rosatom and Zoltan Balog, Hungary's minister of human capacities, during Russian President Vladimir Putin's visit to Hungary.

**The MoU follows an intergovernmental agreement Russia and Hungary signed in January 2014, according to which Rosatom is to build two new units at the Paks nuclear power plant. Under the MoU, the two countries will cooperate in education, training and science related to the use of nuclear energy for peaceful purposes.**

The MoU follows an intergovernmental agreement Russia and Hungary signed in January 2014, according to which Rosatom is to build two new units at the Paks nuclear power plant. Under the MoU, the two countries will cooperate in education, training and science

related to the use of nuclear energy for peaceful purposes. Joint educational and training programs will be developed in order to provide highly-qualified personnel related directly to the new reactor units and also to university education, the Hungarian government said.

...“A high-priority for Hungary is to benefit from Russian professional experience at different levels of the training program, and to further expand its nuclear training system, which stretches back nearly 60 years, thus enabling the safe construction and operation of the new reactor units in Paks,” the government said.

“This memorandum not only creates the legal framework for strengthening our long-standing cooperation in the academic and scientific fields, but it also allows continuing its good traditions. For many decades, our countries have jointly developed peaceful nuclear technologies. Many Hungarian nuclear engineers received their degree in Russia, and we know that the reliable

operation of the four units of the Paks NPP can be attributed to their high qualification, too. Now it is necessary to prepare a new generation of professionals who will participate in the design, construction, and operation of the new units.” ...

*Source: <http://www.world-nuclear-news.org>, 18 February 2015.*

## **INDIA–SRI LANKA**

### **India, Sri Lanka Ink Civil Nuclear Pact, Agree to Expand Defence Ties**

Taking the ties to a new level, India and Sri Lanka inked a civil nuclear pact besides deciding to expand defence and security cooperation. This was announced after the talks between Prime Minister Narendra Modi and Sri Lankan President Maithripala Sirisena.... “The bilateral agreement on civil nuclear cooperation is yet another demonstration of our mutual trust. This is the first

such agreement Sri Lanka has signed. It opens new avenues for cooperation, including in areas like agriculture and healthcare,” Modi said in a joint press interaction with Sirisena.

The nuclear pact would facilitate cooperation in the transfer and exchange of knowledge and expertise, sharing of resources, capacity building and training of personnel in peaceful uses of nuclear energy, including use of radioisotopes, nuclear safety, radiation safety and nuclear security. It would also facilitate cooperation in radioactive waste management and nuclear and radiological disaster mitigation and environmental protection. ...

*Source: The Economic Times, 16 February 2015.*

## **USA–CANADA**

### **US-Canadian Partnership for Isotopes**

Canada’s Nordion and its US parent company Sterigenics International signed partnership agreements on 20 February with the USA’s

General Atomics (GA) and the University of Missouri Research Reactor Center (MURR). Through the agreements, sterilization specialist Sterigenics and radioisotope supplier Nordion will be supplied with molybdenum-99 (Mo-99) produced in MURR’s research reactor using targets incorporating low-enriched uranium (LEU) supplied by GA.

This new medical isotope supply will be produced using GA’s Selective Gaseous Extraction (SGE), which uses a product gas to convert Mo-99 from solid to gas in the fuel. This gas is removed from the target and collected for processing and purification. The company says this process brings several important advantages: reduced fuel requirements and waste due to continued use of the LEU fuel target, reduced time from Mo-99 production to market, use of existing generator and downstream infrastructure, simplified

**This new medical isotope supply will be produced using GA’s Selective Gaseous Extraction (SGE), which uses a product gas to convert Mo-99 from solid to gas in the fuel. This gas is removed from the target and collected for processing and purification. The company says this process brings several important advantages.**

operations relative to uranium dissolution processes, and reduced unit cost which supports full cost recovery efforts.

At 10 MWt, MURR's "tank in pool" type reactor is the USA's largest university research reactor. According to the University of Missouri, "MURR currently produces more reactor-produced radioisotopes for biomedical researchers and human medical applications in the US than any other domestic entity, including the entire US Department of Energy."

In a statement, Nordion said project planning and pre-work is well underway and the partners expect to begin the routine supply of radioisotopes in 2017. Nordion's current supply of Mo-99 is from the National Research Universal (NRU) reactor at Chalk River, Ontario, operated by Canadian Nuclear Laboratories. However, the NRU is scheduled to cease routine production of Mo-99 in November 2016. The Canadian government announced recently that it will support the extension of NRU operations until the end of March 2018 to help support global medical isotope demand in the unexpected circumstances of shortages during this time.

Nordion's president for medical isotopes Tom Burnett said, "Nordion has found what it believes is the best global solution for the industry – a combination of our best-in-class medical isotope capabilities, with the world-class nuclear reactor and innovative target design expertise of General Atomics and the unparalleled reliability of the University of Missouri Research Reactor (MURR), a leading US research reactor centre and radioisotope supplier."

He added that the partnership "will ensure Nordion has a secure long-term supply of medical isotopes, which will consolidate our leadership position in this business. That is great news for our company, for our employees, our customers and patients around the world." Mo-99 is used in medical equipment to generate technetium-99m,

the most widely used isotope in nuclear medicine. Molybdenum-99 has a half-life of only 66 hours, meaning that supplies need to be constantly replenished.

Source: <http://www.world-nuclear-news.org>, 23 February 2015.

## **NUCLEAR PROLIFERATION**

### **IRAN**

#### **Iran Nuclear Talks Advancing, No Deal Likely Next Week**

Talks on curbing Iran's nuclear program have made substantial progress, a senior US official said as the White House braced for an onslaught of criticism next week from Israeli Prime Minister Benjamin Netanyahu. The official told reporters many hurdles remained to reaching an agreement to restrain the Iranian nuclear program in exchange for easing economic sanctions and said he did not expect one to be reached next week.

**In making the case for an agreement, the US official described what he called four US "bottom lines." These included preventing Iran from making weapons-grade plutonium at the Arak heavy-water reactor now being built and from enriching uranium at Fordow.**

US Secretary of State John Kerry and Iranian Foreign Minister Mohammad Javad Zarif are to meet in Switzerland just as Netanyahu comes to Washington. The Israeli leader is expected to deliver a critique of the negotiations. US Republicans have also criticized the talks with Iran.

The US official said critics needed to make a case for a better alternative to the diplomatic efforts. Netanyahu's visit two weeks before an Israeli election has caused consternation in Washington and Jerusalem. US officials have made no secret of their unhappiness that John Boehner, Republican speaker of the U.S. House of Representatives, arranged for Netanyahu to speak before Congress without the Democratic White House initially being in the loop.

In making the case for an agreement, the US official described what he called four US "bottom lines." These included preventing Iran from making weapons-grade plutonium at the Arak heavy-water

reactor now being built and from enriching uranium at Fordow, an underground facility Tehran kept secret until Western officials revealed it in 2009.

They also include restricting uranium enrichment at Iran's nuclear facility at Natanz and requiring it to agree to a highly intrusive inspection regime designed to ensure Tehran does not establish new covert nuclear facilities. "Without an agreement we don't have any of this insight into Iran's nuclear program," the official said. "With an agreement, we have a significant amount of eyes into Iran's program and a much better capacity to detect any potential covert effort to break out and pursue a weapon."

The official sought to play down expectations of a deal being reached at talks in Montreux, Switzerland, which will include US Energy Secretary Ernest Munoz. ... The sides are working toward a deadline of the end of March, by which US officials have said they want a political framework agreement in place. A full, technical deal would then be spelled out by June 30.

Source: <http://www.jpost.com>, 28 February 2015.

## **NORTH KOREA**

### **North Korea may Get 100 Nuclear Bombs, Researcher Says**

North Korea may have as many as 100 nuclear arms in five years and become capable of mounting them on a range of road-mobile missiles, a US researcher said. Joel Wit, who researches North Korea at the US-Korea Institute at Johns Hopkins University, made the projection 24 February 2015 at a seminar in Washington. In an e-mailed analysis to Bloomberg News, he said his moderate projection for North Korea's nuclear stockpile is for it to grow to 50 bombs by 2020 while the country develops a new generation of road-mobile medium- and long-range missiles tipped with nuclear warheads.

The assessment paints a more-advanced scenario of the isolated state's ability to produce nuclear

arms than other estimates. Siegfried Hecker, a Stanford University professor, said last month the Kim Jung Un regime probably has 12 nuclear bombs and may have eight more by the time US President Barack Obama leaves office in 2017.

North Korea probably has 10 to 16 nuclear weapons at present, including six to eight devices

made from plutonium and four to eight from weapons-grade uranium, according to Wit.

"Today, Kim Jong Un is increasingly offering his own choice: between accommodation and acceptance of a nuclear-armed North Korea or periodic tensions and instability on the peninsula," Wit said in the

analysis, jointly written with fellow researcher Sun Young Ahn....

North Korea hasn't made public how many bombs it has. The country conducted its third nuclear test in February 2013 and has since repeatedly threatened to conduct another one to deter what it calls US hostility. South Korea said last month North Korea "may have made significant progress" in making nuclear bombs small enough to be loaded onto missiles. The country has managed to expand its nuclear arsenal even as international sanctions have been stepped up since North Korea abandoned disarmament talks in 2009. ... North Korea's state-run *Rodong Sinmun* newspaper said on Feb 24 that the country would increase its war deterrent as much as it could to deal with military drills by the US and South Korea. Hours later the allies told North Korea they would begin their annual Key Resolve and Foal Eagle drills on 02 March 2015.

Source: Excerpted from article by Sam Kim, <http://www.bloomberg.com>, 25 February 2015.

**Moderate projection for North Korea's nuclear stockpile is for it to grow to 50 bombs by 2020 while the country develops a new generation of road-mobile medium- and long-range missiles tipped with nuclear warheads.**

## **NUCLEAR SAFETY**

### **BELGIUM**

#### **Cracks in Nuclear Reactors Prompt Call for Worldwide Inspections**

The discovery of thousands of additional cracks in critical components of two Belgian nuclear

reactors prompted Greenpeace to call for immediate checks of nuclear power plants worldwide. The cracks were found in the steel nuclear reactor pressure vessels in nuclear reactors Doel 3 and Tihange 2 in Belgium. The vessels contain highly radioactive nuclear fuel cores and the failure of the components can cause catastrophic nuclear accidents, according to Greenpeace.

On 13 February 2015, two leading material scientists announced that the pervasive and unexpected cracking could be related to corrosion from normal operation, with potential implications for reactors worldwide. ... In reaction to the findings, the director-general of the Belgian nuclear regulator of the Federal Agency for Nuclear Control has said that this could be a problem for the entire nuclear industry globally. He added that the solution is to begin the careful inspection of 430 nuclear power plants worldwide.

On 15 February 2015, the nuclear reactor operator, announced that it would be prepared to "sacrifice" one of its reactors to conduct further destructive tests of the reactor pressure vessel for research. Several years ago, the operator dismissed the cracks as being the result of manufacturing problems during construction in the late 1970s in the Netherlands, but still failed to table evidence for this assumption.

The Belgian regulator also stated that the most likely cause was manufacturing, but could not prove it and added that it may be due to other causes. The recent announcements of the materials scientists, indicate that this problem could be far beyond manufacturing. If confirmed, it means that the safety of every nuclear reactor on the planet could be significantly compromised.

*Source: <http://www.wisconsin Gazette.com>, 17 February 2015.*

## **CANADA**

### **Bill Raising Nuclear, Offshore Liability Limits to \$1 Billion Reaches Third Reading in Senate**

The Senate recently tabled Bill C-22, the Energy Safety and Security Act, for third reading, with one Liberal senator vowing to vote against it because it would result in rate increases for nuclear liability insurance. "Right now, the annual insurance costs for Énergie NB Power are around \$65,000," Liberal Senator Pierrette Ringuette said Feb. 19.

**The absolute liability for nuclear operators would increase to \$650 million on royal assent of Bill C-22, which was passed by the House of Commons in 2014. It would gradually increase to \$1 billion three years after royal assent.**

If passed into law with no amendments, Bill C-22 would increase - from \$75 million to \$1 billion - the absolute and exclusive liability of nuclear operators in Canada, including those operating nuclear power plants. Three of Canada's nuclear generating stations (Pickering, Darlington and

Bruce) are in Ontario while Quebec's Gentilly plant was shut down in 2012.

"Currently nuclear operators pay between \$800,000 and \$1.2 million annually for their insurance coverage," Niall O'Dea, director general of the electricity resources branch at Natural Resources Canada's energy sector, said last December during hearings before the Senate Energy, Environment and Natural Resources committee. "We would be looking at that rising to between \$6 million and \$10 million annually for that \$1 billion in insurance coverage." O'Dea said at the time those numbers are "based on a multi-reactor design."

The absolute liability for nuclear operators would increase to \$650 million on royal assent of Bill C-22, which was passed by the House of Commons in 2014. It would gradually increase to \$1 billion three years after royal assent. ... Ringuette's Liberal colleagues in the House of Commons supported the bill last year, Geoff Regan, Liberal MP for Halifax West, told the commons in September.

... Bill C-22 also proposes to increase the absolute liability limits for some offshore petroleum producers, to \$1 billion, for damages from spills. The limit is currently about \$30 million in the Atlantic offshore area and \$40 million in the Arctic. ... Debate on Bill C-22 was adjourned Feb. 19 and it was not put to the Senate for a vote for third reading. "Before any offshore drilling or production can take place, companies have to prove that they can cover the financial liabilities and damages that may result from a spill," Natural Resource Minister Greg Rickford told the House of Commons last September.

"Currently the financial capacity requirements range from \$250 million to \$500 million, with \$30 million to be held in trust for working in the Atlantic offshore and \$40 million for working in the Arctic offshore. This deposit is held in trust by the offshore regulator as a letter of credit, guarantee, or bond. These amounts will increase to \$1 billion for financial capacity and \$100 million to be held in trust per offshore project. These are significant resources that I think go a long way to help build public confidence."

For nuclear operators, at least 50% of their liability will have to be covered by an insurer approved by the federal natural resources minister, while those operators would be allowed to cover up to 50% of their liability with "an alternative financial scheme" - such as assets, provincial loan guarantees or letters of credit - said David McCauley, director of the uranium and radioactive waste division at Natural Resources Canada's energy sector, the Senate committee hearings last December.

Source: <http://www.canadianunderwriter.ca>, 23 February 2015.

## **NUCLEAR WASTE MANAGEMENT**

### **JAPAN**

#### **Government Explores Options on How to Store Nuclear Waste in the Long Term**

The government said it will consider pursuing a final storage site for nuclear waste that can be opened in the event that policies change or better techniques become available to deal with it. Officials aim to include the plan in a revised basic policy on the final disposal of highly radioactive waste. The government is currently considering the vexed question of what to do with waste in the long-term, as some of it may need management for tens of thousands of years.

Prime Minister Shinzo Abe's administration wants to fire up nuclear reactors again following the hiatus caused by the 2011 Fukushima meltdowns, but public opinion remains opposed. Critics accuse the government of pushing a return to nuclear without answering the question of where the waste will go.

Also the Science Council of Japan, a representative organization of various scientists, rapped the government's stance as "irresponsible," urging it and power companies to develop concrete measures for handling nuclear waste as a prerequisite for restarting reactors. To fend off such criticism, the revised policy will also declare that the "current generation" is not only responsible for generating the waste it will also take action on the storage question. However, it falls short of mentioning a time frame for deciding on the final storage.

Finland is currently constructing the world's first disposal facility for high-level radioactive waste.

**For nuclear operators, at least 50% of their liability will have to be covered by an insurer approved by the federal natural resources minister, while those operators would be allowed to cover up to 50% of their liability with "an alternative financial scheme" - such as assets, provincial loan guarantees or letters of credit.**

**Finland is currently constructing the world's first disposal facility for high-level radioactive waste. It decided in 2000 that the repository, in Olkiluoto, should be designed in a way that grants future generations access, while ensuring long-term safety.**

It decided in 2000 that the repository, in Olkiluoto, should be designed in a way that grants future generations access, while ensuring long-term safety.

As for how Japan would store its waste, a policy adopted in 2008 envisions reprocessing the waste, then vitrifying it and placing it deep underground. But the revised policy is expected to leave open the possibility of other methods, too, including the direct disposal that has been opted for by Finland, Sweden and the United States.

This implies a possible review of Japan's long-standing but stalled policy of a nuclear fuel cycle that aims to reprocess all spent fuel and reuse the extracted plutonium and uranium as reactor fuel. It would take a long time to build such a facility. Therefore the government is also seeking to expand storage capacity by constructing new interim facilities as a temporary fix. The revised policy will be adopted by the Cabinet by the end of March.

METI has proposed introducing a system in which the Japan Atomic Energy Commission, a promoter of nuclear power, acts as a third party in the choice of a final disposal site. But some experts who attended the ministry's panel meeting questioned that organization's independence.

The process of finding local governments willing to host a final repository started in 2002, but there was overwhelming opposition and little progress was made. The government now plans to choose candidate sites based on their scientific value, rather than waiting for municipalities to step forward. The Science Council of Japan also suggested that waste be temporarily kept in above-ground dry storage for 50 years in principle, during which the government should try to build a consensus on the issue. It also called for national

discussions on how to curb, or setting limitations, on the amount of nuclear waste to be generated.

*Source: The Japan Times, 17 February 2015.*

## **RUSSIA**

### **Russia Makes Progress with Radwaste Data Management**

Russia has introduced an automated system for the accounting and control of its radioactive substances and waste that encompasses more than 2000 organizations. The system follows an order by state nuclear corporation Rosatom, 113 subsidiaries of which account for 96% of the country's radioactive substances and waste. The system automates the collection and monitoring of the availability, production, transmission, receipt, processing, conditioning, siting and deregistration of radioactive substances and waste, as well as their changes in status, properties and location.

**The system follows an order by state nuclear corporation Rosatom, 113 subsidiaries of which account for 96% of the country's radioactive substances and waste. The system automates the collection and monitoring of the availability, production, transmission, receipt, processing, conditioning, siting and deregistration of radioactive substances and waste, as well as their changes in status, properties and location.**

The next step will be to move the system to a modern IT platform, Rosatom said. Work on this is actively underway and the corporation has decided to put the new platform into trial operation at 12 organizations. These trials will determine how the system is spread out to the rest of Rosatom and other Russian entities. Such an improved system consists of two parts, Rosatom said. The first is autonomous, with the possibility of local and network data processing, and the second is central, implemented as an integrated multi-user solution. The system features advanced functions for referencing and analysing data.

Full implementation of the system is scheduled for late 2015. Oleg Kryukov, Rosatom's director of public policy for radioactive waste, used nuclear fuel and decommissioning of nuclear and

radioactive facilities, said in a statement on 19 February that the system is needed for the implementation of a Russian government decree on the procedure for state registration and control of radioactive waste.

Plans for disposal of low- and intermediate-level wastes are to be in place by 2018. It is expected to establish repositories for 300,000 cubic metres of low- and intermediate-level radioactive waste,

and an underground research laboratory in Nizhnekansky granitoid massif at Zheleznogorsk near Krasnoyarsk for study into the feasibility of disposal of solid high-level radioactive waste and solid medium-level long-lived wastes by 2021. A decision on final high-level radioactive waste repository is expected by 2025.

*Source: <http://www.world-nuclear-news.org>, 23 February 2015.*



Centre for Air Power Studies

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

Centre for Air Power Studies

P-284

Arjan Path, Subroto Park,

New Delhi - 110010

Tel.: +91 - 11 - 25699131/32

Fax: +91 - 11 - 25682533

Email: [capsnetdroff@gmail.com](mailto:capsnetdroff@gmail.com)

Website: [www.capsindia.org](http://www.capsindia.org)

**Edited by: Director General, CAPS**

**Editorial Team: Dr. Sitakanta Mishra, Hina Pandey, Arjun Subramanian P, Chandra Rekha, Debalina Ghoshal**

**Composed by: CAPS**

Disclaimer: Information and data included in this newsletter is for educational non-commercial purposes only and has been carefully adapted, excerpted or edited from sources deemed reliable and accurate at the time of preparation. The Centre does not accept any liability for error therein. All copyrighted material belongs to respective owners and is provided only for purposes of wider dissemination.