Nuclear Terrorism and UN Resolution 1540: A South Asian Perspective

- Dr Reshmi Kazi
Associate Fellow IDSA

The world today lives in a time of increasing nuclear peril. There has been a spurt of states with nuclear weapons or seeking to acquire nuclear weapons. Simultaneously, there have been states looking to expand their arsenals. There also has been increasing concerns about a possible renaissance in nuclear power production that might enhance the danger of nuclear proliferation. This also increases the risk of nuclear materials and weapons being diverted or stolen by terrorist organizations. The probability of terrorists conducting a nuclear explosion is remote. However, this improbable situation could become likely once the terrorists have successfully acquired nuclear bomb materials – highly enriched uranium (HEU) or plutonium (Pu). Technically, HEU would be a preferred option for terrorists seeking to explode a nuclear device. This is because building a crude nuclear bomb with HEU is relatively easy as compared to a plutonium based implosion device.[1] Hence, the "theft of HEU and plutonium is not a hypothetical worry, it is an ongoing reality".[2]

This paper highlights the severity of the danger posed by weapons-grade HEU with emphasis on the enormity of the threat of nuclear terrorism from South Asia. Significantly, Pakistan is also increasing its plutonium production for expanding its deterrence capability.[3] The paper concludes by looking into the UN Resolution 1540 and its possible impact in curbing the danger of nuclear terrorism.

HEU: A Dangerous Nuclear Material

There is a general agreement among national security experts that terrorists would rather opt to acquire the necessary fissile materials and build a fully operational nuclear device than attempt to buy or steal one. In a survey conducted by Senator Richard G Lugar, 63 of the 83 respondents selected "black market purchase" as the most likely means from

---

[1] See Morten Bremer Mærli, Annette Schaper and Frank Barnaby, "The Characteristics of Nuclear Terrorist Weapons", *American Behavioral Scientist*, 46 (6), February 2003, p.732; Jeffrey Boutwell, Francesco Calogero and Jack Harris, "Nuclear Terrorism: The Danger of Highly Enriched Uranium (HEU)," *Pugwash Issue Brief*, Vol. 2, No. 1, September 2002; Bunn and Wier, "Terrorist Nuclear Weapon Construction"; J. Carson Mark *et al*., "Can Terrorists Build Nuclear Weapons?" in Paul Leventhal and Yonah Alexander (ed.), *Preventing Nuclear Terrorism*, Lexington Books, Lexington, MA., 1987 at http://www.nci.org/k-m/ makeab.htm (Accessed August 7, 2009);

[2] Matthew Bunn, "Securing the Bomb 2008," *Belfer Center for Science and International Affairs*, Harvard University, November 2008, p. 8.

[3] See David Albright and Paul Brannan, "Pakistan Expanding Plutonium Separation Facility Near Rawalpindi," *Institute for Science and International Security*, May 19, 2009 at http://www.isis-online.org/publications/southasia/PakistanExpandingNewlabs.pdf (Accessed on May 20, 2009); David Albright and Paul Brannan, "Pakistan Appears to be Building a Third Plutonium Production Reactor at Khushab Nuclear Site," *Institute for Science and International Security*, June 21, 2007 at http://www.isis-online.org/publications/southasia/ThirdKhushabReactor.pdf (Accessed on June 22, 2007).

where terrorist might obtain fissile material.[4] Fifty-five percent of those responding[5] saw terrorist manufacture of a nuclear weapon after obtaining material as more likely, while 45 percent believed that terrorist acquisition of a working nuclear weapon was the more probable scenario.[6]

However, the most challenging impediment for terrorist groups aiming to constructing an operational nuclear device is to obtain the requisite fissile materials – HEU or plutonium. There are basically two designs of crude terrorist nuclear weapons which are likely to serve the purposes of terrorist outfits. First, a "gun-type" bomb - the simplest type of nuclear bomb for terrorists to design from only HEU.[7] In most cases, building such a bomb would require some ability to cast machine uranium, a reasonable knowledge of the nuclear physics involved, and a good understanding of cannons and ballistics.[8] In many cases, an ability to do some chemical processing might also be needed; but the chemical processing required is less sophisticated than some of the processing criminals routinely do in the illegal drug industry.[9] The second design is an "implosion type" device. This is a more difficult process in which explosives arranged around nuclear material compress it to a much higher density, setting off the nuclear chain reaction. The yield is much higher in the implosion type device.

Generally, it is much simpler to devise a crude nuclear bomb with HEU than with plutonium but the critical mass is larger in the former.[10] Due to its relatively low background of spontaneous fission neutrons, HEU is considered much more suitable than plutonium for use in an improvised nuclear device (IND).[11] Past experience suggests that crude HEU nuclear weapons will function without prior testing due to the low neutron

---

[4] Senator Richard G Lugar, "The Lugar Survey Proliferation Threats and Responses," Washington, DC, June 2005, p.16.

[5] 45 out of 82 respondents. Ibid.

[6] Ibid, p.17.

[7] It involves little more than slamming two pieces of HEU together at high speed and can produce a powerful explosion. See Luis Alvarez, *The adventures of a physicist* (New York: Basic Books, 1987).

[8] For discussion, see Bunn and Wier, "Terrorist Nuclear Weapon Construction."; J. Carson Mark et al., "Can Terrorists Build Nuclear Weapons?" in Preventing Nuclear Terrorism, ed. Paul Leventhal and Yonah Alexander (Lexington, Mass: Lexington Books, 1987; available at http://www.nci.org/k-m/makeab.htm as accessed on August 7, 2007).

[9] Professor James C. Warf, one of the leaders of the chemical processing programs in the Manhattan Project, has argued that the steps needed to get HEU from research reactor fuel in which it is mixed with other materials "are not difficult procedures, particularly for someone intent on acquiring an atomic explosive; one might say, in fact, that they are not beyond the ability of most students in introductory chemistry classes at the college level." See Committee on Science, Space, and Technology, Conversion of Research and Test Reactors to Low-Enriched Uranium (LEU) Fuel, U.S. Congress, House of Representatives, 98th Congress, 2nd Session, September 25, 1984, pp. 514-516.

[10] A simple gun-type nuclear explosion devise requires approximately 50 kg HEU that is 93 percent enriched. Comparatively, a plutonium based bomb would roughly require 8 kg of weapons-grade plutonium.

[11] See "HEU as weapons material a technical background," prepared by the organizers of the June 2006 Oslo Symposium on Minimization of HEU in the Civilian Nuclear Sector at http://www.nti.org/e_research/official_docs/norway/HEU_as_Weapons_Material.pdf (Accessed on December 12, 2008).

background and thus a limited risk of preignition.[12] Terrorists seeking to detonate such devices could thus have "reasonable confidence in the performance of those weapons." A crude nuclear bomb using HEU would have an explosive power of few hundred to a few thousand tons and can serve the purposes of groups like Al Qaida (AQ).[13] In 2002, the U.S. National Research Council appraised the threat of nuclear terrorism: "crude HEU weapons could be fabricated without state assistance," observing that "the primary impediment that prevents countries or technically competent terrorist groups from developing nuclear weapons is the availability of [nuclear material], especially HEU."[14] An authoritative article in *Foreign Policy* argues that a team of nineteen terrorists (the same number as that of 9/11 hijackers) could successfully procure HEU, design and fabricate an operational device, transport it to the target area and detonate it – all within a year and less than $6 million.[15]

Global Stockpiles of Nuclear Weapons and the Materials

An important element of the threat of nuclear terrorism is the massive size and broad distribution of the global stockpiles of nuclear weapons and the materials needed to make them. Even after almost two decades after the end of Cold War, US and Russia still retains a stockpile of approximately 10,000 nuclear weapons each and have agreed to limit to about half by the 2012[16] while there are more than 25,000 assembled nuclear weapons in the world.[17] Russia and the United States own some 95 percent of these weapons; the remaining is distributed among Israel, India, Pakistan, and, most recently, North Korea. U.S. nuclear weapons are also reportedly located in the United Kingdom, Germany, the Netherlands, Belgium, Italy, and Turkey. There are other states that are near to joining the nuclear club like Iran and presumably Syria, Taiwan, Japan and Saudi Arabia. In addition, world stockpiles of separated plutonium and HEU, the essential ingredients of nuclear weapons, amount to well over 2,300 tons—enough to manufacture over 200,000 nuclear weapons.[18] Tens of tons of HEU reactor fuel, much of it under inadequate security, is distributed at civilian reactor sites around the world and the global stockpile of civilian but separated plutonium, despite efforts in some countries to recycle it, is growing at an average rate of about ten tons per year.[19] During 2006, the international community continued to make steady progress in reducing HEU stocks but virtually made no efforts in cleaning of excess weapons plutonium or slowing the

---

[12] Morten Bremer Mærli, Annette Schaper and Frank Barnaby, "The Characteristics of Nuclear Terrorist Weapons", *American Behavioral Scientist*, vol. 46, no. 6, (February 2003), pp. 773-774.

[13] The gun-type weapon that destroyed Hiroshima had an explosive power equivalent to 12,500 tons of TNT while largest conventional bomb used in World War II contained only 10 tons of TNT.

[14] Committee on Science and Technology for Countering Terrorism, *Making the Nation Safer: The Role of Science and Technology in Countering Terrorism* (Washington, DC: National Academy Press, 2002), pp. 40, 45.

[15] Zimmerman, Peter G. and Jeffrey G. Lewis, "The Bomb in the Backyard," *Foreign Policy*, (November-December 2006), pp.32-39.

[16] International Panel on Fissile Material "Global Fissile Material Report 2007," *Second Report of the International Panel on Fissile Material*, (Princeton: IPFM, 2007), p.2.

[17] Robert S. Norris and Hans S. Kristensen, "NRDC Nuclear Notebook: Global Nuclear Stockpiles, 1945-2006," *Bulletin of the Atomic Scientists*, Vol.62, No. 4 (July/August 2006), pp. 64-66.

[18] International Atomic Energy Agency, IAEA Safeguards Glossary (Vienna: IAEA, 2001; at http://www-pub. iaea.org/MTCD/publications/PDF/nvs-3-cd/Start.pdf (Accessed on July 9, 2007).

[19] International Panel on Fissile Material "Global Fissile Material Report 2007, op.cit" p.7.

production of separated civilian plutonium. Though Russia and the US continue to blend down their excess weapon HEU to LEU (low enriched uranium) for light water reactor fuel, it is only a miniscule percentage of the existing stocks of separated HEU and plutonium.[20] International efforts for converting HEU-fueled reactors into LEU fuel have been accelerated[21], but there are still roughly 140 HEU research reactors in some 40 countries that continue to operate with HEU as their fuel.[22] Half of these reactors are in Russia which still does not have a policy of converting HEU fueled reactors into LEU fuel. In addition, there are an estimated 128 research reactors or associated facilities worldwide that possess at least 20 kilograms of HEU, enough to make a bomb.[23] India has also refused to place under international safeguards its stock of spent fuel from indigenous reactors, fast breeder reactors and reprocessing facilities and several other CANDU-type reactors as agreed in the Separation Plan of March 2006.

Highly Enriched Uranium Stocks of India and Pakistan

India

India is producing HEU for naval fuel—but probably less than weapon-grade. India's Ratehalli facility plant is estimated to produce about 40-70 kg of 45% to 30% of enriched uranium annually.[24] India has been producing HEU to fuel its planned nuclear-powered ballistic missile submarine, the Advanced Technology Vessel. Its production rates have been estimated to be in the order of 100 kg per year each.[25] Construction on the vessel is near completion, with the reactor integrated into a submarine hull at the end of 2007, and plans are to begin sea trials in early 2009.[26] Given these parameters, it is estimated that by the end of 2007, India would have required to produce 180 kg of uranium-to supply fuel for the land-based prototype reactor and the first submarine core.[27] India intends to deploy three nuclear submarines, each with 12 nuclear-armed ballistic missiles, by 2015.[28] This would necessitate the production of an additional 800 kg of HEU fuel over

[20] In 2006, Russia blended down 30 tons of excess weapon HEU and at least 1.5 tons of excess civilian HEU and the US blended down approximately ten tons of HEU. This is huge amount of material but it corresponds to only about ten percent of the remaining HEU assigned for blend down and three percent of the global HEU stockpile. See International Panel on Fissile Material "Global Fissile Material Report 2007," *Second Report of the International Panel on Fissile Material*.

[21] 16 out of 56 countries that have hosted HEU-fueled reactors have had their civilian HEU removed.

[22] See Ole Reistad, Morten Bremer Maerli, and Styrkaar Hustveit, *Non-Explosive Nuclear Applications Using Highly Enriched Uranium—Conversion and Minimization Towards 2020* (Princeton, N.J.: International Panel on Fissile Materials, 2007).

[23] U.S. Congress, Government Accountability Office, Nuclear Nonproliferation: DOE Needs to Take Action to Further Reduce the Use of Weapons-Usable Uranium in Civilian Research Reactors, GAO-04-807 (Washington, D.C.: GAO, 2004) at http://www.gao.gov/new.items/d04807.pdf (Accessed on July 10, 2007), p. 28.

[24] Z. Mian, A. H. Nayyar, R. Rajaraman, and M. V. Ramana, "Fissile Materials in South Asia and the Implications of the U.S.-India Nuclear Deal," *IPFM Research Report* No. 1, September 2006, p.14.

[25] Z Mian, AH Nayyar, R Rajaramana nd MV Ramana, "Fissile Material in South Asia and the Implications of the US India Nuclear Deal," *Science and Global Security*, Vol. 14, 2004, pp117-143.

[26] Sandeep Unithan, "The Secret Undersea Weapon," *India Today*, January 28, 2008, pp. 52– 55.

[27] M. V. Ramana, "An Estimate of India's Uranium Enrichment Capacity," *Science & Global Security*, Vol. 12, 2004, pp. 115 –124.

[28] "The Secret Undersea Weapon," op. cit.

the next five to six years. To reach this goal, India will need a larger uranium enrichment capacity.[29] India has been purchasing material for building additional centrifuges.[30]

Pakistan

At present, Pakistan may be the only country producing HEU for weapons purposes. Its production rates have been estimated to be in the order of 100 kg per year each.[31] Pakistan's Kahuta enrichment facility is estimated to have produced a stockpile of 1100 kg of HEU by the end of 2003.[32] If production continued at 100 kg/year, Kahuta would have produced 1400 kg of weapons grade uranium by the end of 2006.[33] At present, it is estimated that Pakistan has a weapons HEU stockpile now of about 1300 kg, sufficient for approximately 65 weapons.[34]

Pakistan is reportedly to have developed the capacity to produce significant quantity of HEU in the 1980. It is also believed to have built its enrichment capacity from its P-2 centrifuges until 1990.[35] Recent report suggests that Pakistan has developed more powerful centrifuge technology - P-3 and P-4 whereby it has begun enriching its accumulated stocks of low enriched uranium (LEU) to weapons grade. These machines have the potential to significantly accelerate Pakistan's inventory and production rate of weapons-grade HEU by two and four times that of the P-2 respectively.[36] This material will be highly attractive for AQ as it will not require further enrichment or processing; it is not highly radioactive and can be easily handled by the terrorists and can be easily transportable.

The Danger of Nuclear Terrorism: A South Asian Perspective

Within South Asia, Pakistan's uranium-based nuclear weapons programme is of significant concern. Pakistan's relatively large stockpile of HEU generates concerns that are no longer hypothetical. Pakistan is slowly making efforts to return to normalcy but the grave danger that it could inadvertently become a source of a nuclear terror attack on India and the rest of the world still holds true. A high-powered US Commission on the

---

[29] *Third Annual Report of the International Panel on Fissile Material* "Global Fissile Material Report 2008: Scope and Verification of a Fissile Material (Cutoff) Treaty," (Princeton: Princeton University, 2008), p.14.

[30] See David Albright and Susan Basu, "India's Gas Centrifuge Enrichment Program: Growing Capacity or Military Purposes," *Institute for Science and International Security,* January 18, 2007.

[31] Z Mian, AH Nayyar, R Rajaramana nd MV Ramana, "Fissile Material in South Asia and the Implications of the US India Nuclear Deal," op.cit.

[32] From 3000-5000 SWU/year in 1986 to 9000-15,000 SWU/year in 1990-1991 and 13,000-22,000 SWU/year by the late 1990s, David Albright, Frans Berkout and William Walker, Plutonium and Highly Enriched Uranium 1996, New York: Oxford University Press, 1997, p. 278.

[33] A capacity of about 20,000 SWU/year would produce 100 kg/year of weapon grade uranium as stated in Z. Mian, A. H. Nayyar, R. Rajaraman, and M. V. Ramana, "Fissile Materials in South Asia and the Implications of the U.S.-India Nuclear Deal," IPFM Research Report No. 1, September 2006, p.14.

[34] See Nuclear Notebook, "Pakistan's Nuclear Forces, 2001," *Bulletin of The Atomic Scientists,* January/February 2001.

[35] David Albright, Frans Berkhout, and William Walker, Plutonium and Highly Enriched Uranium 1996, SIPRI, Oxford University Press, 1997, pp. 217–281.

[36] See M Hibbs, " Pakistan Developed More powerful Centrifuges, *Nuclear Fuel*, vol 32, no. 3., 29 January 2007 and HM Hibbs, "P-4 Centrifuge Raised Intelligence Concerns About Post 1975 Data Theft," *Nucleonics Week,* Vol. 48, no. 7, February 15, 2007.

Prevention of Weapons of Mass Destruction report – *World At Risk* – identifies Pakistan as the "intersection of nuclear weapons and terrorism".[37] Indeed, in a 2007 *Foreign Policy* magazine poll, 74 per cent of 117 non-governmental terrorism experts opined that Pakistan might likely transfer nuclear technology to terrorists in the next three to five years.[38] Another area of concern is that Pakistan has emerged as the safe haven for Al Qaida in the wake of intense military pressure on the tribal militants by NATO forces within Afghanistan. The political instability prevailing in the nuclear capable country since late 2007 makes it a potential location for terrorists to acquire nuclear weapons and materials.

The Pakistani military has taken great care towards the safety of their nuclear weapons. A carefully formulated personnel reliability programme and electronic safety mechanisms are in place. Pakistan has a modest nuclear arsenal dispersed over a small number of sites in a disassembled form (that makes it imperative for thieves to succeed at two different stages to procure a bomb) and believed to be adequately guarded. However, sparse information and lack of transparency do not make these claims very reassuring. Moreover, Pakistan might possibly have only a "guards, guns and gates" method of security system, which in all probability lacks state-of-art physical protection and material control and accounting technologies.[39]

The SPD and Pakistan's code system technology

Following the revelation of the global black-market led by AQ Khan in 2004, Pakistan undertook major reforms of its nuclear command, control, and security systems.[40] It is believed that the SPD is entrusted with the overall management of Pakistan's nuclear arsenal. The SPD is reported to have a special unit consisting of roughly 10,000 troops dedicated for the security of nuclear assets. In addition, Pakistani officials have claimed that its nuclear arsenal is protected by an authenticated code technology equipped with systems that will prevent any unauthorised person from accessing the nuclear weapons. However, there is a lot of ambiguity whether Pakistan has also developed a code system technology similar to that of the US system. In 2002 the widely cited Landau report stated that Pakistan did not have

[37] The Report of the Commission on the Prevention of WMD Proliferation and Terrorism, "World At Risk," (New York: Vintage Books, December 2008), pp.65-75.

[38] Ibid.

[39] See Shaun Gregory, "The Security of Nuclear Weapons in Pakistan," *Pakistan Security Research Unit* (PSRU) Brief Number 22, November 18 2007), at http://spaces.brad.ac.uk:8080/download/attachments/748/Brief_22finalised.pdf (Accessed on September 24, 2008); Nathan Busch, No End in Sight: The Continuing Menace of Nuclear Proliferation (Lexington, KY: University Press of Kentucky, 2004); Mahmud Ali Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons" Cooperative Monitoring Center Occasional Paper 37, SAND 2004-3375p (Albuquerque, New Mexico, July 2004; at httpp://www.cmc.sandia.gov/cmc-papers/sand2004-3375p.pdf (Accessed on July 2, 2008); and Kenneth N. Luongo and Brig. Gen. (Ret.) Naeem Salik, "Building Confidence in Pakistan's Nuclear Security," Arms Control Today, (December 2007), at http://www.armscontrol.org/ act/2007_12/Luongo.asp (Accessed on July 2, 2008).

[40] International Institute for Strategic Studies, *Nuclear Black Markets: Pakistan, A.Q. Khan and the Rise of Proliferation Networks: A Net Assessment* (London: IISS, 2007), pp. 112-117.

PAL-type technology.[41] In March 2005, the Director General of Pakistan's Strategic Plans Division, General Khalid Kidwai indicated that Pakistan developed "enabling and authenticating codes"[42] for the physical protection of its nuclear assets. This could mean that Pakistan has an unsophisticated PAL-type capability for its nuclear arsenal that may be easier to bypass. Alternatively, it may relate to a system for only locking delivery systems.[43] Hence, there remains significant ambiguity on the claims of Pakistan's code system technology.

Personnel reliability programme

As regards the 'personnel reliability programme', Pakistan claims that it conducts a watertight selection process of those entrusted with duty of safeguarding the nuclear assets. However, Pakistan's claim that its "two-person" rule at each and every action involving nuclear weapons can hardly substantiate against individual unreliability and irrationality. Given the level of pervasive corruption within Pakistan,[44] such two-person rule can be circumvented by determined individuals.

Insider threats

The infamous AQ Khan case bears testimony to proliferation of sensitive nuclear technology from Pakistan to several countries. Pakistan claims that AQ Khan's illegal nuclear trade, carried on for over 20 years without the government's knowledge. Though this is debatable, it definitely demonstrates the poor security culture of the State. The August 2001 incident of two Pakistani nuclear experts having discussed nuclear weapons sensitivities with bin Laden and al-Zawahiri were let off without any trial or punishment represents a culture of impunity within Pakistan.[45]

Outsider threats

The risk of outsider threats is substantially high in Pakistan. The possibility of Pakistan's nuclear sites being attacked by heavily armed Taliban-linked extremists is not hypothetical. In 2007, violent militants "captured 300 Pakistani soldiers—a substantially larger cohort than is likely to be guarding any particular nuclear weapons depot."[46] Given

---

[41] See Cotta-Ramusino and Maurizio Martelline, *Nuclear Safety, Nuclear Stability and Nuclear Strategy in Pakistan*, Landau Network – Centro Volta, January 2002 at http://lxmi.mi.infn.it/~landnet/Doc/pakistan.pdf (Accessed on December 2, 2008).

[42] This can be questionable since there is no official report substantiating the General's claims. See Shaun Gregory, "The Security of Nuclear Weapons in Pakistan," *Pakistan Security Research Unit* (PSRU) Brief Number 22, (November 18 2007), at http://spaces.brad.ac.uk:8080/download/att achments/748/Brief_22finalised.pdf (Accessed on September 24, 2008).

[43] David Blair, "Code Changes 'Secure' Pakistan Warheads", Daily Telegraph, 9 February 2004 as cited in Shaun Gregory, "The Security of Nuclear Weapons in Pakistan," op.cit.

[44] A Transparency International survey of 163 countries based on perceived levels of corruption saw Pakistan slip down two places compared to its ranking of 145 last year, suggesting a rise in corruption. See http://en.wikipedia.org/wiki/List_of_countries_by_Corruption_Perceptions_Index

[45] Pakistan has decided not to press criminal charges against two of its nuclear scientists whose reported contacts with Osama bin Laden stirred fears of nuclear terrorism. Peter Baker and Kamran, "Pakistan to Forgo Charges Against 2 Nuclear Scientists; Ties to Bin Laden Suspected," *The Washington Post*, January 30, 2002.

[46] See Matthew Bunn, "Securing the Bomb 2008," op.cit., p.36.

Al Qaida's declared intention to acquire nuclear materials, hypothetically, Al Qaida and its allies might attempt to attack Pakistani nuclear facilities or seek insider assistance.

Security Structure of Indian Nuclear Establishment

India's nuclear establishment is elaborate with sophisticated safety and security measures in place.[47] However, much still needs to be done. Though the CISF is responsible for protecting India's nuclear installations, it is "overburdened with additional responsibilities"[48] and "stretched too thin".[49] There remain ambiguities about the possible effects of an aircraft chartered with high explosives crashing into a "typical Indian reactor building." Though, the CANDU-type reactors like the PHWRs have certain safety measures that protect them against sabotage, its spent fuel pool is outside the containment building and hence is more vulnerable to sabotage than the boiling water reactor. The two VVER-1000 type plants being built by Russia in Koodankulam in Tamil Nadu may be also inherently vulnerable to an airliner crashing into it like the WTC attack.[50] There are infrastructural weaknesses within existing plants of this type creating vulnerability to a single blast.[51] The containment structures of old commercial reactors like Tarapur are not as robust as those of modern reactors. It is debatable whether they can withstand a large airplane crash like the one on the WTC.

It can be fairly well known that India's nuclear establishment has some of the finest safety and security measures for the safeguard of its nuclear facilities.[52] But the security is not absolute in any measure. When it comes to the protection of India's nuclear power

---

[47] The Department of Atomic Energy proclaims that the safety mechanism of "radiation protection infrastructure in India is on very sound footing and is constantly being strengthened." See "Success Stories – Radiation Protection," at http://www.barc.ernet.in/rcaindia/4_7.html

[48] Charles D. Ferguson, "Assessing the Vulnerability of the Indian Civilian Nuclear Program to Military and Terrorist Attack," in Henry Sokolski, (ed.), *Gauging US-Indian Strategic Cooperation*, March 2007, at http://www.npec-web.org?Essays/20060913-Ferguson-AttacksOnFacilities.pdf (Accessed on May 23, 2008).

[49] Rajesh M. Basrur and Hasan-Askari Rizvi, "Nuclear Terrorism and South Asia: Cooperative Monitoring", Center Occasional Paper No 25, Sandia National Laboratories, SAND 98-0505/February 25, 2003. The government's official web-site acknowledges "CISF is increasingly being called upon to perform important duties beyond its charter such as internal security, airport security and security of highways, election duty, etc." It also protects steel plants, oil refineries, ports and airports and many vital installations. The CISF web-site states that its seven training institutions are "trying to keep the force abreast of the latest trends in threat perception and its management vis-à-vis the technological advancement in the field." See http:cisf.nic.in/

[50] The containment buildings of the CANDU-type reactors have approximately four foot thick concrete walls built around the main reactors.

[51] Rajesh M. Basrur and Friedrich Steinhausler, "Nuclear Terrorism and Radiological Terrorism Threats for India: Risk Potential and Countermeasures," at http://jps.lanl.gov/vol1_iss1/3-Threats_for_India.pdf (accessed March 22, 2008).

[52] Every nuclear power plant is surrounded by a double-layer security arrangement with a distance of 1.5 km of Sterilized Zone from the nuclear facility deployed with sophisticated surveillance systems. Habitation is restricted in the sterilized zone which expands up to 5 km. The sterilized zone is again surrounded by an Emergency Planning Zone of 16 km. The Nuclear Power Corporation India Ltd. is a member of the World Association of Nuclear Operators (WANO) that conducts peer reviews of all the atomic power stations progressively.

plants there should be no room for complacency. Within a month after 9/11, New Delhi announced no-fly zone restrictions around nuclear power plants but these have not been strictly enforced. There is also not much information available whether these facilities are protected by anti-aircraft defences even as aircraft fly over BARC even today.

Conclusion

The concept of nuclear terrorism is longer a science fiction. Given the state of affairs, improved security measures can reduce the risk of nuclear terrorism in South Asia. The need of the hour is to implement several steps to improve the nuclear security in South Asia. One such promising step that can be undertaken by India and Pakistan would be to make a high-level political commitment to the specifics of UNSCR 1540. UNSCR 1540 passed unanimously in April 2004, created a new binding legal obligation on every state to provide "appropriate effective" security and accounting for whatever nuclear stockpiles it may have (along with a wide range of other legal obligations to improve controls over weapons of mass destruction and related materials).[53] However, not much use has been made of this important Resolution so far. No government or international organization has passed any unanimous mandate on what constitutes an "appropriate effective" nuclear security and accounting system. There is also no mechanism in place to pressure and assist states to put those legally required measures in place. Besides, proliferators will not stop proliferating simply because stringent rules are placed in order. This state of affairs needs to be changed. Undoubtedly, the UNSCR 1540 provides an excellent opportunity for the United States to cooperate with other countries and the IAEA to curb nuclear proliferation and enhance nuclear security in Pakistan and worldwide. Resolution 1540 can provide a new and practical set of tools to prevent nuclear proliferation in South Asia as well as in other parts of the world. Hence, there is a need for a comprehensive and prioritised plan to reduce the risk of nuclear terrorism within South Asia.

Recommendations

- India and Pakistan must consistently work with the international community to detail out the essential elements of an "appropriate effective" system for nuclear security;
- India and Pakistan must also work in tandem with the international community to assess what improvements they in cooperation with other countries around the world need to make to put these essential elements in place;
- India and Pakistan must also render assistance to the UNSCR 1540 Committee members to help countries around the world to take the needed actions. If broad agreement could be reached on the essential elements of an "appropriate effective" nuclear security system, that would, in effect become a legally binding global standard for nuclear security.[54]

---

[53] The text of UNSCR 1540, along with many related documents, can be found at United Nations, "1540 Committee" (New York: UN, 2005; available at http://disarmament2.un.org/Committee1540/meeting.html as of 10 July 2007).

[54] Matthew Bunn, "UNSC 1540: Next Steps to Seize the Opportunity," paper presented at A New Role for the United Nations Security Council: Criminalizing WMD Proliferation--The Impact of U.N.

- It is equally important for India and Pakistan to place stringent nuclear security measures for all its stockpiles of nuclear weapons and weapons-usable nuclear materials.
- There must be unanimous understanding among the world community including India and Pakistan that "appropriate effective" should mean that nuclear security systems could effectively neutralize the threats posed by terrorists.
- India and Pakistan should have a well-enforced national rule specifying that every facility with nuclear weapons or a significant quantity of fissile material must have adequate security in place capable of neutralizing a specified design basis threat (DBT) including outsider and insider risks.
- India and Pakistan and other leading states should take effective measures to develop strong security cultures for all organizations involved with managing nuclear weapons and weapons usable nuclear materials. India and Pakistan must be verifiably able to upgrade its security standards so as to defeat the threats facing its HEU stockpile;
- Pakistan must be verifiably able to upgrade its security standards so as to defeat the threats facing its HEU stockpile;
- Pakistan must also verifiably upgrade the security of its nuclear weapons and materials sites to meet the IAEA physical protection recommendations;
- efforts should be made to enhance the protection and control existing HEU stocks;
- India and Pakistan must also work with the US to see that the UN Resolution 1540 becomes an instrument for overcoming the inhibiting factor of secrecy among the NWS as well as between the former and non-nuclear-weapon-states. This can act as a vital confidence-building-measure between the two groups of states.

Combating the threat of nuclear terrorism is difficult since there is no ready defence against it. However, the danger of nuclear terrorism within South Asia will escalate if the prevailing trends remain unchecked. The UNSCR 1540 is a remarkable instrument and an institutionalised system of high-level guidance that can make significant contribution in dealing with the threat of nuclear terrorism.

Security Council Resolution 1540, Arlington, Va., 15 March 2005 (available at http://bcsia.ksg.harvard.edu/BCSIA_content/documents/UNSC1540.pdf as of 10 July 2009).