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Nuclear Security: India and the NTI Ranking

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Introduction

Nuclear security has become a major concern for India and the global community in recent years. Concerns around nuclear terrorism, including the so-called 'dirty bomb', have become particularly pressing in the last decade. Realistically speaking, it is only a matter of acquiring weapon-grade fissionable material-highly enriched uranium (HEU) and/or plutonium-for a terrorist group(s) to build nuclear explosives. All the sensitive material that is required to build a nuclear bomb is less than 10 kg of plutonium or a few tens of kg of HEU (Nagasaki–Fat man: 6.2 kg of Pu; Hiroshima-Little Boy: 64 kg of U). The threat is real; there have been 16 documented cases alone worldwide of theft or loss of HEU/Pu from January 1993 to December 2013, according to the Incident and Trafficking Database of the International Atomic Energy Agency (IAEA).[1] It comes as no surprise that nuclear security is therefore one of the prime policy concerns of this century. It is not only a challenging policy issue but also a technological concern in terms of keeping record of the entire inventory of potentially dangerous material worldwide, securing them and detecting their diversion for terrorist activities.

To coincide with the bi-annual Nuclear Security Summits (NSS), the Nuclear Threat Initiative (NTI) and the Economist Intelligence Unit (EIU) developed a nuclear material security index (2 editions thus far: 2012, 2014). The NTI, supported by an international panel of nuclear security experts and technical advisors, has developed the framework and priorities of the index, while the EIU was responsible for developing the analytical model for the index and gathering the data. The NTI Index primarily presents an assessment of nuclear material security conditions of 25 countries which possess one kg or more of weapons-grade nuclear material based on 5 broad categories, namely:

Quantities and Sites; Security and Control measures; Global norms; Domestic Commitments and Capacity; and Risk Environment. Each of these categories has indicators (both quantitative and qualitative), which further have sub-indicators.

Problem Areas in the NTI Index

The index does not take into account the nature of individual nuclear programmes. For example, Australia, whose primary nuclear-related activity is uranium mining and exports (with only one operational 20MW research reactor), has been evaluated under the same criteria and scored using the same equally-weighted indicators as India, which is involved in nuclear activities from mining to fuel fabrication and has 20 operational commercial reactors with a total of 4,780 MW, along with all the front- and back-end facilities handling material in addition to exports.[2]

The safety-security synergy has also been overlooked by the NTI Index. According to the report of the NTI Index, "The index does not address proliferation risks, disarmament, nuclear safety, or the threat of sabotage of nuclear facilities." It is not possible to develop a holistic perspective on nuclear security as a stand-alone topic without taking into account nuclear safety, proliferation risks and other associated risks. Synergy between nuclear safety and security was an important agenda of the 2012 NSS. The fundamental objective behind nuclear security and safety is the same-the protection of people, society and environment. The risk associated, irrespective of whether the initiating event is related to safety or security, is presumptively the same. The basic philosophy behind the modes of achievement of nuclear safety and security is that of defence-in-depth. The nature of the layers of protection that are employed for defence-in-depth are the same. These factors were recognised in the Seoul communiqué, and were reflected in the 2012 NSS Work plan.

The first category Quantities and Sites, for example, illustrates the prescriptive, one-size-fits-all approach by the NTI. This indicator seeks to capture each country's combined total quantity of HEU, separated plutonium and unirradiated mixed oxide fuel (MOX). MOX is essentially a mix of plutonium oxide and uranium oxide; the burn-up of MOX fuel is the same as uranium oxide fuel (UOX). MOX can be viewed as a mode of effectively utilising the plutonium recovered from the used fuel as well as a means of burning weapons-grade plutonium for civilian purposes. The other advantages of MOX include: economic benefits, particularly for a country like India, as it reduces the sole dependence on uranium; reduction in the volume and the burden of plutonium in spent fuel (35 percent of the volume, mass and cost of disposal compared to uranium oxide fuel); and ease of achieving desired higher burn-up with MOX fuel with even marginal increases in plutonium concentrations vis-à-vis a much higher cost of enrichment of uranium. India is the only country in addition to France, UK, Russia and Japan to have a MOX fuel fabrication plant of its own—the Advanced Fuel Fabrication Facility (AFFF), Tarapur.

Another factor that needs be mentioned along with MOX is that of closed loop fuel cycle. In the sub-indicator Material Production and Elimination Trends in the same category, the scoring criterion

revolves around the following: "When considering whether a country's total stock of nuclear materials is decreasing, analysts evaluated the following: Is the country reducing its stock of nuclear weapons? Is reprocessing being discontinued? Are HEU-fuelled research reactors being converted to low enriched uranium (LEU), and are unneeded research reactors being decommissioned?" and so on. From this it is clear that the NTI considers the closed loop fuel cycle based on spent fuel reprocessing as proliferation-prone. Spent fuel contains fissile materials and certain minor actinides and other fission products that have fissile value. The closed loop fuel cycle utilises this fission value further for increasing the radiation levels of fresh fuel. In addition, reprocessing significantly reduces the radioactivity of the final waste. These are considered as intrinsically proliferation-resistant technologies. Logically speaking, it is the more sustainable approach compared to the once-through fuel cycle.[3]

Clearly, the index has been conceived by those who subscribe to the notion that reprocessing and MOX fuel are proliferation concerns. To quote a typical source material followed for the index: "The Prefre reprocessing facility is the principal proliferation concern at Tarapur.... The sol-gel pilot-plant and the MOX fuel fabrication facility are also proliferation concerns because they increase India's ability to produce plutonium-bearing spent fuel. MOX fuel is particularly worrisome because it involves the use of plutonium in the civilian power reactors and greatly increases the danger that plutonium could be diverted or stolen. Moreover, the presence of large amounts of plutonium makes the task of detecting clandestine nuclear weapon activities more difficult."

India's three-stage nuclear power programme was chalked out in as early as the 1950s by Homi Bhabha, and is explicitly based on closed fuel cycle and fast breeder reactors. The main motive behind this unique programme was to utilise the enormous thorium reserves of the country and to achieve energy independence. A period of almost 30 years of "nuclear apartheid"—which forced India to rely only on the lower-grade domestic uranium, MOX fuel and spent fuel reprocessing—can be viewed as a time when logical measures were taken for survival and independence by the Indian nuclear establishment. With its fundamentally opposite philosophy from India, it is natural that the NTI Index interprets the indigenously developed facilities including the MOX fabrication plant, spent-fuel reprocessing plants and fast breeder reactors as proliferation threats that consequently reflect in India's poor ranking.

Presumably as a result of this rather inflexible model being used to rank countries with diverse nuclear programmes, governance, security systems et al, there are some stark examples of irrational relative scoring in the index. The following are illustrative of this:

Quantity and Sites: The US ties with Russia for 20th rank, while India, Japan and Pakistan are tied for the 22nd rank. This ranking contradicts the NTI stated rationale behind this category: "The larger the quantity of nuclear material held, the greater the materials management requirements and potential risk that materials could be stolen." The US has 104 operating nuclear reactors (open cycle; spent fuel containing more plutonium) and an estimated 21 nuclear weapons storage sites, and Russia has 31

operational reactors and an estimated 48 nuclear weapon storage locations. India, with only 20 operating reactors and 4-8 estimated sites, undeniably deserves a better ranking than both the US and Russia.[4]

Risk Environment: This category is based on the notion that "a lack of political stability may enable lapses in nuclear materials security." The sub-indicators include social unrest, international disputes and tensions, and effectiveness of political system. The index has ranked North Korea in the 19th position, Iran in 21st and India in 22nd. North Korea was in news as recently as March 2014 for its violation of the UN resolution by test-firing two medium-range Nodong missiles. On February 12, 2013, North Korea conducted a third nuclear test at the Punggye-ri Nuclear Test Facility and claimed to have successfully tested a "lighter, miniaturized atomic bomb."[5] Iran's nuclear posture has invoked global attention and has significantly realigned the geopolitics of the Middle East. Given the current status of these nations, the NTI ranking India below both North Korea and Iran is odd and difficult to understand.

Independent Regulatory Authority: China's score of 100/100 for having an independent regulatory authority is proof of the rather mechanical methodology adopted by the NTI for the index. The credibility of the Chinese nuclear regulatory authority, National Nuclear Safety Administration (NNSA) has been long questioned, mainly because of the absence of an overarching law encoding nuclear regulations and nuclear governance.[6] There is also the perception that the NNSA is insufficiently independent of the China Atomic Energy Authority in spite of the fact that it reports directly to the State Council.[7] The "independent" tag for the regulatory authority is what counts here rather than the actual independent, politically segregated functioning of a regulatory authority.

Pakistan vs. India: The two categories for which Pakistan was scored better than India are Domestic Commitments and Capacity, and Security and Control Measures. The yawning gap of 38 points in the category of Domestic Commitments and Capacity between the two countries is mainly offset again by the fact that Pakistan has an independent regulatory authority. However, one cannot comprehend the rationale behind ranks 1 for Pakistan and 22 for India in the sub-indicator Armed Response Capabilities. Several other such anomalous index rankings can be found (for example, comparative scoring in the index for sub-indicators such as Emergency Response Capabilities and Bilateral/Multilateral Assistances).

Potential Areas for Improvement

While the NTI Index may be mistaken about nuclear security in India, to say the least, one cannot overlook the fact that there are shortcomings in the Indian nuclear security regime. India's Atomic Energy Regulatory Board (AERB), especially in light of the reiterated significance of independent regulation post-Fukushima, has been subject to several critiques, including from the Comptroller and Auditor General of India. Although the legal accountability for nuclear security lies with the operator, the regulator plays a key role whose responsibilities are to set standards, monitor performance and

take action when operators fail to meet the required standards. An ideal regulatory environment demands complete independence of the regulatory body from the operators as well as local and national politics. Constitutionally, the secretary of the Department of Atomic Energy (DAE) is also the ex-officio chairman of the Atomic Energy Commission. This allows the DAE to exercise administrative powers over the AERB. Furthermore, the budget of the AERB is sourced from the DAE. Technically these factors place limitations on the effective functioning of the AERB. For instance, of the 3,200 recommendations by the AERB's Safety Review Committee for Operating Plants, the DAE and the Nuclear Power Corporation of India had not complied with 375 (CAG 2012).[8]

As observed by former chairman of the AERB, Dr. A. Gopalakrishnan, "95% of the members of the AERB's evaluation committees are scientists and engineers on the payrolls of the DAE. This dependency is deliberately exploited by the DAE management to influence directly and indirectly, the AERB's safety evaluations and decisions. The interference has manifested itself in the AERB's toning down the seriousness of safety concerns, agreeing to the postponement of essential repairs to suit the DAE's time schedules, and allowing continued operation of installations when public safety considerations would warrant immediate shutdown and repair."[9]

The DAE has also been critiqued on the grounds that there is very little nuclear expertise outside it. Allegedly, the DAE has been routinely discouraging any expansion of post-graduate programs in nuclear engineering and related subjects in higher institutes and universities. While this vacuum of experts is still to be met by institutes, necessary measures such as strict service contracts and codes of work ethics need be adhered to when the regulatory body solicits aid from ex-DAE personnel in order to minimise conflict of interests. The French model of cooperation between the Nuclear Safety Authority and the Institute for Radiation Protection and Nuclear Safety illustrates a successful model for outside technical support to the regulatory body.[10]

Following the Fukushima disaster, in September 2011, the Indian government introduced the Nuclear Safety Regulatory Authority (NSRA) Bill in the Parliament which facilitates the setting up of an NSRA to replace the AERB as the nuclear regulatory authority. In March 2012, the bill was reportedly approved by the Parliamentary Standing Committee on Science, Technology, Environment and Forests with minor modifications, although two CPM members of the panel disagreed with its recommendations and wanted a thorough overhaul of the bill.[11] There are arguments based on the content of the bill and the context under which the NSRA has been created that it is unlikely to create an effective separation between the nuclear establishment and regulatory authority. For most purposes the authority empowered to act on behalf of the Central government is the Atomic Energy Commission (AEC) (Section 27, Atomic Energy Act, 1962). Therefore, even though the power for crucial steps such as appointment of the members is vested in the Central government, they will eventually be decided by the AEC. Moreover, the AEC chairman will be a key member of the Council of Nuclear Safety, which is an organisation that comes under the NSRA that will set radiation and nuclear safety policies.

In spite of these legislative handicaps it needs be mentioned that till date, there has not been any event in any Indian nuclear power plants (NPPs) that has resulted in adverse radiological impact on the environment. As per the International Nuclear and Radiological Event Scale (INES), events are rated in the scale from Level-1 (anomaly) to Level-7 (major accident) depending on the radiological release and its impact. The Chernobyl and Fukushima accidents were rated Level-7. Out of 156 events reported from the Indian NPPs in the last five years, 140 belonged to Level-0 (i.e. no safety significance) and the remaining 16 were Level-1. The two major events of safety significance are the fire incident in the turbine building at Narora Atomic Power Station (1993, INES Scale Level 3) and the unintended power excursion in Kakrapar Atomic Power Station (2004, INES Scale Level 2). In both these events, there was no radiological impact on the workers, public or the environment.[12]

The image of the Indian nuclear establishment in international forums such as the NTI, to a certain extent, is reflective of India's ineffective public engagement. In the context of nuclear security, the AERB annual report identifies an apex level committee with experts on nuclear security called the "Advisory Committee on Security." This committee, however, does not figure anywhere on the AERB website or related links, which means that critical information, such as the mandate of the committee, its members and what actions it has taken, remains unknown. Similarly, the Nuclear Planning and Control wing set up in the DAE to look into issues of nuclear security—mentioned in the progress report prepared by the Ministry of External Affairs (MEA) for the NSS 2014—also does not find a mention anywhere on the DAE website. Transparency and accountability are essential in order to instil public support and confidence for the nuclear programme. But it is equally important for instilling international confidence in India's nuclear safety and security practices. Signing the IAEA Additional Protocols is indeed a landmark step by India, which has paved way for better commercial relations with other countries for civilian nuclear endeavours. Given India's determination to expand its nuclear programme and seek membership in international organisations such as the Nuclear Suppliers Group (NSG), consistent efforts need be taken for better international and public engagement.

Conclusion

Like other countries, nuclear security has remained an important area for India as well. India's neighbourhood is characterised by instability, which increases India's fears. Thus, there are rigorous attempts being made at national and global levels to revise some of the existing nuclear security structures and establish new ones. The three nuclear security summits held so far are in recognition of this reality.

India has an established nuclear security regime and it has the ability to contribute actively to the new strengthened global nuclear security processes, but Indian efforts have been stymied due to a global perception problem. India needs to pay attention to this given the importance of nuclear commerce in Indian energy plans.

Despite the fact that India's nuclear security policies and practices are among the most proven ones, it has done poorly in terms of advertising what it does in this domain due to the secrecy maintained by India's atomic energy establishment. There is an emerging broad consensus in India that it needs to have a much more open approach in this area. While a closed approach may have served Indian interests in the past, it is beginning to hurt them in this field. While no one is calling for total transparency, a form of controlled transparency and greater engagement with the global nuclear community on nuclear security will enhance India's position on this issue. There have been such efforts recently and this must be appreciated and encouraged. A report put out by the MEA on the subject of nuclear security is a case in point. Also, the formal inclusion of India into the major technology export control regimes will be a factor in India's transparency and openness efforts and such membership can encourage further transparency.

India must also take the issue of image-building seriously in the backdrop of its efforts to gain membership into major technology export control regimes such as the NSG and the Wassenaar Arrangement. It is important for India to communicate what it does in terms of its internal policies and practices, but it is equally important for New Delhi to speak about India's external engagement with international agencies such as the IAEA.

While the NTI Security Index does appeal to some countries, for many the bigger issue is that India is not an Nuclear Non-Proliferation Treaty (NPT) signatory. This is a simplistic exercise in assessing a country's standing in the area of nuclear security. The best illustration is from India's own neighbourhood—China that is an NPT signatory has broken every single principle enshrined in the treaty. India, on the other hand, has not signed the NPT but has adhered to all the ideals behind the treaty.

In conclusion, while there are issues with the NTI security ranking processes and procedures, it nonetheless provides an opportunity for India to take stock of the prevailing policies and practices, and take corrective measures where necessary. The two key areas that India needs to improve relate to

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