



NUCLEAR SECURITY



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

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OPINION – Manpreet Sethi

Same Age, Different Behaviour: Nuclear India and Nuclear Pakistan

On 11 and 13 May, India completed 18 years as a nuclear-armed state. A couple of weeks from now Pakistan will do so too. And yet despite sharing the same age as overt nuclear weapons states, the two countries are far apart in their understanding of nuclear issues and behaviours. Both have chosen dissimilar objectives for their nuclear weapons, are pursuing diverse capability trajectories, and projecting deterrence in disparate ways. As China continues to block India's entry into the NSG and seeks the same treatment for its 'all weather friend' Pakistan, it would be a good idea to understand some of these stark differences that undercut the very demand for uniform treatment.

The first and most evident difference lies in the purpose of the nuclear weapon in the national security strategies of the two countries. For India, the nuclear weapon performs a narrow, limited role of nuclear deterrence – to deter only the nuclear weapons of the other side. It is for this reason that acceptance of universal nuclear disarmament also comes naturally to India since if there were no nuclear weapons with the adversary India would not need such weapons

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either. For Pakistan, on the other hand, nuclear weapons serve the purpose of deterring India's conventional superiority. The Indian conventional strength bothers Pakistan because it fears its coming into play in response to its continued support for terrorism on Indian territory. In one sense then, the objective of Pakistan's nuclear weapons is to provide it with the space and the immunity to continue its policy of bleeding India through a thousand cuts while shielding itself against a conventional Indian response.

With the purpose of nuclear weapons being what it is, the second difference shows up in the

approach of the two to establish credible deterrence. Seeking to deter only the use of nuclear weapons, India has a strategy of deterrence by punishment whereby it eschews the first use of such weapons but promises punitive retaliation in case of their use by the adversary. NFU supported by massive retaliation is, therefore, the bedrock of Indian nuclear strategy. In contrast, the Pakistani nuclear strategy is premised on brinksmanship. It projects first use of nuclear weapons including their battlefield use, thereby threatening to take a conventional conflict to the nuclear level. This brinksmanship is projected through build up of 'full spectrum' deterrence - weapons of all yields, spread across all platforms, and from the tactical to the strategic type.

Given that Pakistan's deterrence strategy is premised on uncertainty and projection of quick nuclear escalation to deter an Indian conventional response to an act of terrorism traced back to the Pakistan deep state, the country believes in keeping the adversary unsettled. In its thinking, arriving at a modus vivendi with strategic stability is not desirable because the more stable the relationship, the more constrained is its policy of support to acts of terrorism. Stability at the nuclear level will concede space to India to conduct conventional war without the risk of nuclear escalation. So, while India desires strategic stability in order to rule out the possibility of inadvertent or mistaken nuclear escalation in case of crisis, Pakistan would rather raise this risk to have India cowering.

While Pakistan considers such a nuclear strategy justified given its threat perception of India as its foremost enemy, the problem lies in the risks it thence creates for regional and international security. The requirements of full spectrum deterrence and credible first use with TNWs will lead to larger and larger requirements of fissile material and delegation of nuclear command and control. While there are currently no international

treaties or regional/bilateral measures that hold Pakistan's hands on this, the fact of the matter is that a country as severely infested with terrorist networks as it is, the situation threatens to spill beyond the control of its own commanders, as much as beyond the region.

It would therefore behove China as also the rest of the supporters of granting equal treatment to Pakistan, to not encourage irresponsible nuclear behaviour and its attendant risks. India can manage without an NSG membership till such time as the members realise the futility of keeping a major nuclear player out of the arrangement, but do regional and international security have the luxury of repeatedly condoning dangerous behaviour and still expect consequences to turn out less dangerous? ...

Source: <http://www.ipcs.org>, 16 May 2016.

OPINION – Olga Olikier

No, Russia Isn't Trying to Make Nuclear War Easier

Somehow, the notion that Russia has lowered its nuclear threshold has become a truism in recent years. Analysts and officials alike repeat the conventional wisdom that Russia's doctrine is one of "escalate to de-escalate." They reference Russian development of small-scale nuclear weapons, or nuclear "scalpels," and Russian modernization more generally as evidence of the danger Russia poses. These arguments are used often, if not always, to indicate that the United States and its NATO allies should also consider lowering their nuclear threshold and/or developing new, smaller, more usable nuclear systems.

Having spent the last two decades studying the Russian armed forces, including Russia's nuclear capabilities, I have been surprised by these statements. They do not track with what I know of

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Russian nuclear strategy, nor with how Russians talk about it, for the most part. De-escalation strategies were all the rage in Russia in the late 1990s, but they'd largely gone away in recent years. So why do so many of my colleagues in the US believe in them? I decided to figure out what was actually going on.

With some help from Brina Malachowski, I traced the sources of these arguments and also sought to unpack what we do and do not know about Russian nuclear intentions. I wrote this up in a short report, available on the CSIS website. My conclusion is that the evidence for either "escalate to de-escalate" or micro-nukes is weak. Russia is certainly keen to remind the world (and especially the United States) that it is a nuclear power, and some of its politicians and pundits do this rather crudely at times, and intentionally so, but there is little evidence that Russia does not take nuclear weapons seriously, or that its threshold for nuclear use has truly been lowered. And if Russia is more eager to remind us all that it is a nuclear power, this stems not from its strength, but from its weakness, and specifically from its fear of US and NATO conventional superiority. All of this argues

not for lowering Western thresholds, which would suggest that the West doesn't share Russia's faith in its capabilities, but for playing to US and NATO strengths.

What is an "escalate to de-escalate" strategy? In the late 1990s, Russian analysts wrote about the small-scale use of nuclear weapons to demonstrate credibility and resolve in conflict and thus convince an adversary to stand down. This is neither an inherently nefarious or a new idea. It echoes Herman Kahn's writing on nuclear deterrence, to say nothing of some past US doctrines. From Russia's perspective, it was a

strategy of conventional weakness. Russian planners worried then, as they worry now, that a conventional conflict could escalate to nuclear use. They sought something to lower down on the

escalation ladder to show resolve, and, lacking conventional capacity, posited that smaller-scale nuclear use might just do the trick. This approach was tested in the 1999 Zapad military exercise, notably with a strategic bomber in a tactical role. It went no further. Reportedly, then President

Boris Yeltsin left the exercise indicating that its scenario was implausible, that Russia would not use nuclear weapons in this way. Shortly afterward, Russia, now under a new president, Vladimir Putin, took steps to start rebuilding its conventional capabilities.

Russia's conventional rebuilding moved in fits and starts, until Moscow's dissatisfaction with its performance in the Georgia war finally provided some real impetus for reform. And in the meantime, Russia tended to point to its nuclear capability as, at the least, a sign of its status and global importance, just as it had for years. More recently, in early 2010, there was talk that Russia

would, indeed, drop its threshold for nuclear weapon use, and possibly allow for "preemption." A new military doctrine was due, and officials hinted that it would include provisions for "preventive" nuclear strikes and deterring conventional

attack. But when the doctrine was issued, the threshold actually went up, not down. Russia's doctrine then, and now, as this language was reaffirmed in 2014, allows for nuclear weapon use "in response to the use of nuclear and other types of weapons of mass destruction against it and/or its allies, as well as in the event of aggression

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against the Russian Federation with the use of conventional weapons when the very existence of the state is in jeopardy.”

Doctrine may not always define what countries actually do. But it seems relevant that a higher threshold was put in place in 2010, when debates suggested a lower one might come, and remained in place in 2014, when Russia revised its doctrine in response to a worsening relationship with the United States and its NATO allies. This is not to say that de-escalation is entirely out of the picture for Russia. In fact, it has its proponents. But the fact that Russian analysts and even the occasional official advocate for it publicly indicates to me that it is not, in fact, current policy.

Official Russian doctrine, not “de-escalation,” also tracks best with the exercises that Russia carries out that involve its nuclear weapons. Almost all involve strategic, not tactical systems, and not strategic systems in a tactical role. They seem designed to test readiness and command and control, to maintain the capacity to deter a strategic attack. Two exceptions are particularly worth noting. Western sources report that Zapad 2009 involved a tactical nuclear strike on Poland. Russian sources do not say this, but it is worth recalling that this exercise took place before the 2010 doctrine was issued—and right in the midst of the debate over dropping the threshold. More recently, a NATO report indicated that Russian forces staged a “mock nuclear attack” by medium-range bombers on Sweden in 2013. This is mysterious and worrying, but without knowing more about the exercise and the event, difficult to judge.

Russian nuclear modernization is also proffered as evidence that Russia is planning on using nuclear weapons. Russia continues to modernize its strategic force. So does the United States. This does not indicate a drop in threshold. Russia has also seized on Western concerns about the dual-

capable nature of many of its newer systems, such as the Iskander missile, and started to play them up (indeed, many of Russia’s systems are dual-capable). But as of now, Russia’s nonstrategic nuclear munitions are, for the most part, stored far from delivery vehicles. In the meantime, these new systems, many of which have been in the works for decades and are only just now rolling off the assembly line, are being deployed in their conventional roles. And as for rumors of “nuclear scalpels,” those can be traced to some comments about possible future developments made at the turn of the century by former Russian Minister of Atomic Energy Viktor Mikhailov, who died in 2011.

Russia, like the US and China, is working on hypersonic weapons, and these may have a nuclear component. But little is known about the specifics of these systems, and their implications, as yet.

This is not to say that I don’t worry about Russian nuclear weapons and

posture. I do. I worry about three things. First of these is that Russian strategic posture continues to rely heavily on less survivable silo-based ICBMs. This, combined with its weakened early warning system, suggests to me a higher risk that Russia, which fears a surprise US attack, might erroneously think one is coming and launch those systems, which it would otherwise lose. This is a terrifying proposition.

Source: <http://nationalinterest.org/>, 23 May 2016.

OPINION – Olli Heinonen

Growth of Nuclear Energy: Issues in Safety, Safeguards and Security

Nuclear energy is seeing a revival post-Fukushima, with interest shifting away from Europe to Asia. As nuclear power use grows, so must the international community bear in mind the 3S – safety, safeguards and security.

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Latest projections show that global nuclear electricity generation is expected to almost double by 2040. While renewable energy sources are projected to be the world’s fastest growing energy source for electricity production between 2012 and 2040, nuclear energy is projected to become the third fastest growing sector after natural gas.

double by 2040. While renewable energy sources are projected to be the world's fastest growing energy source for electricity production between 2012 and 2040, nuclear energy is projected to become the third fastest growing sector after natural gas. Its share of total primary energy over this period will increase from four percent to six percent. According to the United States Department of Energy's Energy Information Administration, concerns over energy security and greenhouse gas emissions support the development of new nuclear generating capacity.

Big Shift from Europe to Asia: There is now a significant shift from Europe to Asia in nuclear energy generation. Asia is now the main region where nuclear generating capacity is growing significantly, driven by China's nuclear power projects. Specifically in Southeast Asia, Vietnam is set to commission its first nuclear reactor by 2025 while Indonesia and Malaysia have long been preparing for possible nuclear power generation.

In the context of Asia and Southeast Asian nations, observing transparency and strict monitoring of states' compliance to global nuclear 3S (safety, safeguards and security) regulations are becoming more important as more Asian states are planning to go nuclear. The region still has significant regional concerns over nuclear safety and security. For instance, there is still a tremendous need to educate more young professionals in the nuclear field, particularly nuclear safety and security.

Nuclear energy users – from electricity generators to companies desalinating water to establishments using radioisotopes - must

demonstrate that nuclear energy is safe, secure and do not contribute to nuclear proliferation. An important basic step is for states to adhere to the latest legal instruments on nuclear safety, security, and safeguards, as well as publicly demonstrate their full compliance with its requirements.

At the same time, nuclear vigilance and maintaining nuclear order goes far beyond signing on to international conventions. The nuclear disaster at Fukushima in March 2011 demonstrated the limitations of international safety monitoring mechanisms. One resulting lesson is the IAEA ongoing efforts to enhance Safety and Security Standards.

Nuclear Safety Post-Fukushima: The Action Plan on Nuclear Safety that the IAEA crafted in 2011 after the Fukushima disaster was another important mark. But much work remains to be done at nuclear installations and to ensure well functioning nuclear regulatory bodies. In the area of nuclear security, a more transparent international monitoring mechanism needs to be developed, even as the entering into force the amendment of the CPPNM

is a welcome step forward. In the field of nuclear terrorism, the ICSANT and the CPPNM are yet to be universally adopted and implemented.

Beyond international conventions and efforts made to secure them as basic compliant standards, the ultimate responsibility for nuclear safety and security continues to rest with individual states. Nuclear safety and security issues continue to paint a mixed picture. While progress and attention has been made to better address vulnerabilities and threats, the 2016 NTI Security Index concludes, inter alia, that the

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Nuclear use also means adhering to safeguards that ensures a purely peaceful application of nuclear energy. The IAEA, which holds the sole international responsibility to apply safeguards, has upgraded its safeguards approach as well as verification methods over the years. The Agency also publishes an annual Safeguards Implementation Report (SIR) that evaluates the performance of its member states and makes recommendations for improvement. The latest SIR has called for the enhancement of national nuclear regulatory bodies that are often found to lack adequate resources or authorities in carrying out its safeguards obligations.

Different but Mutually Reinforcing Roles:

While safety, security and safeguards have different roles, they also co-exist and are mutually reinforcing in many ways. Nuclear safety, security and safeguards are close 'triplets' that have synergetic effects on one another, and contribute to the efficiency and effectiveness of the overall nuclear order. For instance, near real-time nuclear material accountancy, together with monitoring systems, provide valuable information about the location and status of nuclear material. This in turn is useful for nuclear security measures. Similarly, such information serves to benefit nuclear safety by contributing as input to criticality controls and locations of nuclear materials. Currently, information on states' undertakings on nuclear safety, safeguards and security are scattered within various IAEA and other UN documents, including records of review meetings and the UN Security Council resolution 1540 committee. Such information is not only unthreaded, thereby

making it more difficult to present a holistic picture, but data provided is also often lacking in public assessments on the effectiveness and efficiency of those measures.

Need for Implementation Report on 3S: States can also further opt to make public their nuclear safety, safeguards and security regulations as well as other relevant information to build further confidence that the basic legal and regulatory framework for nuclear safety, safeguards and security is in place. This is particularly useful for states and region that are freshly embarking on nuclear power. The IAEA already supports its member states by conducting voluntary peer

reviews on various aspects of safety, safeguards, and security. Such reviews are helpful tools to both improve states' performance and also build confidence in a state's commitment to continuously meet its obligations under the various conventions and treaties.

Stepping up this platform by publishing the results of

such international reviews on a regular basis will help move up the transparency needle. Strengthening the nuclear 3S should be pursued as a work in progress that is seen to benefit the industry, nuclear users as well as its non-users. Nuclear incidents can range from accidents with localised radiological impact to large-scale nuclear terrorist attacks with transnational spillovers that jolt national and regional economy, security and psychology in ways that extend far beyond the mere physical fallout. To provide the international community with a full picture on the global status of nuclear safety, safeguards and security, the IAEA should be tasked to provide a biannual implementation report. Such a report would assess the effectiveness of states undertakings on the ground to ensure nuclear energy is used in a safe, secure and peaceful manner. The report should indicate where

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enhancements are required and suggest improvements taken by individual states or by the international community.

Source: <http://www.rsis.edu.sg/>, 24 May 2016.

OPINION – Kennette Benedict

Let Hiroshima Guide us Back to Nuclear Basics

President Barack Obama's visit to Hiroshima will demonstrate that the rivalries that lead to war do not last forever. In the years since US warplanes dropped atomic bombs on that city and Nagasaki in August 1945, Japan and the United States have become close allies. But the two nuclear weapons used at the end of World War II also heralded the beginning of a very dangerous era. It continues today, with an existing collective global supply of some 10,000 nuclear weapons, the United States and Russia spending billions of dollars to update their nuclear stockpiles, and India, Pakistan, and North Korea intent on building up their own arsenals.

It's tempting to say that the problem of nuclear weapons calls for fresh thinking, but in fact, some very useful ideas have been on the table—in some cases, unheeded—since the summer the United States dropped Little Boy and Fat Man, killing tens of thousands of women, men, and children in a flash. Even back then, Manhattan Project scientists at the University of Chicago were beginning to understand the enormous consequences of the new weapons and the challenges of managing their spread. In a report to US President Harry Truman in June 1945—two months before the United States dropped its bombs—scientist James Franck and others conveyed their concerns about how fear and national rivalries would lead to future nuclear arms races.

Early the next year, US Secretary of State James Byrnes directed a committee to study the problem of controlling atomic energy and weapons. In March 1946, it published the Acheson-Lilienthal Report on the International Control of Atomic Energy, named for Undersecretary of State Dean Acheson and David E. Lilienthal, chairman of the

five-man board that authored the report and soon-to-be head of the new US Atomic Energy Commission. The new report incorporated ideas from the earlier Franck document and informed US proposals to the newly formed United Nations Atomic Energy Commission.

One of the most remarkable things about the Acheson-Lilienthal report is that, for all the studies and treaties on nuclear weapons that have come since, its observations and proposals are still as sound as anything that has followed. It provides insights even now. The Acheson-Lilienthal recommendations follow from four basic observations. First, the nuclear bomb is like nothing else ever experienced, a fact that may seem obvious today, but that people were only just starting to grasp in the early aftermath of the bombings. It is a revolutionary weapon that can destroy cities, eradicate populations, and in sufficient numbers and lethality destroy Earth.

Second, the report pointed out that there could be no adequate military defense against nuclear weapons. That's because the destructive power of just one nuclear bomb is so great, only a shield that prevented every single nuclear-armed missile from hitting its target would suffice, and it's impossible to build such a shield.

Third, the report noted that no single country would be able to have a monopoly over nuclear weapons. The science upon which the release of atomic energy is based was known throughout the world, so all countries would be able to build these weapons of mass destruction unless methods were devised and incentives created to stop their spread.

Fourth, the report's most overlooked observation was that fears arising from national rivalries would result in great demand for international enforcement of nuclear arms agreements by police methods. These methods were bound to fail, the authors suggested, because they would generate resentment and the motivation to evade intrusive inspections.

The authors' solution to this "fatal defect" lay in creating an international organization under the

auspices of the newly created United Nations that would provide incentives for cooperating with other countries in research, monitoring, and ownership of nuclear materials. They wrote: It has become clear to us that if the element of rivalry between nations were removed by assignment of the intrinsically dangerous phases of the development of atomic energy to an international organization responsible to all peoples, a reliable prospect would be afforded for a system of security. For it is the element of rivalry and the impossibility of policing the resulting competition through inspection alone that makes inspection unworkable as a sole means of control. With that factor of international rivalry removed, the problem becomes both hopeful and manageable.

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As the Acheson-Lilienthal report makes clear, working together on nuclear science and technology can engender positive relations that support cooperation among nations, and reduce the need for nuclear weapons. Moreover, the authors suggest, a system of cooperative ownership of atomic energy that places nuclear material under international control would render the problem manageable.

Individual countries should take actions to reduce their dependence on nuclear weapons; they provide only an illusion of national security in any event. But we also must find a way to supersede the rivalry and fear that tempts political leaders to acquire nuclear weapons in the first place.

Unfortunately, these proposals fell victim to suspicions and rivalry between the United States and the Soviet Union in the early days of the Cold War. But one suggestion did eventually come to fruition: Partly in response to Eisenhower's Atoms for Peace proposal in 1953, the IAEA was later established to serve countries interested in developing civilian nuclear energy resources.

As it has evolved since its founding in 1957, the IAEA has made good on two of the Acheson-Lilienthal report's consequent recommendations:

The Agency provides ongoing opportunities for cooperative research on nuclear energy uses in medicine, industry, and agriculture, and it engages in "police-like" inspections. It has not succeeded, however, in one of its other recommendations—that is, in controlling uranium fuel supplies through an international bank jointly controlled by all nations.

Such an ownership mechanism would provide enriched fuel for civilian energy and preclude its use in nuclear weapons. (Currently an IAEA fuel bank for low-enriched uranium is under construction in Kazakhstan, but it is unlikely to prevent all nations from enriching their own fuel.)

As many experts suggest, individual countries should take actions to reduce their dependence on nuclear weapons; they provide only an illusion of national security in any event. But we also must find a way to supersede the rivalry and fear that tempts political leaders to acquire nuclear weapons

in the first place. The Acheson-Lilienthal report provided a foundation for doing just that, but the full architecture of cooperation that it called for hasn't been realized. Obama should use his time at Hiroshima to provide blueprints that reinforce and build on the

original plans, urgently calling for the international control of all fissile material.

Source: <http://thebulletin.org/>, 24 May 2016.

OPINION – K.S. Parthasarathy

When Chernobyl's Radioactive Residues were Thought to be in Mumbai's Butter

On April 26 this year, the nuclear industry solemnly observed the 30th anniversary of the catastrophic accident at the Chernobyl nuclear power plant. While the show was on, Associated Press reporters refused to drink freshly drawn milk that a farmer

from Belarus had offered them, as they suspected it contained Chernobyl's radioactive residues. They tested a sample and found that the strontium-90 level in it was 10-times above the country's safe limit. And their finding that Belarus exports such contaminated products to Russia did not set the Volga on fire. The AP reporters' plight reminded me of India's trust with Chernobyl's radioactive residues in Mumbai in the 'Irish butter case'.

In 1987, there were reports that the fallout from Chernobyl had shown up in foodstuffs in various countries. Taking into account the possible health impact of contaminated food items, the AERB prescribed permissible levels of radionuclides in imported food items. Incidentally, it was the first major policy decision the AERB had taken since the government had set it up, in November 1983.

Initially, there were low-decibel murmurs that the AERB had no authority to fix the safe limits of radioactive substances in foods. But mercifully, the critics were neither stubborn nor persistent.

For many years before the Chernobyl accident, artificial radionuclides such as caesium-137 from the atmospheric testing of nuclear weapons had been present in milk and other dairy products, as well as in food items. From the mid-1950s, the BARC has been operating a network of monitoring stations nationwide for measuring radioactivity in food items. The technical competence for such measurements already existed in the country.

Some of us felt that the AERB could prescribe the limits straight away as well as recognise the

laboratories of BARC at Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam, the Variable Energy Cyclotron Centre (VECC), Calcutta, and one in Trombay to test for radioactive substances in

samples of imported food items and issue certificates. Our refrain was this: Who else in the country could adjudicate on matters related to radiation and radioactivity?

Subsequently, A.K. De, the first chairman of the AERB and a true academic (he was director, IIT Bombay)

with an open mind, proposed that we should call a meeting of specialists, hold discussions with them, submit our views and arrive at a consensual decision.

And so we invited representatives from the ministries of agriculture; food and civil supplies; health and family welfare; commerce; environment and forests; and also from the Bureau of Indian Standards, Marine Products Export Promotion Authority, the Export Inspection Council,

Tea Board, Indian Dairy Corporation, National Institute of Nutrition, Consumer Guidance Society of India, research institutes dealing with food technology, fisheries and toxicology. The meeting represented virtually all stakeholders except caterers!

The board proposed conservatively that it might allow only 0.1 mSv per year (10% of the dose-limit

prescribed by the International Commission on Radiological Protection) from the ingestion of food. The sievert is a unit of effective dose: in one Sv, the radiation energy absorbed is one joule per kg. Since Sv is a large dose, scientists normally use milliSv, one-thousandth of a Sv.

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Considering how much meat, milk, cereals and vegetables an average Indian consumes, and making use of the dose conversion factors (from sieverts to becquerels), the AERB arrived at the permissible levels of important radionuclides such as strontium-90 and caesium-137. The values endorsed by the specialists were 30 becquerels per litre for caesium-137 in milk, and 40 becquerels per kg for solid food products (meat, cereals and vegetables). For strontium-90, the board agreed on 10 becquerels per litre for milk and 15 becquerels per kg for solid foods. The scientists S.D. Soman, S. Subbaratnam, K.C. Pillai and U.C. Mishra played key roles in arriving at the values of these levels.

The delegates then visited the BARC labs and learnt how they and other accredited labs assessed radioactivity in food samples (one delegate wanted to know whether children would become sources of radiation if they ate tainted chocolates every day for 15 to 20 years; her concern was about chocolate imported from Europe).

Slowly, but surely, we proved that we radiation protection specialists were especially talented at making harmless levels of radioactivity sound dangerous by offering very accurate explanations. And the situation became more confusing as more specialists joined the discussion. It is unfortunate that many competent scientists are poor communicators.

Finally, we explained the difference between biological half-life (for caesium-137, 70 days) and physical half-life (30 years) of a radionuclide. If one consumes foodstuffs contaminated with caesium-137 at a constant concentration daily, the activity will reach a steady value in about 100 days. Thereafter, it will not increase further. Radioactivity does not steadily accumulate in the body because the body regularly removes a part of the offending substance from itself.

Our explanations were able to satisfy the distinguished delegate, Dr. (Mrs.) Kamala Sohoni,

a former director of the Institute of Science, Mumbai, and then in charge of the testing lab of the Consumer Guidance Society (who also asked the questions on chocolate). She was generous to our faults and happy about the transparent, scientific deliberations at play in the meeting. "When I did my Ph.D. in Biochemistry from Cambridge during the late 1930s, radioactivity was not a part of the curriculum", she clarified. We had every reason to be humble before such delegates.

The first time the AERB implemented its new policy was in the 'Irish butter case'. In this case, three petitioners who were office bearers of the Maharashtra State Employees Federation filed a writ petition in the high court of Bombay against the Union of India, the Indian Dairy Corporation;

the dairy development commissioner; the general manager, Greater Bombay Milk Scheme; and the Bombay Municipal Corporation.

The petitioners wanted the court to issue an appropriate order

restraining the respondents from importing any milk or milk products, and butter in particular, from Ireland. They argued that any food articles imported from some countries in Europe, including Ireland, after the Chernobyl disaster stood to contain radioactive substances and so its consumption by Indians would be harmful in the long-term.

A division bench of the high court rejected the petition, saying that they "are satisfied that the best scientific brain available in the country has applied itself to the question". At one stage, the court felt disturbed about the concept of the 'permissible limit' and wanted to know the basis on which limit had been determined. The court also wanted to know whether natural foods were also radioactive in normal circumstances.

The court relied on a letter that I'd written as the secretary, AERB, to the National Dairy Development Board as it furnished answers to

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their questions. I included a paper by B.Y. Lalit and his colleagues that presented the amount of radioactive content in many food items, including rice, wheat, brinjal, carrot, coffee, etc.

Having lost their case, the petitioners filed a special leave petition in the Supreme Court, which heard both sides and then set up a committee of three experts – comprising M.G.K. Menon, P.K. Iyengar and G.V.K. Rao – to give its opinion on whether dairy products and other food items containing artificial radionuclides contained them within the AERB-prescribed limits.

After due deliberations, the committee stated that the consumption of those items having levels of artificial radionuclides below the levels fixed by AERB, by all sections of the population and throughout the year, was safe and harmless, via a report in February 1988. The committee also noted that the AERB has allowed more safety margins than other countries and international organisations, like the WHO, in arriving at the levels. Finally, the committee acknowledged that the levels adopted by AERB were among the lowest in the world.

In reply, the petitioners' counsel read out letters penned by some internationally renowned scientists, including a few Nobel laureates, that suggested it was better to avoid foodstuffs containing even low-level activity and which, according to them, could prove to be hazardous in the end. However, the SC dismissed the petition once more, saying, "What is remarkable about these letters is that they are in general terms and only represent a particular school of thought. Surely, the committee of experts comprising two eminent scientists and an equally well known agro-economist was well aware of this point of view."

While the case had been on, Prof. AK De, S.D. Soman and I had participated in a discussion titled

'Radioactivity in food' on the TV channel Doordarshan, Mumbai. We ignored an opinion that we were in contempt of court as the case was still sub judice. And once the SC had rejected the writ petition, the government dairies sold 78 tonnes of butter stored in the deep freeze.

Many companies exporting or importing food want certificates; it is now a routine procedure. BARC earned an income to the tune of over Rs.30 lakh in one year as fees to measure radioactivity in food samples at a rate of Rs.500 per sample. Some humourless persons even kept asking what BARC does with the whiskey samples. And for its part, the AERB has now recognised many more radio-analytical labs, though no one ever wants another Chernobyl.

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Guidance from some of the outstanding specialists who are members of the AERB helps the board secretariat remain scrupulously impartial and transparent in its decision making process. The majority of members continue to be from outside

the Atomic Energy Commission family.

Source: <http://thewire.in/>, 24 May 2016.

OPINION – The PTI

Nuclear Pakistan has Destabilising Effects: US Expert

Nuclear weapons in Pakistan's hands have "corrosively destabilising" effects in the region and provide a license for the country's sub-conventional wars against India, a top American expert has said. "Unfortunately nuclear weapons in Pakistani hands have had larger and more corrosively destabilising effects: they have enabled Pakistan to pursue its revanchist aims of recovering the disputed state of Jammu and Kashmir by force, or more specifically, by unleashing state-supported terrorism against India in the hope of weakening Indian control over the contested territories," said Ashley Tellis from

Carnegie Endowment for International Peace.

In an interview to *The Cipher Brief*, Tellis said this stratagem is based on the assumption that India will be unable to retaliate against Pakistan conventionally for fear of sparking a nuclear holocaust. "Pakistan's nuclear weapons, then, are intended not merely to provide deterrence against Indian attacks, but more ambitiously, a license for Pakistan's sub-conventional wars against India," Tellis said in response to a question. "This behaviour, flowing from Pakistan's possession of nuclear weapons, is what makes deterrence in South Asia more unstable than it would otherwise be— if Pakistan's strategic objectives were as conservative as India's," he said.

This dynamic, in its totality, suggests that India's approach to nuclear deterrence is closer to that of the United States: both nations view their nuclear weapons primarily as deterrents against nuclear attacks by others, he observed. "Pakistan's behaviour, however, exemplifies nuclear coercion rather than simply deterrence: to that degree, it mimics Russian behaviour more than it does the US practice of deterrence," Tellis said.

In a separate paper, Will Edwards, International Producer with *The Cipher Brief*, said Pakistan has long viewed nuclear weapons as a hedge against Indian aggression in disputed territories and a counterweight to India's conventional military superiority. The difference is that now Pakistan has chosen to outstrip India's nuclear forces by drastically increasing fissile materials production and to employ smaller, tactical nuclear devices in a bid to counteract India's widening conventional supremacy, he wrote. Currently, Pakistan out produces India in fissile material at a ratio of 4:1. In terms of estimated warhead production, Pakistan can produce anywhere from 14-27 warheads annually, whereas India can only produce 2-5 warheads per year, he said.

Source: *The Indian Express*, 26 May 2016.

OPINION – Kunal Singh

Pakistan's Tactical Nukes, India's Strategic Dilemma

For someone who does not follow nuclear warfare tidbits, it would not make much sense that low-yield and short-range nuclear weapons of Pakistan could cause more headache for strategic thinkers in India than high-yield and long-range nuclear weapons. A recent paper by two scholars—Toby Dalton and George Perkovich—of the Carnegie Endowment for International Peace dilates on, among other issues, this very dilemma of Indian thinkers and policymakers.

The Indian official response has been unstintingly obdurate and has refused to draw a line between tactical and strategic nuclear weapons of Pakistan.

Shyam Saran, India's former foreign secretary and then convener of the NSAB, said in 2013, "A limited nuclear war is a contradiction in

terms. Any nuclear exchange, once initiated, would swiftly and inexorably escalate to the strategic level." And hence, India's response to a nuclear attack—strategic or battlefield—"will be massive and designed to inflict unacceptable damage on its adversary". This rigid articulation notwithstanding, Indian policymakers have wrestled with this question especially since Pakistan tested Nasr, which reportedly has an operational range as low as 60km. Shivshankar Menon, who was serving as India's national security adviser in 2011 when Pakistan tested Nasr, told me—and I can say it here because this discussion took place in an open-to-public forum—that Indian decision-makers did indeed took cognisance of these developments but decided not to flirt with the language of India's nuclear doctrine.

Dalton and Perkovich have rightly pointed out that a report drafted by NSAB and released by the Indian government in 1999—long before Saran served on the body—called for a "punitive

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retaliation” markedly different from “massive” retaliation articulated in the official release of the Indian nuclear doctrine by the Cabinet Committee on Security in 2003. The simple scenario is a terror attack on India leading to building up of domestic pressure on the government in New Delhi to teach Pakistan a lesson. The terror attacks are often, if not always, conducted with the involvement of the Pakistan army and the Inter-Services Intelligence, the rogue intelligence agency of Pakistan. India’s best option will be a conventional strike to achieve quick gains while staying well below what would make Pakistan uncork its strategic nuclear options.

It was to plug this possibility also enunciated in the Cold-Start doctrine—while as good as non-existent, this doctrine of the Indian army carries a lot of weight among policymakers in Pakistan—that Pakistan developed battlefield nuclear options and shifted to a strategy of “full spectrum deterrence”. While this line of argument was eloquently taken by General Khalid Kidwai, who served as Director General of Pakistan’s Strategic Plans Division for 15 years, at the 2015 Carnegie Nuclear Policy Conference, my personal assessment is that Cold-Start merely provided a cover for the military establishment to pursue their never-ending security goals vis-à-vis the Indian state.

Dalton and Perkovich are right when they argue that New Delhi acquiring tactical nuclear weapons is “unlikely to motivate Pakistan to demobilize groups that attack India”. They add, “If India does not intend to put military boots on Pakistani soil in response to a terrorist attack... then India has no need for tactical nuclear weapons.” But their argument that Indian tactical nuclear weapons will enhance the “use-or-lose pressures” on Pakistani military commanders isn’t very insightful. This use-or-lose pressure is already applicable in

ample measure on Pakistan regardless of whether India develops tactical nuclear weapons or not. If India faces a handicap in achieving limited gains even after a massive terrorist attack like 26/11, it is because of what S. Paul Kapur argued in his theory of “strategic pessimism”.

Kapur had argued that a territorially dissatisfied power, if conventionally weaker, will employ nuclear parity to engage in destabilising activities. And this is where Dalton and Perkovich contradict themselves, even if slightly. They argue that India appears to be falling behind Pakistan in both quantity and quality of nuclear weapons and delivery vehicles. They even go on to reduce the Indian conventional superiority to merely being something of an assumption “in the minds of

many analysts”. This should lead Pakistan to feel more secure and behave more responsibly. But Dalton and Perkovich agree that it doesn’t. Simply because it is a territorially dissatisfied power and it has successfully employed the “Madman Theory” of former US President Richard Nixon. Another contradiction: Dalton has previously, along with co-author Michael Krepon of

Indian tactical nuclear weapons will enhance the “use-or-lose pressures” on Pakistani military commanders isn’t very insightful. This use-or-lose pressure is already applicable in ample measure on Pakistan regardless of whether India develops tactical nuclear weapons or not. If India faces a handicap in achieving limited gains even after a massive terrorist attack like 26/11, it is because of what S. Paul Kapur argued in his theory of “strategic pessimism.”

the Stimson Center, argued that the Pakistani establishment should recognise “that additional nuclear firepower does not provide military or diplomatic utility against a stronger adversary”. Doesn’t quite fit with what Dalton and Perkovich now say.

While Dalton and Perkovich have covered a range of issues from ballistic missile defence to the role of China, I will end by making one observation on the points they make on India’s NFU policy. They mention some voices which recommend India to introduce “additional ambiguity” in its NFU policy for that would “enhance the perceived credibility of India’s deterrence against a first strike”. Though Dalton and Perkovich do not endorse such proposals, the two could have outlined the

problems that could come up with changes in India's NFU policy. It is here that the danger of use-or-lose pressures beginning to alter Pakistan's behaviour is most credible. Any alteration in NFU policy will send the wrong signals of India's nuclear intentions.

On the contrary, changes in "massive" retaliation posture to one which calls for more flexibility in response to tactical nuclear weapons—and I have argued for this before—might indeed open a window of stability

for a limited duration. This change might signal to Pakistan that India is willing to deliver a proportionate or proportionate-plus response to Pakistan's tactical nuclear weapons and hence it is also willing to drop the traditional caution in responding to 26/11-type terror attacks emanating from Pakistan's soil. If India chooses to change from its current posture of massive retaliation, it will have to judiciously plan for this window of stability by building capability in advance and using the window to signal credibility. Otherwise, the window will cease sooner than later as India's bluff—of credibly responding to terror attacks—will be called out.

Source: <http://www.livemint.com/>, 26 May 2016.

OPINION – The Economist

By the Rockets' Red Glare

In January North Korea detonated a nuclear device underground, its fourth such test and the first, it claimed, to show that it could build a thermonuclear weapon. In February it successfully launched a satellite. It has since been testing missile technology at a hectic pace. In March, its leader, Kim Jong Un, posed with a model of a

nuclear weapon core and the re-entry vehicle of a long-range missile. On May 7th he told the congress of the Korean Workers' Party in Pyongyang that his nuclear-weapons and missile

programmes had brought the country "dignity and national power". He boasts of his ability to "burn Manhattan down to ashes".

The nuclear test, most experts believe, did not in fact demonstrate the ability to build a thermonuclear hydrogen bomb. The satellite does not seem to be working. Some of the

missile tests failed. Mr Kim says a lot of nasty things. But there is a limit as to how much you can downplay this sequence of events. As Mark Fitzpatrick of the IISS, puts it: "Just because Pyongyang wants us to pay attention, that doesn't mean we shouldn't."

It is always tempting for America and other countries to put North Korea's nuclear ambitions on the back burner of policy priorities, in large part because of a chronic absence of good options for dealing with them. But only an extreme optimist can today doubt that North

Korea has developed missiles that threaten not just its southern neighbour but also Japan and, soon, the American base on Guam. Many experts, such as John Schilling, who writes about missile technology at 38 North, a website on North Korea run from Johns Hopkins University, believe that North Korea is on track to have a nuclear-capable missile with the range to reach the continental United States by early next decade—which is to say, within America's next two presidential terms. Stopping that from happening needs to be a front-burner priority.

The history of unsuccessful responses to North Korea's nuclear ambitions began in 1994, after Mr

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Kim's father, Kim Jong Il, had threatened to pull out of the NPT. The Clinton administration promised him two proliferation-resistant reactors—that is, reactors from which North Korea would not have been able to derive weapons-grade nuclear material—economic aid and an easing of sanctions if he agreed to freeze and then dismantle the country's nuclear-weapons programme. This "Agreed framework" collapsed in 2002 when evidence of North Korean cheating became impossible to ignore. North Korea duly quit the NPT.

The next diplomatic efforts were the "Six-party talks", which included China, Japan, Russia and South Korea as well as America and North Korea. They appeared to bear fruit in 2005 when America confirmed its recognition of North Korea as a sovereign state that it had no intention of invading, and North Korea agreed to return to the NPT, thus putting all its nuclear facilities under the oversight of the IAEA, and to forsake "all nuclear weapons and existing nuclear programmes".

So Different from Iran: Despite North Korea carrying out its first nuclear weapon test in 2006, the six-party-talks process somehow limped on until April 2009. Then, over a period of little more than seven weeks, North Korea tried to launch a satellite with a three-stage Unha-2 rocket in defiance of UN Security Council Resolution 1718, chucked IAEA inspectors out of its Yongbyon reactor complex and carried out a second underground nuclear test. Since then it has been pretty much downhill all the way. A final attempt at a deal based on aid in exchange for a testing moratorium in early 2012 was stillborn when North Korea announced a new missile launch only a fortnight later.

Faced with such a record of duplicity and intransigence, Barack Obama had apparently long since concluded that if he was to achieve anything in the sphere of nuclear non-proliferation, Iran offered at least a chance of success; with North Korea there was virtually none.

It was a cool calculation typical of the president. For a start, North Korea was a lot further down the road to a nuclear-weapons capability than Iran, which had remained within the NPT and was still a few years from being able to test a device. And Mr Obama realised there was also much more leverage to be had over Iran than North Korea. Bill Clinton had come close to authorising an air strike on Yongbyon in 1994, but pulled back in the belief it would trigger a new war on the peninsula that, by some estimates, could cost a million lives. After the nuclear test in 2006 the military option was off the table for good. That

was never true of Iran. The Iranian leadership could not fully discount the threat of a pre-emptive strike by either Israel or America.

Sanctions were also a much more potent weapon against Iran than they ever could be with North

Korea. Iran was vulnerable because it is dependent on oil and gas exports. And even though the country is only minimally democratic, its leadership has to pay attention to falling living standards and the anger they can bring. That helped make the removal of sanctions a greater priority than pressing ahead with the nuclear programme.

By contrast, sanctions have had a relatively low impact on North Korea's closed economy. In large part that is because 90% of the trade it does is with China, which refuses to cut it off because of fears that a subsequent economic collapse would bring with it a torrent of refugees and the demise of a useful buffer against a close American ally. Nor does Mr Kim have to worry much about the political consequences of hardship for his people. So effective is the regime's brutal system of control—anyone suspected of disloyalty may be killed or banished to a frozen gulag—that there was little sign of dissent even when hundreds of thousands died of starvation during the 1990s.

Lastly, Iran always (if implausibly) denied that it

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was seeking the capability to make nuclear weapons—the supreme leader Ali Khamenei even issued a fatwa that described possessing nuclear weapons as a “grave sin”. Mr Kim believes that nuclear weapons are essential. Like his father before him he has built them into the national narrative and iconography, seeing them as fundamental to the dynasty’s survival. Even without nuclear weapons, Iran is a regional power that America has to take seriously. North Korea has no other claim to fame except its nastiness. Its ruler sees nuclear weapons as the key to gaining the respect he demands from the outside world. They are not bargaining chips to be traded for other benefits.

You can Observe a Lot Just by Watching: That is why the evidence of an almost manic amount of nuclear-weapons-related testing since January is so alarming, and why interpreting what it means both in terms of political signalling and technical progress has become urgent. Gary Samore, Mr Obama’s arms-control adviser until 2013 and now research director at Harvard’s Belfer Centre, cautions how little outsiders really know for sure about North Korea’s capabilities. Jonathan Pollack, a Korea expert at the Brookings Institution, agrees the data are limited. Nevertheless, he says: “In the words of Yogi Berra, you can observe a lot by watching.”

David Albright, the president of the Institute for Science and International Security, a think-tank, and a former IAEA inspector in Iraq, has carried out detailed analysis of what is known of North Korea’s capacity to reprocess plutonium and enrich uranium. If North Korea is producing bombs similar in yield to the one that America dropped on Hiroshima—that is, of 10 to 20 kilotons, which would be small by modern standards, but would therefore require less-capable missiles for their delivery—his central projection is that it can produce enough fissile material for around seven

warheads a year and that its current stockpile is about 20.

Mr Albright, like most analysts, is deeply sceptical that the device tested in January was, as Mr Kim claimed, a true hydrogen bomb. In hydrogen bombs a “primary”, which gets its power from nuclear fission in uranium or plutonium, sets off a “secondary”, which gets its power from the fusion of deuterium and tritium. Such bombs have yields in the hundreds of kilotons, or megatons. Estimates based on seismology suggest this year’s test, like its predecessors, had a yield of

no more than ten kilotons, though the fact that the bomb was more deeply buried than the first three suggests its makers may have expected something bigger. Mr Albright suspects the engineers were trying a technique developed by South Africa’s defunct nuclear programme in which a lithium, deuterium and tritium tablet at the centre of a fission device boosts its yield with a bit of fusion.

The next issue is whether the North Koreans have graduated from devices that can be tested to devices that can be fitted

onto either its existing medium-range Nodong missile (developed from the Soviet-era Scud C) or its two missiles under development, the Musudan IRBM and the KN-08 ICBM. Mr Schilling thinks that they would not have carried out four nuclear tests on something they did not think they could deliver. On March 9th, Mr Kim was photographed paying a visit to what may have been the Chamjin missile factory outside Pyongyang. In a hall packed with several ballistic missiles, Mr Kim posed beside a plausible-looking re-entry vehicle that would be consistent in size with a fission device about 60cm in diameter and weighing up to 300 kilograms. Both American and South Korean officials are convinced that North Korea can indeed make a warhead small enough to fit on the Nodong, which can reach targets in Japan, including American bases

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A further question concerns the re-entry vehicle Mr Kim was proudly showing off: would it survive its passage through the Earth's atmosphere? Until recently, Western intelligence believed that North Korea had not yet mastered this technology. But on March 15th pictures appeared in the North Korean media of what appeared to be a nose-cone from a KN-08 placed on an engine test stand one and a half metres beneath an ignited Scud rocket motor. Another picture (above, right) showed Mr Kim examining the re-entry vehicle after it had seemingly passed its test.

Another ground test on April 9th has, according to Mr Schilling, put to rest any doubts about North Korea's ability to build an ICBM sooner rather than later. Two engines from Soviet-era R-27 submarine-launched ballistic missiles were coupled together to provide the propulsive power and range for a warhead carried by a KN-08 to hit the east coast of the United States. It is not known how many R-27s North Korea has, but up to 150 went missing from Russia in the post-Soviet 1990s. Mr Schilling reckons flight testing of a KN-08 enhanced in this way could begin soon, leading to a "limited operational capability by 2020".

Other recent tests include a large solid-fuelled rocket motor of the kind needed to launch a mobile medium-range missile at very short notice (liquid-fuelled rockets, like those on the KN-08, take much longer to prepare for flight and are harder to move around) and the launch of a ballistic missile apparently from a submerged submarine in late April.

Not all North Korea's tests meet with success. Three recent test fires of the Musudan flopped. Michael Elleman, a missile expert at the IISS, speculates that perhaps the missiles were solid-fuelled and the engines still at an early stage of development. Mr Elleman reckons that getting the Musudans working, and thus being able to threaten the American base in Guam over 3,000km

away, must be a priority. He cautions that a string of failures is not grounds for optimism; the North Korean approach is to try it, find out what went wrong, find a fix and then validate it. "Their systems never work first time," says Mr Schilling, "but they persevere."

Some of what Mr Fitzpatrick describes as "this extraordinary amount of activity" may have been related to the seventh congress of the Workers' Party, a sanctification of Mr Kim's leadership. A less frenzied pace of testing may now resume. Since 2013, Mr Kim has talked of his byungjin policy of combining nuclear deterrence with economic development. Mr Pollack says that if Mr Kim wants the sort of bells-and-whistles deterrent deployed by the large nuclear powers,

These latest sanctions reflect China's increased willingness to co-operate with America and others on North Korea.... Still, unlike the sanctions on Iran, those on North Korea remain focused on hobbling the nuclear programme and denying luxury goods to Mr Kim and his cronies, rather than on damaging the general economy.

with submarine-launched and mobile missiles, the ruinous expense would make such a policy impossible. If, on the other hand, Mr Kim just wants what Mr Pollack calls a "don't fuck with us" deterrent—one that keeps outside powers from interfering with his

regime—he probably has one now.

Given what he has been testing, it seems likely that Mr Kim has his heart set on the former. His talk of economic reform—he laid out the first new five-year plan for decades at the congress—is short on specifics. If his enthusiasm for growth has led him to be worried by the supposedly tougher sanctions agreed to by the UN Security Council in Resolution 2270 on March 2nd in response to the nuclear test, he has shown no sign of it.

Deterrence, Defence, Despair: These latest sanctions reflect China's increased willingness to co-operate with America and others on North Korea.... Still, unlike the sanctions on Iran, those on North Korea remain focused on hobbling the nuclear programme and denying luxury goods to Mr Kim and his cronies, rather than on damaging the general economy. North Korea is free to buy

fuel oil and sell iron ore and coal as long as the revenues are not used to fund military activities. This is not a condition that can be practically enforced.

Chun Yung-woo, South Korea's former chief negotiator at the six-party talks and national-security adviser to President Lee Myung-bak until 2013, says that although China has toughened its stance towards North Korea, it has "not fundamentally changed its policy of putting stability before denuclearisation—it will only implement sanctions that are tolerable to North Korea". He hopes that the next American president, with support from Congress, will put China on the spot by applying a "secondary boycott" to any Chinese businesses trading with North Korea.

Another South Korean official, who talks regularly to the Chinese, is more sympathetic to their dilemma. The official says Beijing has been disturbed by an almost complete lack of communication with the

North Korean regime since Mr Kim executed his uncle, Jang Song Taek, in 2013. Jang was the one senior figure in Pyongyang with whom the Chinese had close ties. The Chinese are changing their tactics, if not their strategy, in response to what they see as continuing provocations, looking for a sanctions "sweet-spot"—harsh enough to change Mr Kim's mind but not so punitive as to risk the collapse of the regime. However, if Mr Kim believes he is now on the "home straight", his instinct may be to sprint for the finishing line and talk afterwards. Mr Chun thinks that North Korea will never denuclearise; if it agreed to stop testing it would be because it had achieved the nuclear power and status it craves.

The rest of the world will not agree to that. Still, Mr Fitzpatrick says that some kind of high-level engagement is overdue: he thinks it preposterous that the only American who knows Mr Kim is Dennis Rodman, a retired basketball player. Peace-treaty talks with North Korea to bring about a

formal end to the Korean war, he reckons, would not require recognition of North Korea's nuclear status and could be part of an agreement to freeze nuclear-weapons development.

Mr Samore thinks Mr Kim's behaviour may eventually exasperate China so much that it will bring into play sanctions which really hurt. In the absence of such leverage, though, the focus must be on strengthening deterrence and containment. That means resisting or defusing Chinese displeasure over the proposed fielding of the THAAD ballistic-missile defence system in South Korea. The Chinese oppose THAAD on the basis that its powerful AN/TPY-2 radar could undermine the effectiveness of their nuclear deterrent against America, a claim that Mr Samore rejects.

China fears that, over time, a regional network of anti-missile systems deployed by America's allies might come to threaten the deterrent effect of its relatively small strategic nuclear forces. In this instance that concern seems far-fetched.

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seems far-fetched. The THAAD system is designed to destroy missiles during the terminal phase of their trajectories, when they are coming back down; it can do nothing against missiles during their boost or midcourse phase, so Chinese missiles aimed at America would have nothing to fear from a THAAD battery in South Korea. Still, the Chinese claim to be worried that THAAD's radars, if used in "look mode" rather than "terminal mode", could reach deep into their territory.

Americans point out that using the radar that way would decouple it from the missile-defence system it was deployed with, which would defeat its purpose. More generally, they say that this is just something China will have to put up with. As America's defence secretary, Ash Carter, said April 2016: "It's a necessary thing. It's between us and the South Koreans, it's part of protecting our own forces on the Korean peninsula and protecting South Korea. It has nothing to do with the

Chinese." The message to China was clear: as you have done such a lousy job persuading your ally to rein in his nukes, you will have to accept the consequences.

Mr Elleman has calculated that, faced with 50-missile salvoes, a layered defence consisting of two THAAD batteries and South Korea's existing Patriot systems would be able to stop all but 10% of what was fired. He and Michael Zagurek, in a paper for 38 North, base their calculations on what is known in the jargon as "single-shot probability of kill" (SSPK). With two layers of defence, the SSPK of each interceptor need only be a bit over 0.7 for 90% of the incoming missiles to be destroyed.

That would be an impressively effective defence against conventionally armed missiles. But only one or two nuclear warheads need to get through for the casualties to be immense (420,000 killed and injured in Seoul for each 20 kiloton warhead, reckon Mr Elleman and Mr Zagurek). And if nuclear-tipped missiles were launched alongside or behind conventional decoys the system would be clueless as to which was which. If Mr Kim were to add submarine-launched missiles to his arsenal, defence would be harder still; they could be fired out of sight of THAAD's radar.

Like tougher sanctions, THAAD is well worth deploying. But neither can fully contain the threat. Nor is it certain that conventional deterrence (which rests upon the assumption that the regime to be deterred is sufficiently rational not to invite its own destruction) will necessarily work against North Korea. Another reason the Chinese give for their unwillingness to tighten the screw on the regime is that they

fear its imminent collapse could result in a last act of suicidal nuclear defiance by Mr Kim. That may just be what Mr Kim wants his adversaries to believe. But if it is a bluff, it is not one that anybody wishes to call.

Source: <http://www.economist.com/>, 28 May 2016.

BALLISTIC MISSILE DEFENCE

USA

Air Defense: European Ballistic Missile Defense Operational

Another reason the Chinese give for their unwillingness to tighten the screw on the regime is that they fear its imminent collapse could result in a last act of suicidal nuclear defiance by Mr Kim. That may just be what Mr Kim wants his adversaries to believe. But if it is a bluff, it is not one that anybody wishes to call.

Two years after the movement process began, the only land-based Aegis anti-aircraft/missile system in existence (in New Jersey) has been taken apart, packed into 60 large (40 foot) shipping containers and sent to Romania, where it has been be put back

together, tested and became operational in May 2016 as an anti-missile system. This took six months longer than expected but this was seen as a possibility because this was the first time land-based Aegis was disassembled and moved and then set up in a combat zone. The US is building two more ground-based Aegis systems; one in Poland and one in Hawaii. All three, including new Aegis components for two of them

and needed missiles (24 per location) and launching hardware for all of them will cost \$2.3 billion. That's nearly \$800 million per system.

The US also wanted to put silos for the GBI (Ground Based Interceptors) in Romania but Russia was very much against this as

they saw it as diluting the intimidation effect of their ICBM force. The GBI project was put on hold but may be revived. The GBI is a 12.7 ton ballistic

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missile that delivers a 64 kg (140 pound) "kill vehicle" that will intercept a ballistic missile before it begins its descent into the atmosphere. The GBI kill vehicle attempts to destroy the incoming missile, while avoiding decoys. The US already has GBIs deployed in Alaska and California. The GBI can receive target information from a variety of source, mainly a large X-band radar and space based sensors (that can detect ballistic missiles during their initial launch.) Each GBI costs over \$100 million (up to several hundred million dollars, depending on how many are built and how you allocated development costs.) The GBI can intercept ballistic missiles launched from as far away as 5,000 kilometers.

Back in 2010 Romania agreed to base American anti-missile systems on its territory. It was assumed this would include a land based Aegis system. At that time Israel also expressed an interest in buying a land based version Aegis, but that deal fell through. Since the land based Aegis in Romania will belong to the United States it was decided to use the development version of Aegis for this since it was always land based and was still operational. With so many Aegis systems at sea, development work can be done on one of those. When Aegis went live in Romania Russia protested and threatened Romania. For the Romanians, annoying the Russians is a bonus for a system that is there mainly to protect Europe from Iranian missiles.

The US has long sought to put anti-missile systems in Eastern Europe to protect against ballistic missile attacks from Iran. Russia has opposed this and sees it as a subterfuge to weaken the effect of Russian ballistic missiles attacking European targets. Most Europeans don't know what to make of that, but East European countries (like Romania) that spent 1945-89 as involuntary Russian vassal (or "satellite") states, do see a need for protection from Russian missiles.

So far, Aegis has achieved an 83 percent success

rate during live test firings. So now many countries want Aegis ABM ships for protection. The Aegis system was designed to operate aboard warships (cruisers and destroyers that have been equipped with the special software that enables the AEGIS radar system to detect and track incoming ballistic missiles). Currently, the US Navy has 30 ships with the Aegis anti-missile system. There are over 100 American and foreign warships equipped with Aegis, but less than half of them had the software mods and anti-missile missiles that enable them to shoot down ballistic missiles and low-orbit satellites. Converting an Aegis ship to Aegis ABM costs about \$15 million, mainly for new software and a few new hardware items. This is seen as a safe investment.

To knock down ballistic missiles, Aegis uses two similar models of the US Navy Standard anti-aircraft missile, in addition to a modified version of the Aegis radar system, which can now track incoming ballistic missiles. The anti-missile missile is the RIM-161A, also known as the Standard Missile 3 (or SM-3). It has a range of over 500 kilometers and max altitude of over 160 kilometers. The Standard 3 is based on the anti-missile version of the Standard 2 (SM-2 Block IV). This SM-2 missile turned out to be effective against ballistic missile warheads that are closer to their target. One test saw a SM-2 Block IV missile destroy a warhead that was only 19 kilometers up. An SM-3 missile can destroy a warhead that is more than 200 kilometers up. But the SM-3 is only good for anti-missile work, while the SM-2 Block IV can be used against both ballistic missiles and aircraft. The SM-2 Block IV also costs less than half what an SM-3 costs.

The SM-3 has four stages. The first two boost the interceptor out of the atmosphere. The third stage fires twice to boost the interceptor farther beyond the earth's atmosphere. Prior to each motor firing it takes a GPS reading to correct course for approaching the target. The fourth stage is the nine kg (20 pound) LEAP kill vehicle, which uses

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infrared sensors to close on the target and ram it.

Source: <https://www.strategypage.com/>, 25 May 2016.

NUCLEAR STRATEGY

CHINA

China's Nuclear Modernisation Driven by Defence Capabilities of India, US, Russia: Pentagon

The defence capabilities possessed by the US, Russia and India are among the main factors driving China to modernise its nuclear force and bolster its strategic strike capabilities....In a report to Congress detailing China's nuclear power, Pentagon on 13 May said the country was deploying new command, control and communications capabilities to its nuclear forces to improve control of multiple units in the field. China, it said, insists that the new generation of mobile missiles, with warheads consisting of MIRVs and penetration aids, are intended to ensure the viability of its strategic deterrent in the face of continued advances in the US and, to a lesser extent, Russian strategic ISR (Intelligence, surveillance and reconnaissance), precision strike, and missile defence capabilities.

"Similarly, India's nuclear force is additional driver behind China's nuclear force modernisation," the Pentagon said in its report. Through the use of improved communication links, ICBM units now have better access to battlefield information and uninterrupted communications connecting all command echelons, the report said. According to

the Pentagon, China is working on a range of technologies to attempt to counter the US and other countries' ballistic missile defence systems, including MaRVs, MIRVs, decoys, chaff, jamming, and thermal shielding. China has acknowledged that it tested a hypersonic glide vehicle in 2014. The country's official media also cited numerous PLASAF training exercises featuring manoeuvre, camouflage, and launch operations under simulated combat conditions, which are intended to increase survivability, it said.

Together with the increased mobility and survivability of the new generation of missiles, these technologies and training enhancements strengthen China's nuclear force and bolster its strategic strike capabilities. China's nuclear arsenal currently consists of

approximately 75-100 ICBMs, including the silo-based CSS-4 Mod 2 (DF-5A) and Mod 3(DF-5B), the solid-fueled, road-mobile CSS-10 Mod 1 and Mod 2 (DF-31 and DF-31A), and the more-limited-range CSS-3 (DF-4). This force is complemented by road-mobile, solid-fueled CSS-5 Mod 6 (DF-21) MRBM for regional deterrence missions. Pentagon

said China's nuclear weapons policy prioritises maintaining a nuclear force able to survive an attack and to respond with sufficient strength to inflict unacceptable damage on an enemy. "Further increases in the number of mobile ICBMs and the beginning of SSBN deterrence patrols will force the PLA to implement more sophisticated C2 systems and processes that safeguard the integrity of nuclear release authority

for a larger, more dispersed force," it said.

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JIN-class nuclear-powered ballistic missile submarine (SSBN), with four commissioned and another under construction. The JIN will eventually carry the CSS-NX-14 (JL-2) SLBM (submarine-launched ballistic missile) with an estimated range of 7,200 km. Together these will give the PLAN its first credible long-range sea-based nuclear capability. JIN SSBNs based at Hainan Island in the South China Sea would then be able to conduct nuclear deterrence patrols, it said.

Source: <http://indianexpress.com/>, 14 May 2016.

PAKISTAN

'Pakistan may Move Towards Second Strike Capacity for its Nukes'

India's moves towards "second strike capability" in its nuclear programme would compel Pakistan to follow suit, an official of Pakistan's Strategic Plans Division has said, according to reports. "Development of second strike capability (by India) ... would put pressure on Pakistan to take remedial measures and develop its own version of the capability," said the official from SPD, which serves as the secretariat of the country's National Command Authority, Dawn newspaper reported on 15 May.

The reported successful testing of nuclear-capable K-4 SLBMs in April from its nuclear-powered INS Arihant has taken India closer to what is described as "second-strike capability" in nuclear deterrence. It refers to the capability of a military to hit back at an enemy in a situation where its land-based nuclear arsenal had been neutralised.... Speakers at the CISS round-table discussion say that the reported SLBM tests by India will impact the delicate strategic balance of the region....

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Following the test, a statement issued by Pakistan's Foreign Office had said: "The reported Indian tests of a Submarine Launched Ballistic Missile and development of a nuclear submarine fleet are serious developments, which impact the delicate strategic balance of the region. It has resulted in the nuclearisation of the Indian Ocean." Suggesting that Pakistan could have already moved in that direction, the SPD official recalled that Islamabad had set up its Naval Strategic Force Command (NSFC) in 2012.

At the time of the commissioning of NSFC Headquarters, the ISPR had said that it "will

perform a pivotal role in development and employment of the Naval Strategic Force. The Force, which is the custodian of the nation's second strike capability, will strengthen Pakistan's policy of Credible Minimum Deterrence and ensure regional stability". Former defence secretary, retired Lt Gen Naeem Khalid Lodhi, had claimed last year that Pakistan possessed second strike capability against India. However,

defence analysts had questioned the claim, saying that Pakistan was yet to achieve submarine-based 'assured second strike capability for stable deterrence.

The SPD official, speaking about India's development of anti-ballistic missiles, said it could give its military planners "false sense of security" while contemplating military action against Pakistan. He said up-gradation of military hardware by India for operationalising the Cold Start Doctrine, building a variety of nuclear capable missiles ranging from tactical weapons to intercontinental ballistic missiles, enabling of its nuclear triad, acquisition and up-gradation of aircraft carrier fleet and nuclear submarines were all worrisome developments that would destabilise the nuclear stability, Dawn reported.

Alongside these, India is also “disturbing sub-conventional stability” by shifting Pakistan military’s orientation from external to internal security challenges by using its intelligence agencies....

At the round-table, Dr Zafar Nawaz Jaspal of the Quaid-i-Azam University said it would be wishful to think of strategic stability in the region as long as mistrust existed between India and Pakistan. He said although there was imbalance of power between India and Pakistan, still ‘balance of terror’ (due to modernisation of weaponry) was sustaining a semblance of strategic stability in the region. Dr Riffat Hussain, a professor at NUST, said that any additional military capability acquired by India would hurt Pakistan. CISS Executive Director Ambassador Ali Sarwar Naqvi said that Pakistan needed to closely watch the India-US strategic partnership, especially in the context of the upcoming Logistic Support Agreement (LSA) and accordingly assess its policy options. LSA is to be signed later this year between India and the US. The prospects of conflict between the two nuclear armed rivals have only increased due to absence of an institutional dialogue process and “deliberate escalation by India” both by covert and overt instruments against Pakistan, he added.

Source: <http://www.hindustantimes.com/>, 15 May 2016.

Nuclear-Armed Pakistan has Ability to ‘Target’ Delhi in Five Minutes: AQ Khan

Nuclear-armed Pakistan has the ability to “target” the Indian capital Delhi in five minutes, the father of Pakistan’s nuclear programme Dr AQ Khan has said. Addressing a gathering in Islamabad on the 18th anniversary of Pakistan’s first nuclear tests, which were carried out under his supervision in

1998, Khan, said Pakistan could have become a nuclear power as early as 1984 but the then President General Zia ul Haq “opposed the move”. The 80-year-old nuclear physicist said General Zia, who was Pakistan’s President from 1978 to 1988, opposed the nuclear testing as he believed that the world would intervene militarily.

Alongside these, India is also “disturbing sub-conventional stability” by shifting Pakistan military’s orientation from external to internal security challenges by using its intelligence agencies.

The prospects of conflict between the two nuclear armed rivals have only increased due to absence of an institutional dialogue process and “deliberate escalation by India” both by covert and overt instruments against Pakistan.

Further, it would have also curtailed international aid Pakistan was receiving due to the ongoing Soviet occupation of Afghanistan. “We were able and we had a plan to launch nuclear test in 1984. But President General Zia ul Haq had opposed the move,” Khan said on Saturday. Khan also said that Pakistan has the ability to “target” Delhi from Kahuta near Rawalpindi in five minutes. Kahuta is the home to the (KRL, Pakistan’s key uranium enrichment facility, linked to the atomic bomb project. ... Referring to the treatment meted out to him during Gen Pervez Musharraf’s era, Khan said nuclear scientists in the country have not been given the respect that they deserve. “We are facing the worst against our services to the country’s nuclear programme,” he added.

Source: *The Indian Express*, 29 May 2016.

USA

US Going to Keep Nuclear Submarine Fleet Most Powerful in World - Carter

Defense contractor General Dynamics Electric Boat has begun research and development for the US Navy’s next-generation ballistic-missile submarine, due to begin construction in 2021. “We have got to keep the size of the submarine fleet,” Carter told us service personnel on 24 May. “That is something we are favoring this year in the budget. I’m going to predict it will be favored in the future.” Carter said US command of the oceans through its submarine fleet was one of the most

important factors in maintaining America's global power, and he was determined to preserve it. "There is widespread recognition [that] this is a source of American superiority and we need to keep it," he explained. The total potential value of the program to replace the current Ohio-class ballistic missile-carrying nuclear submarines is projected to be more than \$60 billion for 12 submarines, according to a 2015 US Navy estimate.

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Source: <http://sputniknews.com/>, 25 May 2016.

NUCLEAR ENERGY

FRANCE

EDF Sees French Energy Plan Shaping Nuclear Depreciation Schedule

The French government's energy investment plan due in July will be a key indicator for whether and for how long EDF will extend the depreciation period of its nuclear plants, an executive said on 19 May. EDF hopes to get nuclear energy regulator ASN's authorisation to extend the lifespan of its nuclear plants to 50 years from 40, and already wants to extend the depreciation period on these assets, which would boost bottom-line profit.

Early this year ASN said it expects to give generic guidelines on French nuclear plant life extensions by 2018, but said extensions could not be taken for granted and that they would be decided reactor by reactor. The government's long-awaited multi-year energy investment plan (PPE) – implementing the August 2015 energy transition law - will not specify reactor lifespan, but should set targets for the share of nuclear in France's power mix. President Francois Hollande has vowed to reduce

that share from 75 percent to 50 by 2025, but has taken no concrete steps towards that goal.

"The PPE, and notably its nuclear chapter, expected early July, will figure largely in our decision about the accounting lifespan of our nuclear reactors," EDF nuclear chief Dominique Miniere told reporters. In 2003, EDF extended the depreciation schedule for its reactors in its accounts

to 40 years from 30 – six years before the ASN authorised the move. CEO Jean-Bernard Levy said in April EDF plans to extend the depreciation period by the closing of first-half results. Miniere said the PPE should signal how many of EDF's 58 reactors can keep operating, which will determine over what period reactors and related maintenance costs can be depreciated. He said life extension would also impact EDF's 23 billion euros (1 billion pounds) worth of decommissioning and nuclear waste provisions. "Delaying reactor decommissioning also means delaying provisions," he said. Miniere said 80 percent of EDF's 58 reactors were built between 1980 and 1990. From 2020, many need to

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close or get approval to operate another decade. Miniere said every reactor has annual maintenance costs of about 50 million euros, or about 3 billion euros per year for EDF's fleet.

Extending EDF's reactors by 10 years and incorporating safety lessons learned from the Fukushima disaster will boost that to 4-4.2 billion euros per year in the 2014-2025 period, a total of just over 50 billion, after which costs will ease to 4.2-3 billion euros per year, he said.

Source: <http://uk.reuters.com/>, 19 May 2016.

INDIA

India Doesn't Lag in Developing Thorium-fuelled Nuclear-Reactor: MR Srinivasan

There is a misconception that the Indian atomic energy programme has been slow in developing breeder reactors that will be fuelled by the country's vast thorium deposits, a foremost nuclear expert says.

"India has not been slow in developing next generation nuclear reactors that would use thorium as a fuel. Such notions are misconceived. No one in the world is ahead of us in this direction," former AEC chairman and ex-secretary DAE M.R. Srinivasan told IANS in a telephonic interview from Ooty. Describing the claims in this regard as "publicity seeking", Srinivasan spoke of the AHWR as the latest Indian design for a next-generation nuclear reactor. In its final stages of development, the AHWR is being tested at the BARC in Mumbai as part of the third stage of India's nuclear energy programme, which envisages the use of thorium fuel cycles for generating commercial power.

"Using thorium is a time-consuming process. By itself it is not a fuel, it is a potential fuel placed in the reactor and some other fissile material is needed to convert it into Uranium 233," he pointed out. The AHWR will be fuelled by a mix of uranium-233 converted from thorium, and plutonium. Uranium-233 is the reactor fuel for this third stage of the Indian nuclear power programme. "The Advanced Heavy Water Reactor design has been made and it will start work next year," Srinivasan said. The AHWRs are expected to shorten the period of achieving large-scale utilization of thorium. A second version of the AHWR, being tested, will use low enriched uranium along with thorium.

India's thorium deposits, estimated at 360,000 tonnes, far outweigh its natural uranium deposits at 70,000 tonnes. The country's thorium reserves

make up 25 percent of the global reserves. "India currently has a large data base and experimental information on thorium radiation. However, large scale commercial generation of electricity will only be possible around 2030 and we are in no way behind the others," Srinivasan said.

The key to the AHWR's development is India's second stage of nuclear power generation that envisages the use of Plutonium-239, obtained from the first stage reactor operation, as the fuel core in FBR. Pu-239 is the primary fissile element used in the FBR. The former AEC chairman explained that a blanket of U-238 surrounding the FBR fuel core will undergo nuclear transmutation to produce fresh Pu-239 as more and more Pu-239 is consumed during the operation. A 500 MW prototype fast breeder reactor is in an advanced stage of completion at Kalpakkam in Tamil Nadu and will be operational next year, he said. "Thorium utilisation in the third stage will reduce India's dependence on fossil fuels and will be a major contribution to global

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efforts to combat climate change," Srinivasan said.

Besides, U-233 fuelled AHWRs will have a thorium blanket around the reactor core which will generate more U-233 as the reactor goes operational, resulting in the production of more and more uranium fuel that would help sustain long-term fuel requirements for power generation, he added. According to Srinivasan, the currently known Indian thorium reserves can result in the generation of 358,000 gigawatt-year (GWe-yr) of electrical energy and can easily meet the energy requirements during the next century and beyond. He said the AHWRs are also the most secure and safe reactors and could be set up close to densely-populated regions.

In this connection, Russia has offered India a new range of reactor units - the VVER-Toi (typical optimised, enhanced information) design – for the third and fourth units of the Kudankulam project

in Tamil Nadu being built by its atomic power corporation Rosatom, whose Atomexpo conference gets under way in Moscow from Monday.

An inter-governmental agreement between India and Russia was signed in December 2008 for setting up Kudankulam's units 3 to 6. The ground-breaking ceremony for construction of units 3 and 4 was performed earlier this year. "All the Russian built units at Kudankulam, including the first and second, are 'Generation 3 plus' reactors. They meet all current safety requirements," Srinivasan said. "Their design has benefited from the review conducted of nuclear accidents like Three-Mile Island (US) and Fukushima (Japan)," he added.

Source: The Economic Times, 29 May 2016.

US Supports India's Entry into NSG

Amid China and Pakistan's opposition to India's bid to join the Nuclear Suppliers Group, the US has backed New Delhi's entry into the group. US State Department spokesman John Kirby on 13 May quoted US President Barack Obama as saying during his visit to India in 2015 that "India meets missile technology control regime requirements and is ready for NSG membership".

To reports that China has blocked India's membership to the group, Kirby said the US was committed to help India become a member of NSG. On Pakistan and China's position on India's membership to the suppliers group, Kirby referred the media persons to the governments of the respective country. "I'm going to refer you to the governments of China and Pakistan with respect to their positions on India's membership," Kirby said. China and Pakistan are closely coordinating their strategy against India's admission into the NSG, Sputnik News said quoting US sources who

work with the group.

The sources pointed to the fact that when India requested a session with the NSG participating governments at the recent NSG Consultative Group meeting on April 25 and 26, where it would have made a formal presentation in support of its membership, Pakistan also sought a similar opportunity. Though aware that its request would not be accepted, Pakistan made it in order for China to look "neutral" and reject both applications on grounds of parity, it said.

Sources from the US expressed their disappointment with China's tactics of "using Pakistan's non credentials with the NSG to settle scores with India." The "either both or none" strategy is not a secret; it was coordinated during the visit of Pakistan's President Mamnoon Hussain to China in November 2015.

Sputnik News quoted sources as saying that the Chinese government told President Hussain that if India is allowed into the NSG, China would ensure that Pakistan also gets its membership in the group. However, "if India is allowed to join the NSG and Pakistan is deprived of NSG membership, Beijing will veto the move and block the Indian entry." "India's non-proliferation credentials are not comparable with Pakistan's, as Pakistan has a history of "selling nuclear technology to rogue states like Libya", the sources noted.

Moreover, the West fears that Pakistan's nuclear weapons could easily find their way into the hands of terrorists. China knows that Pakistan does not stand a chance at the NSG, and most of the NSG members will reject its application. Nevertheless, that did not stop Beijing from using Pakistan as a "parity token to stop India which is fast emerging as China's competitor," added the sources.

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Meanwhile, in Beijing the foreign office spokesperson, to a question on India's NSG membership, said that all the multilateral non-proliferation export control mechanisms, including the NSG, have been taking the NPT membership "as a necessary qualification for their accession". "Not only India, many other non-NPT members have voiced their aspirations to join the NSG. This poses a question for the international community. Many NSG members, China included, think that this matter shall be fully discussed and then decided by consensus among all NSG members in accordance with the protocols and procedure of the NSG," said the spokesperson.

"We supported and also took part in such discussions. As we repeatedly said, our position targets no one. It applies to all non-NPT members. Why we and other like-minded members are committed to this position is because we want to uphold the international nuclear non-proliferation regime based on the NPT," the Chinese official said on 13 May.

Source: <http://www.northeasttoday.in/>, 15 May 2016.

'In-depth' Talks Needed for India's Entry into Nuclear Group: China

China on 23 May called for "in-depth" talks to build consensus over India's admission into the NSG, days after Pakistan staked claim to join the 48-member grouping with purported backing from Beijing and just ahead of President Pranab Mukherjee's visit to that country. China also rebutted India's assertion that France was included in the NSG without signing the Non-Proliferation Treaty, saying France was a founder member of the elite group and so the issue of accepting its membership does not arise.

Chinese foreign ministry spokesperson Hua Chunying sounded firm about China's stance that

all new members that join the NSG must sign NPT. Hua rebutted India's assertion that France was included in the elite group without signing the NPT. "When France joined the NSG it was not a party to the NPT: France was the founder member of the NSG so the issue of acceptance to the NSG does not exist", Hua said responding to ministry of external affairs spokesman Vikas Swarup's comment. "The NSG is an ad hoc export control regime and France, which was not an NPT member for some time, was a member of the NSG since it respected NSG's objectives," Swarup had said on May 20, rejecting China's oft-repeated assertion

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that India should sign the NPT to join the NSG. "The NSG is an important component of the non-proliferation regime is founded on the NPT. This is a long term consensus of the international community which was reaffirmed last year by the NPT review convention," Hua said. That is why the NSG has been taking NPT

signatory status must status for new members, Hua said....

Acknowledging differences among the NSG members in the backdrop of US supporting India's bid to join the grouping based on its non-proliferation record, contrary to Pakistan's history of clandestine export of nuclear technology, Hua said the NSG members needed "in-depth" talks on the issue. "Pakistan is not a party to the NPT. For whether the non-NPT countries can join the NSG there are discussions with in the group and there are major differences that is why China along with other countries have been maintaining that there should be through discussions whether non-NPT countries can join the NSG and decision shall be made upon consensus", Hua said. "This applies to all non-NPT countries including Pakistan", she said.... "Our position is not targeted against Pakistan and applies to all non-NPT countries", the spokesperson said. "We support the NSG members having in-depth discussions on

this so as to reach a consensus at an early date and we continue to take constructive part in the relevant discussions”, she said.

Source: <http://www.hindustantimes.com>, 23 May 2016.

PAKISTAN

Have Credentials to become Member of NSG: Pakistan Tells US

Pakistan on 17 May told the US that it has the credentials to become the full member of the nuclear materials export control regimes, including the NSG, as the two nations discussed their respective concerns over nuclear and missile developments in South Asia. The two sides held the 8th round of Pakistan-US working group on Security, Strategic Stability, and Nonproliferation (SSS&NP), which is part of the bilateral Strategic Dialogue. Pakistan Foreign Secretary Aizaz Ahmad Chaudhry and Under Secretary of State for Arms Control and International Security Rose Gottemoeller co-chaired the meeting held here. According to the joint statement, the delegations had a productive exchange of views on issues of mutual importance, including strategic export control regimes, nonproliferation, and regional stability and security.

Source: <http://indianexpress.com>, 17 May 2016.

USA

TVA May Build Small Nuclear Reactors Near Oak Ridge

Just a week after voting to scrap an unfinished 1970s-era nuclear power plant in Alabama, the Tennessee Valley Authority began taking steps toward possible future construction of small modular reactors.

TVA spokesman Jim Hopson says several designs

for the new generation reactors are in the pipeline to be certified by the Nuclear Regulatory Commission. TVA is asking the commission to approve a site plan that could accommodate any

one of those designs at its Clinch River site near Oak Ridge. Hopson says the small reactors produce around 80-200 megawatts of power. In comparison, the traditional reactor at TVA's Watts Bar Unit 2 will produce around 1150 megawatts. Unlike large

reactors, the small reactors can be operated at different power levels and are designed to be used in combination.

Source: <http://www.al.com/>, 17 May 2016.

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NUCLEAR COOPERATION

CHINA-SUDAN

China to Help Sudan Develop First Nuclear Plant

The agreement was signed on 23 May in Khartoum by China National Nuclear Corporation (CNNC) chairman Sun Qin and Moataz Moussa, Sudan's Minister of Water Resources and Electricity. The signing of the framework agreement came during a three-day visit to Sudan by a Chinese delegation led by Nur Bekri, deputy director of the National Development and Reform Commission's National Energy Bureau.

Ministry spokesman Mohamed Abdelrahim Jawish was quoted by the AFP news agency as saying, "The

agreement will allow Sudan to build in the future a nuclear plant to generate nuclear energy for peaceful use. This preliminary agreement was signed on 22 May and we are now talking of capacities." Sudan - one of China's main suppliers of oil - was on the list of priorities for Chinese reactor sales in a State

Sudan - one of China's main suppliers of oil - was on the list of priorities for Chinese reactor sales in a State Council (cabinet) Energy Development Strategic Action Plan 2014-2020. Sudan's Ministry of Energy and Mines initiated a nuclear power program in 2007, and in 2010 the country started considering the feasibility of a nuclear power plant. At that time, Sudan was envisaging a nuclear plant with four 300-600 MWe units operating by 2030.

Council (cabinet) Energy Development Strategic Action Plan 2014-2020. Sudan's Ministry of Energy and Mines initiated a nuclear power program in 2007, and in 2010 the country started considering the feasibility of a nuclear power plant. At that time, Sudan was envisaging a nuclear plant with four 300-600 MWe units operating by 2030.

The country's Atomic Energy Commission has been consulting the International Atomic Energy Agency on introducing nuclear energy. In July 2015, the government's Geological Research Authority said that uranium exploration was a high priority and that any mining would be undertaken by Russian companies. Under a memorandum of understanding signed last September, China General Nuclear and the Kenya Nuclear Electricity Board are to discuss CGN's Hualong 1 technology, and carry out comprehensive cooperation in nuclear power development and capacity building in neighbouring Kenya. This will include research and development, construction, operation, fuel supply, nuclear safety, nuclear security, radioactive waste management and decommissioning.

Source: <http://www.world-nuclear-news.org/>, 24 May 2016.

EGYPT-RUSSIA

Egypt Gets \$25 Billion from Russia to Build Nuclear Reactors, Despite Terror Risk

Egypt's president announced on 22 May that, the country will accept a Russian loan of \$25 billion in order to build a nuclear power plant, despite recent terrorism and civil unrest in the country. The loan will finance longstanding Egyptian plans to build a new reactor in Dabaa, despite long running terrorism concerns in the region. Egypt's current president, Abdel Fattah el-Sisi, signed a nuclear power plant deal with Russia last

November, just days after the Kremlin announced a Russian aircraft was downed by an act of terrorism, killing all 224 people on board. The plane was heading from an Egyptian resort city to St. Petersburg in Russia.

Groups tied to the ISIS have made repeated attacks in Egypt, even killing nine people, six of whom were police officers, with a bomb in Cairo in January. Egypt is also politically unstable, and has changed presidents three times since 2011. The country's former president, Mohamed Morsi, was removed from office by a military coup in 2013 and sentenced to death last May. Egypt has planned to build a nuclear reactor since 1955, but aborted most of its plans after the Chernobyl accident. Egyptian interest in nuclear power was renewed after

Egypt has planned to build a nuclear reactor since 1955, but aborted most of its plans after the Chernobyl accident. Egyptian interest in nuclear power was renewed after the country signed nuclear cooperation agreements with Russia in 2004 and 2008, according to the World Nuclear Association. Egypt currently operates two extremely small and old reactors with technical assistance from Russia and Argentina.

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Source: <http://dailycaller.com>, 23 May 2016.

RUSSIA-CAMBODIA

Russia, Cambodia Agree to Cooperate on Peaceful Use of Nuclear Energy

The document was signed within the framework of a meeting between Russian Prime Minister Dmitry Medvedev and his Cambodian counterpart Hun Sen in Russia. Sergei Kirienko, the general director of Russia's state nuclear energy corporation Rosatom, and Cambodian Environment Minister Say Samal signed the memorandum. The sides also signed a memorandum of understanding on the establishment of an information center on nuclear energy in Cambodia. Hun Sen's visit to Russia coincides with the May 19-20 ASEAN-Russia

Summit in Sochi to mark the 20th anniversary since the establishment of the Russia-ASEAN Dialogue Partnership.

Source: <http://sputniknews.com>, 17 May 2016.

NUCLEAR PROLIFERATION

PAKISTAN

Pakistan Rules Out Talks on Nuclear Programme Freeze

Pakistan has turned down a US demand to start negotiations on a treaty that bans production of fissile materials used in making nuclear weapons, officials said after talks between the two countries on nonproliferation issues on 17 May. Islamabad has long been resisting US pressure to freeze its nuclear programme by agreeing to sign the controversial Fissile FMCT. The FMCT is aimed at placing a ban on the production of fissile materials, including uranium and plutonium. At a meeting of the Pakistan-US Working Group on Security, Strategic Stability and Nonproliferation, the American delegation pressed Islamabad to start negotiations on the treaty dealing with fissile materials.

In response, Pakistan underlined its preference for broader FMT that "addresses the asymmetries in existing stocks" and said its position would be determined by its national interests and the objectives of strategic stability in South Asia," said a joint statement issued by the Foreign Office.... Pakistan believes the treaty must include existing stocks otherwise the imbalance of power in the world will simply be further enhanced. The country's reluctance to sign the treaty is also attributed to the discriminatory policies of the West on civilian nuclear cooperation.

While rejecting talks on the FMCT in its current

form and conditions, Pakistan, however, assured the US delegation that it would not be the first in its region to resume nuclear testing, and expressed its support for the objectives of CTBT. The meeting of the working group was held against the backdrop of recent missile testing by archrival India that, according to Pakistan, would disturb the strategic balance in South Asia. The Foreign Office's statement said both sides recognised their interest in strategic stability and discussed their respective concerns over nuclear and missile developments in South Asia. In that context, Pakistan also expressed concerns on growing conventional imbalance, and reiterated its longstanding proposal for the Strategic Restraint Regime (SRR) in South Asia and its readiness to pursue measures in the region

aimed at building confidence and avoidance of an arms race. Both sides emphasised the importance of meaningful dialogue and progress in this area and expressed hope for lasting peace in South Asia and the resolution of outstanding disputes through peaceful means.

According to the statement, the US delegation recognised Pakistan's significant efforts to harmonise its strategic trade controls with those of the NSG and other multilateral export control regimes. Both sides agreed on the value of Pakistan's continued engagement, outreach and integration into the international non-proliferation regime. The Pakistan delegation expressed its confidence regarding their country's credentials to become full member of the export control regimes, particularly the NSG and the MTCR. Both sides committed to continue cooperation related to export control capacity-building under the US Export Control and Related Border Security (EXBS) programme.

The Foreign Office said Pakistan stressed the need

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for access to peaceful uses of nuclear technology as a socio-economic imperative. Pakistan also indicated its interest in cooperation with the US on peaceful applications of the nuclear science in areas such as health, agriculture and water. The US expressed its interest in exploring such nuclear science cooperation with Pakistan.

Source: <http://tribune.com.pk>, 18 May 2016.

NUCLEAR SAFETY

INDIA

US Official Says India has Addressed Nuclear Concerns

A US State Department official assured lawmakers on 24 May that India has addressed concerns over liability that had for years kept US corporations from signing nuclear power contracts in the country. "We believe that the steps that India has taken have addressed by and large the key concerns that have been in place," Assistant Secretary of State for South and Central Asian Affairs Nisha Desai Biswal told the Senate Foreign Relations Committee. She also said the United States supported India joining the NSG.

India wants to increase its nuclear energy capacity dramatically as part of a broader push to move away from fossil fuels, cut greenhouse gas emissions and avoid the dangerous effects of climate change. India was shut out of the nuclear trade for decades because of its weapons program. A 2008 agreement with the United

States gave it access to foreign suppliers without giving up arms primarily meant as a deterrent against nuclear-armed China. But hopes that US nuclear reactor manufacturers would get billions of dollars of new business evaporated after India adopted a law in 2010 giving the state-run NPCIL the right to seek damages from suppliers in the event of an accident. Biswal declined to say that all US companies would now be comfortable doing business in India. "Those are going to be individual determinations that companies are going to have

to make," she said....

Diplomats quietly launched a new push last year to induct India into the group, which would carry the risk of antagonizing Pakistan as well as its ally, China. Beijing could veto any application by India. Biswal said the United States backs India. "We believe that India has complied with, and is consistent with, the requirements of the NSG and therefore should be considered for membership," she said.

Source: <http://in.reuters.com>, 24 May 2016.

JAPAN

600 Tons of Melted Radioactive Fukushima Fuel Still not Found, Clean-up Chief Reveals

The Fukushima clean-up team remains in the dark about the exact locations of 600 tons of melted radioactive fuel from three devastated nuclear reactors, the chief of decommissioning told the ABC's Foreign Correspondent program in an exclusive interview. The company hopes to locate and start removing the missing fuel from 2021, the TEPCO chief of decommissioning at Fukushima, Naohiro Masuda, revealed. The fuel extraction technology

is yet to be elaborated upon, he added. Following the tsunami-caused 2011 meltdown at Fukushima Dai-ichi nuclear power plant uranium fuel of three power generating reactors gained critical temperature and burnt through the respective reactor pressure vessels, concentrating somewhere on the lower levels of the station currently filled with water. The melted nuclear

fuel from Reactor 1 poured out completely, estimated 30 to 50 percent of fuel from Reactor 2 and 3 remained in the active zone, Masuda said.

The official estimates that approximately "200 tons of [nuclear fuel] debris lies within each unit," which makes in total about 600 tons of melted fuel mixed up with metal construction elements, concrete and whatever else was down there. Five years after the Fukushima tragedy, the exact location of the highly radioactive "runaway" fuel

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remains mystery for TEPCO. The absolutely uncontrollable fission of the melted nuclear fuel assemblies continue somewhere under the remains of the station. It's important to find it as soon as possible," acknowledged Masuda, admitting that Japan does not yet possess the technology to extract the melted uranium fuel. "Once we can find out the condition of the melted fuel and identify its location, I believe we can develop the necessary tools to retrieve it," Masuda said.

TEPCO's inability to locate the melted fuel could be explained by huge levels of radiation near the melted reactor shells. It is so high that even custom-built robots sent there to get information about the current state of affairs there get disabled by the tremendous radioactivity flux. Human presence in the area is understandably out of the question.

The company's decommission plan for Fukushima nuclear power plant implies a 30-40 year period before the consequences of the meltdown are fully eliminated. Yet experts doubt the present state of technology is sufficient to deal with the unprecedented technical task. "Nobody really

knows where the fuel is at this point and this fuel is still very radioactive and will be for a long time," the former head of the US NRC, Gregory Jaczko, told Foreign Correspondent. "It may be possible that we're never able to remove the fuel. You may just have to wind up leaving it there and somehow entomb it as it is," said Jaczko, who headed the USNRC at the time of the Fukushima disaster. Melted uranium fuel and tons and tons of highly radioactive water aren't the only issues troubling TEPCO's clean-up team at Fukushima. There are also some 10 million plastic bags full of contaminated soil concentrated in gigantic waste dumps scattered around the devastated nuclear facility.

The Japanese prime minister at the time of the Fukushima disaster, Naoto Kan, told the ABC that Japan's government is already paying TEPCO US\$70 billion to enable the company to do the decommission works at Fukushima. "But that is not enough. It will probably cost more than \$240 billion. I think 40 years [to decommission the plant] is an optimistic view," Kan said.

Source: <https://www.rt.com>, 24 May 2016.



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