



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

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**INTERVIEW – Evgeni Griva, Director General
Rosatom, South Asia**

Q. During the recent visit of PM Narendra Modi to Russia it was announced that the signing of the MFA for the construction of units 5 and 6 is planned in 2016. What is the status of this project?

A. The technical and commercial proposal for the installation of Kudankulam power units 5 and 6 has already been provided to the Indian party. Atomstroyexport JSC and the Indian Nuclear Energy Corporation are currently involved in detailed discussions of the project and the Master Framework Agreement with regard to the Indian party requirements concerning further enhancement of the project safety and localization.

Q. Based on the results of talks between Russian President Putin and Indian PM it was announced that an agreement has been reached on allocation by the Indian party of one more site for a Russian design nuclear power plant apart from Kudankulam NPP which is already under construction. What is the progress in this area?

A. Apart from the Kudankulam NPP, Russia and India are considering the possibility of building a number of other nuclear power plants. These are all practical steps to implement the most important document signed on December 11, 2014 – “Strategic Vision of Strengthening Cooperation in the Peaceful Uses of Nuclear Energy between the Russian Federation and the Republic of India”. An agreement has been reached on the allocation by the Indian party of one more site for the construction of six new nuclear reactors of Russian design. We hope to get more detailed information about the site from

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the Indian party as soon as possible.

Q. Recently Rosatom has been actively building up its network of regional offices. How many offices does Rosatom now have abroad, what are the network development plans? Do you plan to establish a representative office in India?

Rosatom is now actively expanding its global footprint. The State Corporation is opening its regional offices. Rosatom is expanding its branch network to strengthen its global footprint in accordance with its long-term development strategy of increasing the foreign orders portfolio up to USD 190 billion. This is the ambitious but achievable goal of the State Corporation for the next 5 years. Rusatom-International Network Company is in charge of developing and managing Rosatom's regional network.

Rosatom regional centers are currently already in operation in South Africa, Eastern, Central and Western Europe, Central and Southeast Asia and

Latin America. Work is now underway to establish an office in Dubai in order to promote products and services of Russian nuclear industry enterprises in the Middle East and North Africa. In addition, in order to strengthen the presence of Rosatom State Corporation in South Asia, the process of opening a regional office in Mumbai, India, is being finalized, which will also ensure supervision of our projects in Bangladesh and Sri Lanka.

Source: *The Hindu*, 05 February 2016.

OPINION – KS Parthasarathy

Investigative Report or Collection of Horror Stories, Unfounded Allegations and Flawed Studies

Recently, Mr Adrian Levy, a popular journalist published four articles on India's Nuclear Program. The fusillade was not cost effective as the Indian media largely ignored them. Serial production compromised their credibility!

He based his article titled "India's nuclear industry pours its wastes into a river of death and disease" (Center for Public Integrity, December 14, 2015) almost entirely on media stories on the alleged health effects in Jadugoda where the first Indian uranium mine and mill are located.

Once in every few months, over the past few decades, some news papers have been publishing uranium mining- related horror stories which have absolutely no scientific basis, with such boring and regular frequency that specialists ignored them. I collected a few since 1987.

They contained human interest stories, spiced with melancholy and drama to scare the public by exaggerating the perceived or imaginary risks of radiation.

A common feature of these horror stories is photographs. Telling photos have a killing effect.

Levy used the photographs provided by Ashish Birulee. The International Uranium Film Festival (IUFF), an anti nuclear NGO popularized a photo exhibition titled "Jadugoda Drowning in Nuclear Greed."

Twenty-six specialists including specialist-physicians, scientists and academicians, many of them from outside the DAE carried out three separate health surveys in Jadugoda. In one such health survey, medical teams examined over 3000 inhabitants from nearby villages. Specialists concluded that the alleged health effects are not caused by radiation. Their frequency in Jadugoda is the same as that elsewhere in the country with similar socio-economic parameters / conditions.

I have no quarrel with photojournalists or reporters if they do not attribute, without any scientific basis, every adverse effect they see to nuclear radiation. Macabre photos from Jadugoda are on tap. Reporters use them to spice up their articles!

Earlier, an NGO made the startling and frivolous claim that many women in Chattikocha village in Jadugoda had change in their menstrual cycle and had gynaecological problems and infertility! Since photo-journalists are helpless to photograph these "phenomena", they looked for children born with one eye, disfigured face, twisted legs etc.

The United Nations Scientific Committee of the Effects of Atomic Radiation which publishes authentic reports on the health effects of radiation has never said that low dose radiation can cause such effects. Adrian Levy deftly followed the path of his less well known professional brothers/sisters to write his articles.

Levy used the photographs provided by Ashish Birulee. The International Uranium Film Festival (IUFF), an anti nuclear NGO popularized a photo exhibition titled "Jadugoda Drowning in Nuclear Greed" by Ashish Birulee. IUFF spreads anti nuclear

messages "through motion pictures containing soulful human stories." Never mind whether their observations are supported by science or not.

IUFF wins the emotional game because specialists knowledgeable in the health and safety aspects of uranium mining do not challenge them. Since the 90s when unfounded allegations of adverse health effects due to radiation started appearing in news papers,

Government of India set up specialist committees to verify the claims.

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health survey, medical teams examined over 3000 inhabitants from nearby villages. Specialists concluded that the alleged health effects are not caused by radiation. Their frequency in Jadugoda is the same as that elsewhere in the country with similar socio-economic parameters / conditions.

The UCIL which operates the uranium mines in India complies with the safety standards prescribed by the Directorate General of Mine Safety, the State Pollution Control Board and the AERB in all its operations.

UCIL ensures that the radiation dose to workers and the radioactive releases from the mine and mill to the environment are within the limits prescribed by AERB. Radioactive wastes from the uranium mill are impounded in tailings pond and are not poured into any river as recklessly alleged by Mr Adrian Levy.

BARC has set up an Environmental Survey Laboratory (ESL) in Jadugoda. in 1965. They monitor the environment and have conclusively shown that the operation of the mine and mill has not led to significant increases in radiation levels in the surrounding areas.

BARC scientists routinely publish their studies in peer reviewed journals. In so far as the safety aspects are concerned, Levy's claim "of absolute secrecy that surrounds the nuclear sector", is misleading and patently wrong.

I could effortlessly locate papers from the ESL in 6 journals and dozens of presentations in national and international conferences. Levy ignored these publicly available data as they do not fit his agenda. He liberally quoted the studies of a Japanese Professor Koide Hiroaki, known for his opposition to nuclear power for 40 years. Koide's "paper" which gives the radiation levels he measured, is laced with political messages. If he had any academic inclination, he should have, at least referred to, and if appropriate, contradicted the findings in at least a few, of the many papers on the environmental releases at Jadugoda published by Indian scientists.

Koide's admirers believe that he remained an Assistant Professor all his career because of his anti nuclear views; some humorless critics may argue that it was because he was unproductive in the assessment of the University. Levy refers to a study by Professor Dipak Ghosh to argue that

millions of people along the water- way were potentially exposed. Levy talks about the "toxic footprint" due to uranium mining. Dr. Ghosh measured humongous levels of radioactivity in water samples, much higher than those obtained by BARC scientists.

He followed a special method, not used by the US Environmental Protection Agency, European Union or Bureau of Indian Standards to estimate radioactivity in water. Most likely, it is a case of wrong calibration. It is a flawed study. In a similar instance, a professor used his own method to estimate uranium in teeth. His values were reportedly so high that other scientists felt that such teeth could be used as a source of uranium!

Estimation of low activity requires great care and extensive domain knowledge. ESL has been collecting data over several decades. They have participated in international inter- comparison programmes. Once Dr Ghosh and BARC scientists resolve the differences, Levy's "toxic footprint" will dissolve in the waters of Subarnarekha River!

Levy published a picture of villagers washing vegetables in an ostensibly contaminated rivulet. I shall happily consume those vegetables as there is no excess radioactivity there! Levy highlighted a few violations such as leakage of slurry from pipe lines, poor access control at the tailings pond, sloppy practices in transporting ore etc. The ESL staff estimated the impact of each of these items.

When there was leakage of slurry from the pipeline UCIL removed them. The residuals left were too small to cause any health consequence. A person has to stand on the surface of the tailings pond for four hrs every day for 365 days to receive the dose limit allowed for public. A few hours stay over the tailings pond has no impact....

The Ploughshares Fund, the anti-nuclear US charity gave \$20,000 (about Rs 1.2 million) to Indian Doctors for Peace and Development (IDPD), an Indian NGO to 'support public education campaign, policymaker education and media work around the proposed expansion of uranium mining in India for purposes of nuclear energy and weapons expansion and the related public health impacts.'

The flawed IDPD study avoided peer review and got published in news papers with the blessing of the US agency which did not care about ethical

niceties; the agency's aim was to plant seeds of suspicion against uranium mining in the villagers and the public at large.

This writer's follow up of the "study", with the US agency, opened a can of worms.

... "Without batting an eyelid, Levy ignored many peer reviewed scientific papers which gave the levels of uranium and radium in mine and mill effluents in Jadugoda; he had the audacity to highlight the data (probably wrong) from an obscure journal as it could be used to promote his skewed perception.

Does it speak of high integrity?"Honestly, I find it hard to defend Levy. Identifying Levy's motivations is beyond the scope of this article.

I have some conflict of interest to declare. I worked in BARC which monitors Jadugoda environment, before joining the AERB. As Secretary of the Board from 1987 to 2004, I had intimate knowledge of all the developments including ESL data. I was closely involved in the enforcement actions of the AERB. I have been helping the DAE and AERB in many activities. My policy is to explain matters objectively based on accurate information. I place all arguments on the table. Discerning readers will sift the corn from the chaff.

Source: <http://www.eurasiareview.com/>, 15 January 2016.

OPINION – Ramesh Thakur

Sanctions, Strategy, and Iran's Nuclear Deal

In Resolution 2231 (20 July 2015), the UNS unanimously endorsed the Iran nuclear deal of 14 July 2015. On 2 December 2015 Iran was confirmed by the IAEA to have fulfilled its commitments under the deal. Accordingly, seven UNSC resolutions were terminated on 16 January 2016 and US\$100 billion worth of frozen financial assets released as part of the lifting of sanctions. But

unilateral US sanctions remain against its alleged missiles program, while Tehran denounced them as legally and morally illegitimate.

Sanctions played some role in getting to this outcome, but not a decisive one. Policy options to change or contain undesirable behaviour include military strikes, economic and other sanctions, and diplomatic persuasion. America's Iran policy has been poisoned by a long history of mutual suspicions, recriminations and distrust. Key milestones include the 1953 overthrow of the Mohammad Mosaddegh government with British

and US complicity, the West's support of the authoritarian Shah of Iran, the Islamic revolution of 1979 and the siege of the US Embassy in Tehran with American diplomats held as hostages for 444 days (1979–81).

The bitter enmity has framed regional geopolitics since 1979, with no American president having the space within Washington's increasingly

toxic politics to enter into any dialogue with Iran's Islamic regime.

Military strikes have always been on the table as US policy options. The balance of sober assessments in Washington was that at best, they would cause a temporary setback to Iran's nuclear ambitions against four deleterious consequences: Tehran would resume pursuit of the bomb with grim determination; it would expel all international inspectors and exit the Nuclear Non-Proliferation Treaty; all Iranians would unite behind the government; and US global reputation would take a hit as a warmonger.

...While under sanctions Iran's centrifuges increased from 164 in 2003 to 19,000 in 2013, the stockpile of low enriched uranium grew from 100kg to over 8,000kg and uranium enrichment increased from 5 per cent to just below 20 per cent.

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Limiting the policy toolkit solely to sanctions may well have delayed a mutually acceptable deal, according to senior former US officials and analysts. Seyed Hossein Mousavian, a high-ranking former member of Iran's political elite, noted that "the fact the unilateral US sanctions are not readily reversible exacerbates Iran's scepticism about Washington's real intentions behind sanctions and removes any incentives for cooperation with the West".

The most propitious time for ending a conflict is when it ripens to the point of a mutually 'hurting stalemate'. The combination of UN, US and EU sanctions regimes have been assessed to be potentially more effective than UN or unilateral sanctions alone. The combined three sets of mutually reinforcing tough sanctions had badly crippled Iran's economy and damaged its international standing. But America too paid a heavy military, financial and reputational price for its addiction to bombing and invading Muslim countries, leading to a collapse of domestic, Congressional and global support for an interventionist foreign policy.

The interim deal of November 2013 that paused Iran's nuclear march did not result from Tehran's capitulation, but from the election of a new president keen to explore a rapprochement with the West and from the shift in the US red line from 'no enrichment' to 'no bomb'. Over a decade of sanctions, Teheran had expanded, deepened and entrenched its nuclear capability through acquisition, stockpiling and building of materials, skills and facilities. The narrower the gap between capability and breakout time to the bomb, however, the more nervous key outside powers became and the closer Iran came to being bombed by Israel and the US. Others (Saudi Arabia, Egypt, Turkey) would race to their own nuclear weapons if they concluded Iran stood on the threshold of nuclear weapons.

In other words Iran was close to the inflection point in the delicate regional balance of its interests vis-à-vis Sunni and Arab rivals. Washington had done Tehran a huge favour by overthrowing its most troublesome neighbours in Baghdad and Kabul. The US expended the most

blood and treasure over a lost decade of futile nation-building in Afghanistan and Iraq, but the biggest strategic victor was Iran. Thanks to Western strategic myopia, Iran was able to expand its regional influence dramatically without nuclear weapons. With its sizeable population, resources and conventional military power, and as the font of Shia normative authority, Iran over the course of this century has emerged as a regional powerhouse relative to all other actors in the Middle East – to the point where the just-published global rankings by one US group catapults Iran into the top eight great powers of the world.

The key policy takeaway therefore is 'incentivised sanctions': a mixed strategy of punishment and inducements and a graduated series of partial lifting of sanctions in return for benchmarked good behavior.

Source: <http://www.policyforum.net/>, 11 February 2016.

OPINION – Arun Vishwanathan

International Monitoring of North Korea's 2016 Nuclear Test

The DPRK conducted a nuclear test on January 6, 2016. The recent test takes the count of nuclear tests conducted by North Korea to a total of four with previous tests in October 2006, May 2009 and February 2013. Following the January 2016 test, North Korea released a statement claiming that it had tested a small H-bomb or thermonuclear bomb.

The North Korea test resulted in widespread global condemnation led by the UNSC, the US, China, South Korea and Japan. However, subsequent differences over measures to curb the expanding North Korean nuclear and missile arsenal and over imposition of economic sanctions have evoked what Ralph Cossa describes as a sense of déjà-vu.

Rather than dwell on the best possible manner to deal with Pyongyang, this article will focus on the expanding capabilities of the Preparatory Commission of the CTBTO's International Monitoring System (IMS) to successfully detect

even a fairly small nuclear test (up to 0.1kt) in any part of the globe with about 90% probability. Since it was founded in 1996, the IMS capabilities have expanded to its current strength of 321 Seismic, Radionuclide, Infrasound and Hydroacoustic stations spread across the globe. The primary aim of the IMS is to ensure that no nuclear test conducted in the atmosphere, underwater, underground goes undetected.

As Ola Dahlman, Jenifer Mackby, Svein Mykkeltveit and Hein Haak have described in their excellent book *Detect and Deter: Can Countries Verify the Nuclear Test Ban?*, the establishment of the international monitoring network and the ability to detect any nuclear test provides countries with the ability to “improve their detection and deterrence capabilities.” Recent North Korean tests have highlighted the network’s capability to detect a nuclear test. However, the lack of an effective policy response to Pyongyang’s actions highlights the fact that it is the global resolve and intent in addition to the technical capability to monitor such activities that matters.

Seismic Monitoring: Seismic monitoring is a time tested and well developed method to detect and analyse both natural earthquakes and man-made events like nuclear explosions. Over the years, seismic stations located across the globe have successfully detected all the four North Korean tests. The magnitude of the earthquakes following the four tests as recorded by the Norwegian NORSAR seismic monitoring array is depicted in Figure 1. The 2016 nuclear test was detected up by 27 of CTBTO’s seismic monitoring stations. Further analysis of the seismic data has enabled estimation of the location and depth of the test.

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The 2016 nuclear test was detected up by 27 of CTBTO’s seismic monitoring stations. Further analysis of the seismic data has enabled estimation of the location and depth of the test. Both these are important for estimating the probable yield of the nuclear test. The device tested in January 2016 was buried approximately at twice the depth of the 2013 test. This could be indicative of expectation of a higher yield.

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...The latest analysis by 38 North website estimates the location of the North Korean tests. It points to the fact that the device tested in January 2016 was buried approximately at twice the depth of the 2013 test. This could be indicative of expectation of a higher yield. The same report also points to the fact that after

the release of radioactive gasses in the 2006 test, North Korea conducted the subsequent tests at a different location. A geological analysis of the new location brings out the fact that they are located under a type of granite. This explains the lack or very faint release of radionuclides (also termed as venting) following the 2009 and the 2013 tests.

Radionuclide Monitoring: Detection of radionuclides from a nuclear test provides the clinching evidence to back up initial detection provided by seismic monitoring stations. A portion of the fission products are released in days and weeks following a nuclear explosion. In particular these stations will seek to detect radionuclide noble gasses like Xenon and Argon.

Given the North Korean claim that it conducted a test of a small H-bomb / thermonuclear device, it will be crucial to detect isotopes of Argon (Ar-37) in order to verify the North Korean claim. Though the Argon levels in the atmosphere are low, the international community does not have any prior experience in detecting Argon following nuclear tests. If the North Koreans had conducted a thermonuclear test, most of the residual products would not travel very far and would settle close to the site of the explosion.

In addition, the North Korean leadership has attempted to prevent venting by burying the nuclear device under hard rock like granite. Given this, the probability of cracks developing in the aftermath of a test is less, thereby reducing the chances of detecting radionuclides from the test as observed in the 2009 and 2013 tests. Though radionuclide stations in Japan have begun collecting radionuclide samples, a final analysis will be available after 50-60 days following the test.

Conclusion: In short, the CTBTO's International Monitoring System (IMS) of seismic stations worked very well in near-time detection and identification of the North Korean nuclear test. The radionuclide network is in the process of collecting and analysing samples of fission products released from the North Korean test. Therefore, it is possible that we might eventually have a definitive answer to the question as to whether North Korea tested a thermonuclear device.

However, the fact that Pyongyang conducted its fourth nuclear test is itself a worrying fact given that it could enable the Kim regime to work towards miniaturizing its nuclear warhead and launch them using long range missiles. This will be possible if North Korea modifies its Unha-3 launch vehicle into a ballistic missile. Trajectory analysis using the Quo Vadis software developed at the National Institute of Advanced Studies (NIAS), Bangalore points to the fact that North Korea could launch a 1000kg payload (which is sufficient to carry a nuclear warhead) on the modified Unha-3 to reach Alaska and northern Canada. Further reduction of the mass of the payload might allow the missile to target parts of western United States.

In the past, global responses to the North Korean nuclear and missile tests have largely been restricted to condemnation, passing resolutions and sanctioning its nuclear and missile programmes. These have proven largely

ineffective in forcing the North Korean regime to change course as recent plans to launch a satellite in February 2016 highlight. Sanctioning the North Korean economy and its leadership seems to be the best possible short-term option available to the international community. The question is whether those required hard choices will be made to properly deal with North Korea. If not, it will be matters as usual in the Korean Peninsula.

Source: <http://www.e-ir.info/>, 05 February 2016.

OPINION – Kaveh Afrasiabi

Flawed Arguments on Iran's Missile Program

In a recent article in *The National Interest*, two former US ambassadors, William Luers and Thomas Pickering, as well as Greg Thielmann, have defended the recent US sanctions on Iran over its missile program, calling for a mix of "pressure and diplomacy" to curtail the development of Iran's missile program.

The authors draw attention to the parallel development of Saudi and Israeli missile programs, and acknowledge the important role of Iran's missile program given its "outdated air force" and the "potential threats Tehran sees from Israel, Saudi Arabia and the US." They portray Iran's missile program as "worrisome" and propose a US-led missile diplomacy that would have the objective of freezing "the current range of Iran's missiles (around 2,000 km) to complement the nuclear nonproliferation objectives of the JCPOA. At the same time, the authors realize the regional dimension of the issue and argue in favor of a broader regional security discussion "including parallel regional missile constraints."

Concerning the latter, given the authors' own admission that both Saudi Arabia and Israel have developed "longer range missiles before Iran," it is highly doubtful that either country will consent to somehow shrink the present range of their missiles as part of a "regional solution." There is virtually no international pressure on Israel and

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Saudi Arabia over their respective missile programs and, technologically speaking, it is doubtful that a 'reverse engineering' aimed at reducing the range of their missiles is even possible.

Assuming, hypothetically, that Iran and Saudi Arabia can come to terms to a mutual cap on their missile programs, this would not be in Iran's interest so long as Saudi Arabia enjoys an upper hand in air power, in light of the sophisticated, cutting-edge western jet fighters sold to Saudi Arabia and other member states of the Persian Gulf Cooperation Council (PGCC), worth tens of billions of dollars. Realistically speaking, then, only when Iran is freed from the present constraints on purchase of latest model fighter jets it is possible to fathom a regional missile agreement, otherwise it remains basically a pipe dream.

This aside, the authors do not bother with the legal aspect of the US sanctions on Iran's missile program. To recall, in January, 2016, the US Treasury Department imposed sanctions on 11 individuals and companies involved in the Iranian missile program, in reaction to Iran's missile test in December, 2015, which the US officials branded as a violation of UN Security Council Resolution 1929. Resolution 1929, adopted in 2010, banned any activity by Iran "related to ballistic missiles capable of delivering nuclear weapons." But, the problem with the US's move is that all the previous UN resolutions on Iran, including 1929, have been rendered moot and no longer relevant as a result of the nuclear agreement and the subsequent Resolution 2231 (July 2015). The "Annex on Implementation" of the JCPOA clearly states: "In accordance with the UN Security Council resolution endorsing the JCPOA, the provisions imposed in UN Security Council resolutions...1929 (2010) will be terminated."

Under the new UN resolution 2231, Iran is prevented for some eight years from conducting any test of missiles capable or designed to be capable of carrying nuclear warheads. Furthermore, Resolution 2231 has a carefully-drafted wording banning the Iranian ballistic missiles "designed to be capable of delivering

nuclear weapons." This suggests that the text has a fixed meaning, in light of the fact that "designed" is synonymous with a purposeful activity. In fact, what is lacking in the US's claim against Iran is a "plain meaning" interpretation of resolution 223.

There is a full array of UN precedents and *opinio juris* that supports Iran's position that the resolution's prohibition on missile tests is not absolute. Moreover, the mere allegation that Iran's conventional missiles can be, technically speaking, converted to nuclear-capable missiles, is not sufficient, particularly when taking into consideration the special regime of inspections and verifications imposed on Iran by the nuclear agreement – that would make it exceedingly difficult if not impossible for Iran to pursue clandestine nuclear warheads. According to the US missile expert, Theodore Postol, in his communication with the author, the general assumption in the expert community is that the intermediate-range Iranian missiles can carry a conventional payload of roughly 700 Kg, whereas the lightest and most compact nuclear warhead weighs around 1000 kg, too heavy for those missiles.

Notwithstanding the above-said, it is unclear on what legal ground ambassadors Luers, Pickering and others support the US sanctions on Iran over its conventional missile program? In addition to the lack of clarity on this issue, these authors also somewhat contradict themselves by, on the one hand, admitting the deterrent and "worrisome" (for Iran's rivals and regional adversaries) nature of Iran's missile program and yet, on the other hand, belittling it as having "limited value." But, in light of the growing accuracy of Iran's missile program, that includes ground to sea missiles capable of targeting hostile ships in Iran's vicinity, there is absolutely no way for Iran to agree to any cap on its missile program because of the above-said regional realities. The US should therefore cease its counterproductive efforts to limit Iran's missile program, which serves the country's vital national interests.

Source: <http://www.campaigniran.org/>, 10 February 2016.

OPINION – Jost Wübbeke and Guan Ting**China's Nuclear Industry Goes Global**

There is a strong desire among Chinese leaders to base future economic growth on innovation and to become a global supplier of high-tech commodities "created in China." The objective is to seize strategic industries – photovoltaics, high-speed railways, computer chips and the like – and their global markets. The "One Belt, One Road" strategy is intended to shape global economic integration and trade by Chinese terms, advancing nuclear technology as one of China's new high-tech export brands, as railways before. The business opportunities are tremendous, as building one nuclear power plant equals the value of several hundred thousand car exports.

Acting as salesmen, China's leaders use any possible state visit to negotiate new nuclear deals, for which they promise generous financial backing. At home, everything has been in preparation for the "going out" years ahead. On basis of foreign technology and own original research, China has developed its own third generation reactors. The advanced reactors Hualong-1, CAP1400, and a high-temperature gas-cooled reactor design (HTR) are supposed to conquer international markets. To achieve that, the government is coping with combining the design development and global activities of the vigorously competing nuclear corporations.

China's nuclear export ambitions coincide with an increase in market opportunities. As if the Fukushima incident did not happen, nuclear power is developing rapidly as countries around the world seek energy security and low-carbon power generation. And China wants a slice of that pie. However, China is fighting an uphill battle in a global nuclear market divided among the well-tested technologies of Canada, France, Russia, South Korea, and the US. As Chinese home-grown technology does not yet enjoy a comparable reputation, the entry point for Chinese companies are projects that use foreign-built reactors, but use Chinese money and construction expertise.

China's most recent nuclear projects around the globe fit into this pattern. In October 2015, China

General Nuclear (CGN), one of the country's three large nuclear enterprises, agreed with Électricité de France (EDF) to jointly invest in, construct, and operate two nuclear reactors at Hinkley Point C, UK. The reactor design is provided by EDF. Similarly, CGN and its largest domestic rival China National Nuclear Corporation (CNNC) entered into agreements with Romania and Argentina to build Canadian designed CANDU-6 reactors.

All this is only the first step. These projects are intended to create overseas experience for the Chinese companies and build trust among current and potential customers. Ultimately, China seeks to sell its own reactor designs, especially the Hualong-1 and CAP1400. This strategy seems to have bright prospects for success.

The nuclear enterprises base additional Hualong-1 projects on preceding projects with foreign technology. The deal with EDF to build the reactors at Hinkley Point C also includes an agreement to collaborate towards constructing a Hualong-1 reactor at Bradwell. The UK government has yet to make a decision on the project. The Argentinian government already agreed to build a Hualong-1 at the Atucha site in Buenos Aires province.

China's third largest nuclear enterprise, the State Power Investment Cooperation (SPIC), is in negotiations with the Turkish government about the construction of two CAP1400 reactors. CNNC's most advanced projects are in Pakistan, with two Chinese small-sized reactors already in operation and two more under construction. In August 2015, the first Chinese overseas construction project for Hualong-1 started in Karachi.

How can China enter a market dominated by others for decades? Chinese firms offer a complete package including state of the art technology, financing, and construction services. With 30 nuclear plants in operation and 21 under construction at home, China has gathered plenty of knowledge about how to build and run a plant. In addition, the government supports the overseas projects with generous concessional loans (see table).

...With these resources, the nuclear enterprises are able to initiate and revive projects that had

previously stalled due to financial shortfalls. Before the participation of CGN, the Hinkley Point C projects ran out of funds despite a UK government loan guarantee of 2 billion pounds. Similarly, the Cernavoda project in Romania was on the verge of failure before when GDF Suez, CEZ and RWE, and other major shareholders withdrew from the project.

Safety and Non-proliferation Concerns: Nuclear power is never going to be 100 percent safe, but with its untested technology, China's nuclear industry is under particular pressure to prove its reliability. Xing Ji, the chief designer of Hualong-1, claims that the reactor is among the safest in the world. However, China itself just began building its own demonstration projects for Hualong-1 in Fujian and Guangxi. Every future foreign project that might deploy technologies developed in China, and in particular the Karachi project in Pakistan already under construction, will be an adventurous experiment.

It will be essential for China to convince its prospective customers of its technology. In this regard, it made a step forward as the Hualong-1 passed the IAEA's Generic Reactor Safety Review in December 2014. However, the greatest challenge will be to pass the European Utilities Review and similar procedures in the United Kingdom. This will not only take approximately five years and a lot of funding, but also put the reactor design through thorough examinations. If the Hualong-1 can obtain these core approvals, it will experience a real boost on global markets. The results of these assessments will critically decide the success of Chinese overseas ambitions. The assessments will have to be very strict, in order to avoid any possibility of a Chinese reactor experiencing a negative incident in Europe or

anywhere else.

Chinese-built reactors in countries with a mature nuclear regulatory framework will hopefully be as safe as the existing reactors in these countries. However, Chinese nuclear enterprises also try to tap markets without much previous nuclear experience such as Kenya, Jordan, and Algeria. Chinese nuclear regulators, already grappling to supervise the rapid domestic nuclear build-up, will hardly be able to ensure the safety standards of exported nuclear equipment. China's future customers will likely also have insufficient regulatory regimes to assess the safety implications of nuclear projects.

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China will also face pressure to comply with non-proliferation regimes as it expands its nuclear energy

trade. In Pakistan, China has the most favorable conditions for testing its technology abroad, and no competition from other suppliers. Pakistan is currently the most important buyer of China's home-grown nuclear technology. For the CNNC, which builds these reactors, its Pakistan activities are central for its global strategy.

However, these deals may undermine global regimes intended to control the spread of nuclear weapons-related materials and technologies. The Nuclear Suppliers Group, which unites the most important supplier countries of nuclear technology, prohibits the supply of nuclear equipment to non-signatories of the Treaty on the Non-Proliferation of Nuclear Weapons such as Pakistan. China is undermining this rule with its activities at the Chashma and Karachi sites. These engagements can further aggravate the security situation in Southern Asia.

These deals may undermine global regimes intended to control the spread of nuclear weapons-related materials and technologies. The Nuclear Suppliers Group, which unites the most important supplier countries of nuclear technology, prohibits the supply of nuclear equipment to non-signatories of the Treaty on the Non-Proliferation of Nuclear Weapons such as Pakistan.

Thirty years from now, we will possibly see dozens of reactors outside of China built by Chinese companies and possibly even using Chinese

designs. It is therefore of the highest interest for both China and its foreign customers to make sure that the technology is safe. The experiences with the demonstration projects of Hualong-1 in Fujian and Guangxi may decide China's success in the global market.

If Chinese technology turns out not to be safe, international customers may refuse to buy Chinese technology despite the fact that it will be offered with generous financial support. China has a lot homework to do if it really wants to become a major global supplier of nuclear technology. A pivotal step to demonstrating the reliability of the technology is a more transparent nuclear industry and safety regime within China itself.

Source: Jost Wübbeke is head of the economy and technology program at the Mercator Institute for China Studies in Berlin. Guan Ting is a visiting academic fellow at MERICS. <http://thediplomat.com/>, 11 February 2016.

NUCLEAR STRATEGY

USA

Pentagon Protects Nuclear Modernization Programs in FY17 Budget

The Pentagon's fiscal 2017 budget keeps all its nuclear modernization programs on track, keeping alive concerns from both inside and outside the department about a coming "bow wave" of modernization expenses.

The building will spend roughly \$3.2 billion on programs to modernize and recapitalize the service's nuclear submarines, bombers, ICBM and nuclear equipped cruise missiles in 2017, a total that will increase throughout the Future Years Defense Program (FYDP). That also includes a small amount of funding to continue development on the F-35 joint strike fighter to enable it to carry nuclear weapons.

In addition, the NNSA, a Department of Energy organization that handles development of nuclear warheads, requested \$12.9 billion in funding.

Estimates for upgrading and maintaining the US nuclear force show a likely cost of more than \$700 billion over the next 25 years, costs that come

simultaneously with a major modernization "bow wave" of conventional weapons.

At a Feb. 9 event rolling out the budget, Deputy Secretary of Defense Bob Work acknowledged concerns over nuclear modernization funding. "Starting in 2021, between 2021 and 2035, it's about \$18 billion a year to reconstitute and recapitalize our strategic nuclear deterrent," Work said....

The largest drivers of cost are the SSBN(X) replacement for the Ohio-class submarine, with roughly \$1.86 billion in funds, as well as the Air Force's Long Range Strike-Bomber (LRS-B) program at \$1.4 billion. The LRS-B also requests \$12.2 billion over the FYDP.

In addition, the Air Force requested \$113.9 million in '17 for the Ground Based Strategic Deterrence program, which will replace the service's Minuteman III ICBM program (\$3.3 billion over the FYDP) and \$95.6 million for the Long Range Stand-Off (LRSO) cruise missile (\$2.2 billion over the FYDP.)

The LRSO will replace the Air-Launched Cruise Missile (ALCM) program with 1,000 to 1,100 cruise missiles that represent the Air Force's stand-off nuclear delivery capability. Critics of the US nuclear modernization strategy have zeroed in on the LRSO as a potential cut, citing its similarity to existing US weapons.

The \$12.9 billion request for NNSA is an increase of \$357 million above the FY 2016 appropriation. Of that funding, \$9.2 billion is slated for upgrade and maintenance of the weapons themselves.

While those who feel the current nuclear strategy is required in the face of threats from Russia and China, the stay-the-course policy is welcome news. But those who wish to see a change in the nuclear policy were likely unhappy with the decision to maintain the modernization of all four delivery systems, as well as the "2+3" weapon development plan being pursued by NNSA.

..."Unfortunately, the president's final budget request released is divorced from reality," wrote Kingston Reif, director for disarmament and threat-reduction policy at the Arms Control Association,

Estimates for upgrading and maintaining the US nuclear force show a likely cost of more than \$700 billion over the next 25 years.

in an analysis on his organization's website....

Source: <http://www.defensenews.com/>, 10 February 2016.

USA-SOUTH KOREA

US Hopes to Send Anti-Missile System to South Korea 'as Quickly as Possible'

The US military wants to send a sophisticated missile-defense system to South Korea "as quickly as possible," the Pentagon said.... After Pyongyang's launch of a long-range rocket.... South Korean and US military officials said they would start formal discussions on placing the THAAD on the North's doorstep.

Though the launch saw North Korea successfully blast a satellite into orbit, the United Nations and world powers quickly condemned the action as evidence Pyongyang is continuing to develop an intercontinental ballistic missile capable of striking the US mainland. The launch came only weeks after North Korea carried the latest in a series of underground nuclear tests.

"Without getting into a timeline, we'd like to see this move as quickly as possible," Pentagon spokesman Peter Cook said of a possible THAAD deployment.

...America's highly deployable THAAD system fires anti-ballistic missiles into the sky to smash into enemy missiles either inside or outside the Earth's atmosphere during their final flight phase. The interceptor missiles carry no warheads, instead relying on kinetic energy to destroy their targets.

While China firmly opposes the deployment of such anti-missile hardware so close to its borders, the move to place THAAD in South Korea underscores Washington's frustrations with Beijing's failure to take a tougher line with Pyongyang over its nuclear weapons program.

..."If the THAAD system were deployed to the Korean Peninsula, it would be focused solely on North Korea, contribute to a layered missile defense that would enhance the alliance's existing missile defense capabilities against potential North Korean missile threats," he said....

A US defense official told AFP the anti-missile system could be deployed within one to two weeks of a deployment order.

The THAAD system, in service since 2008, includes truck-mounted launchers, radars, interceptor missiles and global communications links. Five THAAD batteries are currently operational, according to the Pentagon's Missile Defense Agency, and two more were ordered in 2014....

Source: <http://www.defensenews.com/>, 08 February 2016.

BALLISTIC MISSILE DEFENCE

IRAN

'Iran to Upgrade Ballistic Missiles, Get Russian S-300 Defense System Soon'

Iran will unveil an upgrade of its Emad ballistic missiles this 2016, the defense minister was quoted as saying, advancing a program that has drawn criticism from the UN and sanctions from the US.

The Islamic Republic would also start taking delivery of an advanced Russian S-300

surface-to-air missile defense system in the next two months, Hossein Dehghan added – a system that was blocked before a landmark nuclear deal with world powers.

Tehran agreed the deal on curbing its nuclear work in July 2015 and international sanctions were lifted in January 2016. But tensions with Washington have remained high as Tehran continues to develop its military capabilities. Iran first tested the Emad missile in October 2015. With improved accuracy over its existing arsenal, Iran says the new missile will be an important part of its conventional deterrent.

But the US says the Emad is capable of carrying a nuclear warhead and the test therefore violated a UN resolution. Washington imposed fresh sanctions last month against Iranian individuals and businesses linked to the missile program.

..."The Emad missile is not a violation of the nuclear deal or any UN resolution since we will never use a nuclear warhead (on it). It's an

Iran first tested the Emad missile in October 2015. With improved accuracy over its existing arsenal, Iran says the new missile will be an important part of its conventional deterrent.

allegation," he said, adding that mass production would begin in the near future. Iran is also due to start taking delivery of the S-300 missiles system from Russia in the next two months, Dehghan said, and the order would be completed by the end of the year.

Source: <http://www.jpost.com>, 10 February 2016.

NUCLEAR ENERGY

INDIA

Gauging India's Nuclear Power Potential

For India, 2016 could be a transformative year in nuclear power. After years of isolation, India's nuclear energy sector is ready to grow, with several new reactors scheduled to come online over the next 12-24 months. New Delhi wants to expand nuclear capacity to meet growing energy needs for its population and economy. India's 04 February 2016 ratification of the international Convention for Supplementary Compensation for Nuclear Damage, which seeks to increase reparation for damage caused by nuclear mishaps and encourage cooperation in nuclear energy and safety, was done in part to resolve concerns among potential foreign partners. India will need as much foreign investment and technology as possible to reach its ambitious goals.

But concerns about domestic liability laws remain, which could deter foreign investment and ultimately constrain India's hopes to expand nuclear power production. Electricity consumption in the subcontinent will rise in the coming years. All types of energy production can be expected to increase capacity. Foreign suppliers such as Japan, France and the USs can compete to meet this immense demand for nuclear energy, but Russia will continue to be India's preferred provider. India's aspirations of developing domestic thorium-powered reactors – a technology that would

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remove India's dependence on fuel imports altogether – have technical feasibility issues and remain a far-off dream. In the end, capacity overall will increase, but nuclear energy is destined to play a minor role in filling

the country's growing energy appetite.

India's Nuclear History: India was one of the first countries to adopt nuclear power, turning its first commercial reactor online in Maharashtra state in 1969. But because India refused, and to this day still refuses, to sign the NPT, in part to maintain its capabilities in the face of Pakistan's and China's nuclear weapons programs, the global community placed sanctions on the country in the 1970s, isolating India's civilian nuclear program and stifling its growth. Exclusion denied India access to imported nuclear technology, equipment and fuel and severely restricted domestic development. By the 1990s, Indian nuclear power plants had some of the lowest actual output compared to potential output, if operating at full capacity, in the world. Fluctuating uranium supply also curbed the amount of nuclear power India could produce.

But in 2008, New Delhi signed the India-US Civil Nuclear Agreement, separating its civilian and military nuclear operations to begin the process of opening up India's nuclear sector to foreign investment. In theory, it should have ushered in a new era for nuclear energy.

Practical reality, however, was another matter. Subsidized electricity prices and a disjointed energy policy, in which five ministries sometimes compete for control of the whole energy sector, make it difficult to do business there in general. It makes it equally difficult to attract the foreign investment the

country needs for nuclear power when protracted negotiations and delays are the norm.

Another deterrence for the nuclear sector is India's liability laws, which hold suppliers, rather than operators, directly liable in the event of an

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accident, the reverse of the scheme typically found in other countries. Though India has created a \$220 million insurance pool and ratified the nuclear damage convention, the industry is still skeptical. The Indian Civil Liability for Nuclear Damage Act contradicts the international treaty, as there are still clauses in the domestic law that force suppliers to shoulder the burden in the event of an accident. It is ultimately unclear whether ratifying the convention will be enough to assuage such worries.

Today, India operates 21 nuclear power reactors, accounting for 5.8 percent of India's total energy generation capacity of 290 GW. The average size of its reactors is much smaller than the global average, an artifact of decades of isolated development. New Delhi's targets seek to have nuclear power reach a capacity of 14.6 GW by 2021 and 27.5 GW by 2032. The longer-term target is to account for a quarter of the nation's electricity by 2050, although reaching that goal is unlikely. Nuclear energy accounts for less than 3 percent of the total generation mix and 1 percent of India's overall energy consumption.

Projects Planned and Underway: To meet some of its goals, India is constructing six new reactors: five for power production and one as a domestic pilot project. In conjunction with Russian national nuclear corporation Rosatom, a second reactor at the Kudankulam site in Tamil Nadu is scheduled to finally commence operations in 2016 or early 2017 after years of delay. In addition, two new domestically developed reactors are scheduled to commence operations by the end of the year at the Rajasthan nuclear power plant. Another two reactors under construction at the Kakrapar plant in Gujarat had been scheduled to begin operation in late 2015 but have been delayed and are currently under review.

There are also several planned or proposed projects, including additional domestically developed reactors. But it is the efforts of foreign firms that will be the most important. Western firms will provide assistance in some large plants, yet the main obstacle continues to be red tape, since none of these foreign projects have even

started despite the signing of bilateral agreements as early as 2009.

For example, Indian-French relations are expanding, as French President Francois Hollande's visit to India in January 2016 showed. But though India signed a memorandum of understanding with French electric company EDF, which took over operations of French nuclear company Areva 2015, it was simply an update to an earlier agreement. Construction on the deal's Jaitapur project could start as early as 2017, but India's nuclear power operator NPCIL has concerns regarding the performance and cost of the French reactors, only slowing operations more.

Toshiba-Westinghouse and GE-Hitachi have been tapped to eventually supply six reactors each to the Mithivirdi and Kovvada sites. But as with the French and other projects, little to no actual progress has been made. India's civil liability laws continue to deter US, French and Japanese participation, although opinions could always change in 2016.

Given such uncertainty, Japan's response will perhaps be the most important to monitor. After all, the majority of parts from EDF-Areva, Toshiba-Westinghouse and GE-Hitachi come from Japan. Strengthening relations with New Delhi could benefit Tokyo as well as Washington, countering Chinese influence in the region. A memorandum of understanding between Japan and India was signed in December 2015 with regard to nuclear cooperation, though legal and technical issues are still being negotiated. Indian government officials have also said an agreement could be ratified as early as the second quarter of 2016. India will need it if it hopes to have a partner besides Russia in the near term.

Enter Russia: As Western companies balked at India's liability laws, Russia took advantage of this relatively new open market. Of course, Russia does not export only nuclear technology to India, but Rosatom can be expected to be highly active there, especially since nuclear power provides Russia another avenue into the Indian economy as its defense sales weaken. An agreement signed in 2014 indicated that Russia's involvement could reach as high as 20 new reactors. During Indian

PM Narendra Modi's first visit to Moscow in December 2015, the desire for at least a dozen reactors was also confirmed and included the designation of Andhra Pradesh as a likely location for several of these reactors. India may want to diversify nuclear suppliers, but New Delhi also views Russia as a reliable partner. India could benefit from the partnership with Rosatom as well because the corporation will source from Indian manufacturers, which works in favor of the "Make in India" initiative to build up the Indian economy.

India's appetite for electricity will grow, and we can expect to see capacity increases across all fuel types, including nuclear. When India emerged from 40 years of nuclear isolation almost a decade ago, expectations for foreign cooperation were high. However, India's potential to expand and reach its ambitious nuclear targets continues to be crippled by bureaucratic hurdles. Ultimately, nuclear power will contribute only minimally to India's overall energy portfolio.

Source: <https://www.stratfor.com/>, 09 February 2016.

JAPAN

Japanese Bill Seeks to Support Reprocessing Business

The Japanese cabinet has approved a bill aimed at "taking measures necessary for the steady implementation of the reprocessing of used nuclear fuel". The bill creates a new entity responsible for reprocessing and introduces a new system for funding it.

At a meeting on 05 February 2016, the cabinet approved the bill "to amend the part of the law on funding and management of the reserve fund for the reprocessing of used fuel in nuclear power generation".

In a statement the same day, the Ministry of Economy, Trade and Industry (METI) noted that

reprocessing and the use of MOX fuel are key parts of the Basic Energy Plan approved by the cabinet in April 2014. However, the ministry said that with the full liberalization of the country's retail electricity market starting in April, increased competition could have major impacts on business environment surrounding nuclear power. This, it suggests, could mean the reprocessing business may "stagnate" as nuclear operators could struggle to secure the necessary stable funds.

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One of the main measures of the recently approved bill is to establish a new "contribution system" for funding reprocessing. Nuclear plant operators will be required to contribute to the reprocessing fund according to how much used fuel they generate.

Currently, Japan's ten power companies deposit fees for future reprocessing with the Radioactive Waste Management Funding Research Centre (RWMC). The fee is JPY0.5 (0.4 US cents) per kilowatt-hour of nuclear electricity generated. This is supervised by the government's Agency for Natural Resources and Energy (ANRE). ANRE reported that the fee deposits at RWMC amounted to JPY 2.4 trillion (\$21 billion) as of March 2015.

The bill also authorizes a new "authorized corporation" to take responsibility for Japan's reprocessing business. In addition, it introduces a "proper governance system" in which a steering committee - which could include a third party - is established to make decisions on the authorized corporation's operations.

The government intends to enact the legislation during the current parliamentary session.

Japan Nuclear Fuel Limited (JNFL) was set up in 1992 to operate the country's nuclear fuel cycle facilities, including uranium enrichment, reprocessing of used fuel, MOX fuel fabrication, and disposal of low-level radioactive wastes. It

is a joint stock company by the electric power utilities, with some wider shareholding. JNFL operates a major complex at Rokkasho-mura in Aomori prefecture....

Source: <http://www.world-nuclear-news.org/>, 09 February 2016.

TURKEY

Turkey Increases Focus on Nuclear Energy Cooperation

Turkey launched the construction of its first nuclear power plant in Akkuyu, located in the southern province of Mersin, in April 2015 in order to provide greater energy self-sufficiency. Turkish companies will engage in collaborative work with global investors to stimulate mergers in the nuclear sector between nuclear companies that can contribute the growth of the economy

A written statement from the Nuclear Industry Association of Turkey said...the country's nuclear economy is growing with the existing nuclear power plant projects in Akkuyu and Sinop, as well as a third planned nuclear facility. It was stressed that if Turkish companies can join the supply chain of foreign companies, they will have an opportunity to take a share of international nuclear projects as well, since Turkey's nuclear market worth \$40 billion attracts the attention of foreign investors.

Nuclear Industry Association of Turkey founder and secretary-general, Koray Tuncer, said the association endeavors to increase mergers between nuclear companies to contribute to the growth of the economy. To achieve this aim, the association has signed several cooperation agreements with foreign nuclear industry associations.

Speaking to Anadolu Agency (AA), Tuncer said cooperation agreements signed with nuclear industry associations from the United Kingdom, France, Canada and Bulgaria will boost Turkey's nuclear economy....

According to Tuncer, currently many domestic companies cannot directly provide materials for nuclear power plants, but they can join the supply chain by merging with other companies that can provide materials for the existing projects....

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nuclear power plant in Akkuyu, located in the southern province of Mersin, in April 2015 in order to provide greater energy self-sufficiency. The \$20 billion project will consist of four units able to generate 1,200 megawatts of power each. The power plant, which is being constructed by Russian state-run atomic energy corporation Rosatom, is expected to produce approximately 35 billion kilowatt-hours of electricity per year after its construction is completed, and its service life is expected to last 60 years. A second plant is planned to be built by a French-Japanese consortium in the northern Black Sea city of Sinop. Also, former Energy and Natural Resources Minister Ali Rıza Alaboyun announced in October 2015 that the Yöneada district in the northwestern province of Kırklareli is where the country's third nuclear power plant will be built.

Source: <http://www.dailysabah.com/>, 10 February 2016.

USA

Half-Built Nuclear Fuel Plant in South Carolina Faces Test on its Future

Time may finally be running out on the Mixed Oxide Fuel Fabrication Facility, a multibillion-dollar, over-budget federal project that has been hard to kill. The Energy Department has already spent about \$4.5 billion on the half-built plant near Aiken, S.C., designed to make commercial reactor fuel out of plutonium from nuclear bombs. New estimates place the ultimate cost of the facility at between \$9.4 billion and \$21 billion, and the outlay for the overall program, including related costs, could go as high as \$30 billion.

Officials warn that the delays in the so-called MOX program are so bad that the plant may not be ready to turn the first warhead into fuel until 2040.

... The Energy Department proposes abandoning it. Energy officials want to spend only the money necessary to wind down the MOX program while the government shifts to a different method of disposing of the plutonium.

...Many in South Carolina, including Senator Lindsey Graham, third from left at the plant in 2005, defend it. The struggle is a case study in the difficulty of cutting unnecessary or wasteful federal programs, with the added twist that

proponents of keeping the plant include some of the Republican Party's most determined opponents of government spending, like Representative Joe Wilson, a South Carolina Republican whose district includes Aiken.

...Two companies involved with the plant's construction are among Mr. Wilson's biggest contributors, according to campaign records. Chicago Bridge and Iron, one of the two companies that own the main contractor for the facility, gave \$10,000 to Mr. Wilson's 2014 re-election campaign, and the other owner, Areva Group, donated \$8,000, according to campaign records.

...Mr. Wilson countered that the administration had used "discrepancies in data" to overestimate costs for finishing the project. Proponents of the MOX plant also cited a recent study, paid for by the main contractor working on the plant, that concludes that the costs of the program are much lower than the estimates in recent studies sponsored by the Energy Department.

The Obama administration has wanted to get rid of the program for years. In a budget request three years ago, it said the idea of making reactor fuel "may be unaffordable." But Congress has repeatedly restored funding. The plant is being built to comply with an agreement with Russia in 2000, when both countries said they would eliminate 34 metric tons of weapons-grade plutonium from their nuclear arsenals. Construction started during the George W. Bush administration, but has been plagued by long delays, cost overruns and little interest from commercial nuclear plants in buying the fuel that the plant was designed to produce.

...Giving up on the plant means the administration will abandon plans to turn the weapons-grade plutonium into fuel for commercial nuclear reactors, and will instead switch to a process that dilutes the plutonium into nuclear waste.

The Energy Department would like to move that nuclear waste to a facility near Carlsbad, N.M.,

where it would be stored deep underground in salt formations. The administration says it can get rid of the weapons material under the alternative approach for about \$300 million to \$400 million a year, compared with \$800 million to \$1 billion a year under MOX.

...Still, the administration faces big obstacles before it can make the switch. It will have to persuade the Russian government to agree to modify the agreement to allow the United States to change its method for disposing of the plutonium.

Another hurdle is the New Mexico underground storage facility, which has been closed for two years because of a 2014 leak of radioactive material. Once it reopens, the Energy Department will have to obtain legal and regulatory approvals to store the plutonium waste there, and that will mean

winning over New Mexico's political leaders, who are not yet convinced.

...In late January 2016, Gov. Nikki Haley of South Carolina, a Republican, issued a letter formally asking Mr. Wilson's son – Alan Wilson, South Carolina's attorney general – to sue the Energy Department over MOX. The grounds for the lawsuit are expected to be based on the fact that the Energy Department missed a Jan. 1 deadline for the removal of some of the plutonium out of the state, and the suit is expected to claim that the department owes fines to South Carolina.

"As the state's chief legal officer, our office has been working to protect the MOX facility legally for more than two years," Alan Wilson said in a statement. "The Department of Energy has continually shown disregard for its obligations under federal law to the nation, the State of South Carolina and frankly the rule of law."

Even if the administration can get past the Wilsons, Mr. Graham will be tougher to beat. He sits on the Armed Services and Appropriations Committees, the two most important Senate panels dealing with the program. He is not

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satisfied by what he has heard so far from the administration....

Source: New York Times, 06 February 2016.

URANIUM PRODUCTION

RUSSIA

Russia Plans Significant Expansion of Uranium Production

Amid the ongoing financial crisis in Russia, the Russian government has designed a package of measures, aimed at the supporting of the national uranium industry and creation of conditions for a significant expansion of uranium production in the country during the next several years.

According to Vladimir Verkhovtsev, General Director of ARMZ Uranium Holding Co., Russia's leading uranium mining company, currently the domestic production fully meets Russia's needs for uranium, however there is a possibility that such situation may change in the future.

This is mainly due to the planned commissioning of new nuclear power capacities in Russia during the next several years, which may lead to a shortage of uranium in the country already by 2025. Verkhovtsev has also added that the same problem may be observed in the EU countries.

Among the support measures, which have preliminary been approved by the Russian government is the introduction of preferential tax regime for the domestic uranium producers and the elimination of bureaucratic hurdles in the industry. The latter means simplification of the procedure for the provision of domestic uranium fields to local mining companies.

It is planned that a particular attention of the state is expected to be paid for the support of the JSC

"Argun Industrial Mining and Chemical Enterprise", Russia's largest facility for the production of uranium, which is based in the city of Krasnokamensk, a town in the Krasnokamensky District of the Zabaykalsky Krai....

...Victor Svyatetskii comments: "The launch of the new mine will allow the company to stay profitable for decades, while its capacity will amount to 3,000 tonnes per year. In the structure of ARMZ the No 6 mine accounts for 18% of all stocks of the holding, while in the case of Argun, this figure is estimated at 40% of all the reserves of the enterprise".

The increase of uranium production is part of the existing Energy Strategy of Russia, which is designed until 2020 and which involves the increase of the share of nuclear power in the total energy balance of Russia from the current

16% to 23% by 2020, with an increase in nuclear power generation from 130 to 230-300 billion kw/h per year.

It is planned that Russia, along with France, will continue to remain the main global lobbyists of nuclear power during the next several decades, being not ready to cut on the already existing nuclear power capacities.

Formally, the mineral resources base of uranium in Russia is estimated at more than 600,000 tonnes of reserves and 830,000

tonnes of predicted resources.

However, the development of the majority of these reserves is associated with the cost of US\$80/kg, which, amid the current market conditions, is considered as too high for the majority of Russian and global uranium investors. Overall, according to optimistic expectations of the Russian government, up to 16,000 tonnes of uranium per year will be produced in Russia by 2020.

Source: <http://investorintel.com/>, 02 February 2016.

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NUCLEAR COOPERATION

INDIA–RUSSIA

N-Plant Parts to be Made in India

In a move that could become a model for countries keen on a share of India's civil nuclear energy pie, India and Russia have set up a working group to locally build components for nuclear power plants of Russian design.

This is based on the Action Programme signed between Rosatom and the Department of Atomic Energy of India during PM Narendra Modi's visit to Moscow in December 2015. "Based on the decision signed in December 2015, a fourth working group on the localisation of production in India has already been established and is operating successfully." ... Rosatom, as part of its plans for expanding its global footprint, is in the process of opening its regional office for South Asia office in Mumbai.

According to Mr. Griva, the Action Programme includes areas of cooperation in the field of joint machinery production, especially for nuclear power plants, as well as cooperation in the field of joint development, mastering and technological support of the implementation of end-to-end production technologies of products for heavy and power engineering industries.

The three joint working groups, set up under the Indo-Russian Coordinating Committee on cooperation in the peaceful uses of nuclear energy established in December 2014, are on the nuclear fuel cycle, nuclear energy and scientific-technical cooperation.

..Russia is currently building six reactors in Kudankulam of which the first unit was commissioned in autumn 2013. It was shut for the first scheduled preventive

maintenance (SPM) and has now successfully restarted power generation. The assembly of the second unit assembly has been finished and the hot run stage was completed. "The physical launch is scheduled by the Indian party for mid-2016," Mr. Griva said.

Source: The Hindu, 05 February 2016.

SOUTH KOREA–ARGENTINA

Sales of Nuclear Energy Cooperation

The Korea Hydro & Nuclear Power Corp. (KHNP) announced that it has signed a MOU for technological cooperation with Nucleoeléctrica Argentina Sociedad Anonima (NASA) on 27 January 2016 in order to safely manage domestic nuclear power plants and

push into global nuclear energy market by expanding cooperation with a global nuclear power plant operator.

Under the MOU, the two firms will cooperate in a range of areas including the operation, maintenance, engineering and construction of nuclear power plants. KHNP also said it has been in practical talks to participate in the Embalse nuclear power plant project in which NASA has been seeking to extend the plant's operation life. The Korean nuclear power company wants to export its technology and experience that has been proven by the successful extension of the

Wolseong unit 1 reactor's life span. It said another deal can be signed when the two companies agree.

...In Argentina, about 5 percent of the electricity comes from nuclear reactors. The country has nuclear power life-cycle technologies, such as enrichment, operation, construction and reprocessing, and there are a total of nine nuclear

power plants, including research reactors...

Source: <http://www.businesskorea.co.kr/>, 04 February 2016.

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NUCLEAR PROLIFERATION

NORTH KOREA

North Korea Continues to Evade UN Sanctions to Get Material for Nuclear, Ballistic

North Korea continues to evade UN sanctions, using flights, ships and the international financial system to procure material needed for its nuclear and ballistic missiles programs, UN experts said, according to the Associated Press. Pyongyang claimed that it successfully launched a satellite, a move the international community believes is a cover to test North Korea's intercontinental ballistic missile.

The experts, who have been monitoring the sanctions on Pyongyang, also said that the Kim Jong Un-led country exports material related to ballistic missiles to the Middle East and trades in arms and related material with Africa,... The panel of experts analyzed sanctions, starting from the country's first nuclear test in 2006, and are checking how the country has been able to evade them. The report was sent to the UNSC, where rival South Korea and the US are working on implementing stronger sanctions the latest rocket launch.

According to the report, a "low level of implementation" is one of the reasons North Korea is able to evade sanctions. The panel also cited "lack of political will," not enough national legislation, an absence to understand the Security Council resolutions, and "low prioritization" as other key reasons.

The panel also said that North Korea hides its illegal activities by placing its agents in foreign companies and using its diplomatic personnel, its trade partners and through forming relationships with few trusted foreign nationals. The panel added, according to AP, that despite being blacklisted through UN sanctions since July 2014, North Korea's Ocean Maritime Management Company, Ltd. "continues to operate through foreign-flagged vessels, name and company re-registrations, and the rental of crews to foreign ships...."

The rocket launch by North Korea has been condemned by international powers, including China, which has supported Pyongyang on several occasions, while the UNSC called for an emergency meeting after the launch. World leaders called the launch an "intolerable provocation" and said that it was a banned test of a dangerous ballistic missile technology.

Although China has so far condemned the rocket launch, some experts say that Beijing is reluctant to impose measures that could lead to the country's economy collapsing. However, the US, South Korea, Japan, and other Western allies have all called for stronger sanctions....

Source: <http://www.ibtimes.com/>, 10 February 2016.

North Korea Capable of Harvesting Plutonium in Weeks, on Way to Field kn-08 ICBM: US Intelligence Chief

North Korea has run its nuclear reactor for long enough to harvest plutonium "within a matter of weeks to months" and Pyongyang is also believed to have taken "initial steps" toward fielding a road-mobile intercontinental ballistic missile....

Director of National Intelligence James Clapper unveiled the assessment in his "Worldwide Threat Assessment" report submitted to the Senate Armed

Services Committee, days after North Korea carried out a banned missile launch following its fourth nuclear test a month earlier.

Clapper said the North has followed through on its 2013 announcement to "refurbish and restart" its nuclear facilities, including the uranium enrichment facility and its five-megawatt reactor at its Yongbyon nuclear complex....

The graphite-moderated reactor has been the source of weapons-grade plutonium for the communist nation. The small reactor is capable of producing spent fuel rods that, if reprocessed, could give the regime enough plutonium to make one bomb a year. The reactor has provided Pyongyang with weapons-grade plutonium that the regime used in its first three nuclear tests, in

The graphite-moderated reactor has been the source of weapons-grade plutonium for the communist nation. The small reactor is capable of producing spent fuel rods that, if reprocessed, could give the regime enough plutonium to make one bomb a year.

2006, 2009 and 2013. The North conducted its fourth nuclear test on 06 January 2016, claiming it successfully detonated a hydrogen bomb.

Speaking of the North's missile program, the intelligence chief said that Pyongyang is also committed to developing "a long-range, nuclear-armed missile that is capable of posing a direct threat" to the US, and has publicly displayed its KN-08 road-mobile intercontinental ballistic missile on many occasions.

The KN-08 is believed to have a range of at least 5,500 km, which puts Alaska at risk. US officials have expressed concern about the missile in that it can be launched from elusive mobile platforms. Deputy Defense Secretary Robert Work also voiced concern about the KN-08 missile later in the day.

Kim and his regime have also publicly emphasized – and codified – the North's focus on advancing its nuclear weapons program, developing the country's troubled economy, and improving the livelihood of the North Korean people, while maintaining the tenets of a government-run, "command economy," the intelligence chief said.

Despite efforts at diplomatic outreach, Kim continues to challenge the international community with provocative and threatening behavior in pursuit of his goals, as prominently demonstrated in the November 2014 cyber-attack on Sony, the August 2015 inter-Korean confrontation spurred by the North's placement of landmines that injured two South Korean soldiers, and the fourth nuclear test in January 2016," he said....

Source: <http://english.yonhapnews.co.kr/>, 10 February 2016.

NUCLEAR SAFETY

GERMANY–BELGIUM

Germany Expresses Concerns over Belgian Nuclear Safety

Germany's environment minister wanted answers from the Belgian government regarding the safety of its nuclear reactors. But her visit shows that beyond voicing concerns, Germany has little influence on the matter. The list of Germany's questions over security at Belgium's seven nuclear reactors has received no immediate answers after

environment minister Barbara Hendrick's visit to Brussels.

No, said Barbara Hendricks firmly, after her meeting with Belgian interior minister Jan Jambon and environment minister Marie-Christine Marghem, no, she was not disappointed...Some two weeks ago, the minister had submitted a set of questions to the Belgian nuclear authority regarding the safety of two of Belgium's seven reactors in particular. While the meeting in Brussels yielded no answers, there was a promise that they would be delivered in the coming weeks.

With nuclear policies firmly in the hands of each EU-member state, Hendricks seemed fully aware of how little weight her country's concern about the safety of Belgium's ageing nuclear reactors carries in the neighboring European state.

The Tihange nuclear site close to the town of Huy on the Maas river lies only about 60 kilometers (37.5 miles) from the German border, and citizens in the city of Aachen have been up in arms ever since reactor Tihange 2 was restarted in December 2015. Belgium's two nuclear sites at Doel and Tihange supply half the country's electricity and whenever one or several of the seven reactors were shut down temporarily, it sparked fears of electricity black-outs. Seven nuclear reactors go a long way towards providing Belgium with power. The nuclear sites are also the central element of Belgium's independence when it comes to energy: There are no power lines connecting Germany and Belgium, and with a transition to other sources of energies very much ongoing, Belgium would come to depend on neighboring France if its own nuclear power supplies dwindled. In 2003 Belgium decided in principle to get out of nuclear energy and it limited the operating lives of its nuclear reactors to 40 years.

But while the country's oldest reactor, Doel 1, was duly shut down after the completion of its 40-year-life span in February 2015, parliament then passed a law enabling both Doel 1 and Doel 2 to operate for a further ten years. The lifetime of the Tihange 1 reactor was also extended, so that Belgium's nuclear exit has been put back to December 1, 2025.

Reactor number 3 at the Doel site near the Belgian city of Antwerp, close to the border with the

Netherlands and Tihange 2 had been shut off in 2012 after tiny cracks had been found in the reactors' pressure vessels. The nuclear reactors at Tihange evoke fear among neighboring cities and communities. But at the end of 2015, the Belgian nuclear authority FANC found that restarting the reactors did not involve any security risks: The justification brought forth by utilities operator Electrabel was convincing and the "structural integrity" of the reactors was not compromised by the cracks, the body concluded.

In a statement to the German parliament's environment committee, the environment ministry reported that the cracks constituted a "significant deviation" from the production quality required, and that existing margins of safety were being "significantly reduced." "From a German perspective, it is doubtful to what extent this is reconcilable with basic requirements regarding the safety of nuclear reactors," the ministry report read.

A study commissioned by the group of Green parties in the European parliament and published in January came to a similar assessment. "This study comes to the clear conclusion that there is no evidence how and when these cracks appeared in the reactor pressure vessels," Greens co-president Rebecca Harms commented....

A European directive on nuclear safety is in fact in place but it does little more than require member states to have an "independent, competent, regulatory authority endowed with adequate powers and resources." With regard to the security concerns voiced by Germany and other states neighboring Belgium, such as the Netherlands and Luxembourg, the European Commission says there is no indication Belgium is violating the nuclear safety directive.

And federal minister Hendricks said she saw no advantage in EU law providing a basis for nuclear safety. "Personally, I would be worried that in that case, we would have to soften the nuclear safety standards we have in Germany."

Source: <http://www.dw.com/>, 14 February 2016.

NUCLEAR WASTE MANAGEMENT

JAPAN

How is Fukushima's Cleanup going Five Years After its Meltdown? Not So Well.

Seen from the road below, the Fukushima Daiichi nuclear power station looks much as it may have

right after the catastrophic earthquake and tsunami that caused a triple meltdown here almost five years ago.

The No. 3 reactor building, which exploded in a hydrogen fireball during the disaster, remains a tangle of broken concrete and twisted metal. A smashed crane sits exactly where it was on March 11, 2011. To the side of the reactor units, a building that once housed boilers stands open to the shore, its rusted, warped tanks exposed.

The scene is a testament to the chaos that was unleashed when the tsunami engulfed these buildings, triggering the world's worst nuclear disaster since the one at Chernobyl, in Ukraine, in 1986. Almost 16,000 people were killed along Japan's northeastern coast in the tsunami, and 160,000 more lost their homes and livelihoods.

Tokyo Electric Power Co. (Tepco), the utility company that runs the Fukushima plant and drew fierce criticism for its handling of the disaster, says the situation has improved greatly. "In the last five years, radiation levels have been reduced substantially, and we can say that the plant is stable now," said Akira Ono, the Tepco plant superintendent.

...People will be allowed to return to their homes in the nearby town of Naraha next month and to Tomioka, even closer to the plant, next year. For now, Tomioka and neighboring Okuma remain ghost towns, lined with convenience stores, fast-food restaurants and gambling parlors that haven't had a customer in five years. Bicycles lean near front doors, and flowerpots sit empty on windowsills.

A sign on the road to the plant showed a radiation reading of 3.37 microsieverts per hour, at the upper end of safe. At a viewing spot overlooking the reactor buildings, it shot past 200, a level at which prolonged exposure could be dangerous. Both readings are hundreds of times lower than they were a couple of years ago.

After about 20 minutes at the viewing spot, a Tepco official hustled visiting reporters, wearing protective suits, onto a bus. "We don't want you out here too long," he said. Below, men continued working on the site.

There's the groundwater that is flowing into the reactor buildings, where it becomes contaminated. It has been treated – Tepco says it can remove 62 nuclides from the water, including strontium, which can burrow into bones and irradiate tissue. It cannot filter out tritium, a

radioactive isotope of hydrogen that can be used to make nuclear bombs but is not considered especially harmful to humans.

The water initially was stored in huge bolted tanks in the aftermath of the disaster, but the tanks have leaked highly contaminated radioactive water into the sea on an alarming number of occasions. Now Tepco is building more-secure welded tanks to hold the water, theoretically for up to 20 years. There are now about 1,000 tanks holding 750,000 tons of contaminated water, with space for 100,000 tons more. The company says it hopes to increase capacity to 950,000 tons within a year or two, as well as halve the amount of water that needs to be stored from the current 300 tons per day.

As part of those efforts, Tepco built the 1,500-yard-long ice wall around the four reactor buildings to freeze the soil and keep groundwater from getting in and becoming radioactive. Company officials hoped to have the wall working next month....

Then there's the radioactive soil that has been collected from areas around the Fukushima Daiichi plant during cleanup efforts. More than 700 million cubic feet of soil – enough to fill 8,000

Olympic-size swimming pools – has been packed into large black plastic bags and is being stored, row upon row, in local fields.

More than 700 of the bags, which contain radioactive cesium isotopes, were swept away during floods last year, some ending up in rivers 100 miles away. The government has said that 99.8 percent of the soil can be recycled.

The fuel that melted down remains in containment vessels in its reactors, and this part of the plant is so dangerous to humans that robots are used to work there. Getting to this fuel and removing it safely is a task that will take decades.

Japan does not have a nuclear waste dump, and there is vehement resistance to disposing of contaminated material on land. As a result, one of the options the government is considering is building a nuclear waste dump under the seabed, about eight miles off the Fukushima coast. It would be connected to the land by a tunnel so it would not contravene international regulations on disposing of nuclear waste into the sea. A government study group is set to report on that proposal by the end of the summer....

Source: Washington Post, 10 February 2016.



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