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Coping With and Mitigating Effects of Nuclear Reactor Accidents in Pakistan

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Summary

After briefly tracing Pakistan's nuclear history – both civilian and military – this article examines the safety and security of Pakistan's power generating program, a massive expansion of which is currently under way with Chinese help. Present plans call for 8,000 MWe of installed nuclear capacity by 2030, up from the current figure of 1,040 MWe. To deal with safety matters, a large official apparatus now exists in the form of the Pakistan Nuclear Regulatory Authority (PNRA). While formally independent of the Pakistan Atomic Energy Commission, its parent organization, in fact there is a strong overlap of interests as well as the personnel of both organizations. Opaqueness continues to be PNRA's guiding principle, a consequence of the fact that Pakistan's nuclear weapon program was intimately connected to its reactor operations in earlier decades. Hence public input into matters pertaining to nuclear plant location and safety, radiation safety, or disposition of nuclear wastes, is strictly limited. This is an impediment to improving safety standards.

1. Pakistan was introduced to nuclear energy by the United States in 1955 following the "Atoms for Peace" speech by President Dwight. D. Eisenhower two years earlier. A five year "Agreement for Cooperation on the Civil Uses of Atomic Energy" between Pakistan and the US was signed in 1955 and subsequently a nuclear research reactor using 93 per cent enriched uranium was funded by the US. It was built and supplied by the American Machine and Foundry Company and went critical in December 1965. The Pakistan Institute of Nuclear Science and Technology, located near Islamabad, helped create a generation of nuclear technologists who laid the foundations for Pakistan to become the world's first Muslim nuclear power.

2. The first power generating reactor was supplied by the Canadian government in 1972. It has been operated by the Pakistan Atomic Energy Commission (the PAEC). Located on the Karachi coast, it is a single unit CANDU-type pressurized heavy water reactor nominally rated at 137MW and is known today as KANUPP-1 (Karachi Nuclear Power Plant). Following the Indian nuclear test of 1974, Pakistan refused to sign the Nuclear Non-proliferation Treaty (NPT), after which Canada withdrew support and fuel supplies. Through an arduous process of learning, Pakistan was able to set up its own fuel fabrication plant and improvise on maintenance. It remains in intermittent operation. A 2007 study had placed KANUPP's lifetime energy availability record at 27.84 per cent.[1]

[1] Chaim Braun, "Security Issues Related to Pakistan's Future Nuclear Power Program," in Henry D. Sokolski, ed., *Pakistan's Nuclear Future: Worries Beyond War* (Carlisle PA: Strategic Studies Institute, US Army War College, 2008), p. 289;

3. Nearly thirty years passed before a second power reactor, located at Chashma on the Indus River in Punjab Province, came on line in 2005. This was a Chinese pressurized water reactor built on the design of the Qinshan plant, with a design maximum of 330MW. A total of four nearly identical reactors were planned. The two other reactors, Chashma-II and Chashma-III, began electricity production in 2011 and 2016 respectively. Chashma-IV is expected to start in 2017.

4. The total size of the Pakistani nuclear power program is currently 1,040MWe, which is small by the standards of more advanced nuclear countries. But there are ambitious plans for expansion. These plans have created fears among parts of the local population, particularly in Karachi which has an estimated population of 23 million and is growing at a rapid rate. Issues raised by worried citizens, and the responses received from the nuclear authorities, will be discussed in some detail in the last section.

5. The present plans call for building 32 nuclear power plants generating 40,000MW at eight sites across Pakistan.[2] Each site would have four plants of 1,100MW each. There are reports that the government is discussing with China a deal to build three reactors at Muzaffargarh, near Multan, and one or more reactors at Ahmadpur East, near Bahawalpur.[3] As many as six sites for reactors have already been identified.[4] Work has already started on two 1,100-megawatt reactors from the China National Nuclear Corporation, to be located at the same site as KANUPP, worth $4.8bn apiece. This has been made possible by a Chinese loan – presumably on soft terms – for $6.8bn.

6. How China can legally supply these reactors to Pakistan is unclear at the moment because Pakistan is not a signatory to the NPT and is also not a member of the Nuclear Suppliers Group (NSG). In 2004 China joined the 46-nation NSG whose rules prohibit supply of nuclear materials to non-NPT states. China has not yet formally notified this body of its intention to supply the two new reactors. It had earlier explained away the supply of the Chashma-II reactor under the so-called 'grandfathering clause', arguing that an agreement had existed prior to China's joining the NSG. For the two new reactors to be supplied to Pakistan, the legality of the clause is unclear. However, in 2012 it used the grandfather clause to justify the sales of Chashma-III and Chashma-IV.

Civil–Military Links

7. Pakistan's nuclear weapon capability uses indigenous uranium as well as plutonium produced from four dedicated military reactors located at Khushab in Punjab Province. This is separate from the civil nuclear fuel cycle, a fact that Pakistan emphasizes in its bid for membership of the NSG. However both the civil and military programs have common beginnings.

8. In Pakistan under General Ayub Khan (1958–68), there was no linkage of the civilian nuclear program with any military one. In fact there was no perceptible movement or enthusiasm for nuclear weapons. But as early as 1966, Zulfikar Ali Bhutto, who became president in 1971, had written of the need for Pakistan to have a nuclear deterrent. The first step towards this was taken after the civil war of 1971 that, with India's assistance, led to East Pakistan becoming an independent Bangladesh. Weeks later, Bhutto called a meeting of Pakistani scientists in the city of Multan and asked them to work on the bomb.

9. Since that time (1972) the PAEC has had a dual goal – to develop the civil nuclear program as well as to work on weapons. The linkage with military applications demanded that the PAEC's approach had to be opaque on every nuclear matter, including civil nuclear power, production of radio-isotopes for medical purposes and even agriculture. Thus subterfuge became essential because Pakistan's for-

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http://www.strategicstudiesinstitute.army.mil/pdffiles/PUB832.pdf

[2] "32 nuclear plants to produce 40,000MW: PAEC," *The News*, 27 February 2014; https://www.thenews.com.pk/archive/print/487599-32-nuclear-plants-to-produce-40000mw-paec

[3] Baqir Sajjad Syed, "Muzaffargarh, Ahmadpur East selected for new N-power plants," *Dawn*, 3 January 2014; http://www.dawn.com/news/1078065/muzaffargarh-ahmadpur-east-selected-for-new-n-power-plants

[4] World Nuclear Association, "Nuclear Power in Pakistan" (January 2017); http://www.world-nuclear.org/information-library/country-profiles/countries-o-s/pakistan.aspx

mal position was to insist vociferously that its nuclear program was strictly for peaceful purposes. This tactical manoeuvre did not change until the nuclear tests of May 1998.[5]

10. Because of the security veil, details on nuclear matters are still hard to come by. The authorities reveal little of what has been spent over five decades in creating a vast infrastructure that comprises hundreds of buildings, fuel processing facilities, as well as local and foreign training, salaries and benefits, security arrangements, etc. There exists little public data on the funds used for buying computers, electronic and electrical machinery, chemical plants and chemicals, lathes and workshop machinery.

11. How nuclear equipment was purchased in earlier decades makes an interesting story. Companies in the West were often more interested in profits than what they considered to be "political matters." Pakistan's quest for a reprocessing plant is an example. Pakistan was inspired by the fact that India had reprocessed plutonium from a Canadian reactor similar to what Pakistan had received. So although in 1974 the PAEC managed only KANUPP – a small natural uranium reactor – it nevertheless solicited bids from European firms to to build a reprocessing plant capable of separating weapons-usable plutonium from 100 tonnes of spent nuclear fuel per year. Pakistan eventually contracted with a French firm to build a plant at Chashma, but American pressure on the French government caused the deal to fall through.

National Safety Regulatory Framework

12. Diversion of spent fuel from Pakistan's power reactors towards military uses is not allowed under the terms by which the reactors were acquired from Canada and China. the PAEC has signed several safeguards agreements allowing the International Atomic Energy Agency (IAEA) to inspect these plants. The PAEC, being the owner and operator of all of Pakistan's nuclear power plants, is a member of the World Association of Nuclear Operators (WANO).

13. The official body responsible for national nuclear safety and radiation protection is the Pakistan Nuclear Regulatory Authority (PNRA). The PNRA is the "competent and independent body for the regulation of nuclear safety, radiation protection, transport and waste safety in Pakistan" and is "also empowered … to determine the extent of civil liability for damage resulting from any nuclear incident." It "devises, adopts, makes and enforces such rules, regulations, orders or codes of practice for nuclear safety and radiation protection as may … be necessary."[6] The current strength is said to be more than 200 appropriately trained professionals. The PNRA Ordinance 2001 specifies that the regulatory body is independent of the operator of nuclear plants, the PAEC.

14. As part of a formal procedure, the PNRA requires a No Objection Certificate from the relevant provincial Environmental Protection Authority (EPA) prior to giving permission to operate. But No Objection Certificates are rarely a hurdle because of the much lower stature of the EPAs compared to the national giant, the PAEC, which can get what it wants. The independence of PNRA from the PAEC is a formal requirement but may not be very meaningful. Many – or even most – PNRA senior employees are from the PAEC, have been trained at a related institution, the Pakistan Institute of Engineering and Applied Science, and are loyal to their parent institution. Both the first director, Jamshed Hashmi (2001–09) and the second, Anwar Habib (2009–present), were senior the PAEC officials before moving to their new jobs.

15. In spite of official statements, the fact is that public input into matters pertaining to nuclear plant location and safety, or disposition of nuclear wastes, is not permitted. Nuclear authorities have dismissed local concerns regarding public safety. Citizens raising questions about nuclear safety are frequently la-

[5] See Pervez Hoodbhoy and Zia Mian, "Changing Nuclear Thinking in Pakistan," APLN/CNND *Policy Brief* No. 9 (February 2014); http://www.a-pln.org/briefings/briefings_view/Policy_Brief_9_%E2%80%93_Changing_Nuclear_Thinking_in_Pakistan

[6] PNRA, "History of PNRA," http://www.pnra.org/history.html

belled as agents of foreign powers. An early example is that of village communities around the Baghalchur area of Dera Ghazi Khan who reported health effects from uranium mining operations. No protection gear was provided to miners, leading to serious lung problems.

16. This led to questions being asked in the National Assembly about the "serious hazard posed to the health and survival of residents of central Punjab by the shocking levels of toxic uranium waste being dumped near the village of Baghalchur by the government agencies" and why the "the PAEC refuses to answer" such concerns.[7] The villagers eventually mustered the courage to go to court and demand compensation but the PAEC refused to give an answer in open court. Under pressure, the villagers had to withdraw their court cases.

17. Public hearings on siting and safety are mandated by law but avoided by the authorities. According to Sind Environmental Protection Agency officials, the existing Pakistan Environmental Protection Act of 1997 has a provision for skipping the public hearing of an environmental impact assessment if the case is of national importance. In the case of the two new Chinese reactors in construction near Karachi, the PAEC had requested in writing that the project should not be discussed on a public platform since it was a sensitive and strategic matter. A Sind EPA official said: "We accepted the request since it is allowed under the law and held a hearing by an expert committee only."[8] Officials declined to name the hand-picked experts they had invited.

18. The immediate official reaction to the 2011 Fukushima disaster was initially to deny that any such natural disaster could strike a nuclear power plant in Pakistan. The PNRA issued the following statement: "Due to geographical differences between Pakistan and Japan, the likelihood that similar extreme natural events may occur in the vicinity of the country's nuclear plants is quite small."[9] However, PNRA subsequently issued new safety guidelines that ordered re-evaluations of the designs of the Chinese plants to be constructed in Karachi and Chashma. It has not been revealed what these new guidelines were nor is it known whether they resulted in any substantial action.

19. According to *Jang News*, Pakistan offered to provide technical assistance to Japan to help control the disaster and on 20 March 2011 it was reported experts from PNRA and the PAEC were ready to leave for Japan after Japanese officials accepted Pakistan's offer. It was not subsequently known whether, in fact, they had left nor, more importantly, how they could have added value.

Nuclear Liability

20. The potential consequences of a nuclear accident could easily spill over national boundaries, requiring laws that can handle liabilities accruing from an accident both within a country and beyond. As a default option, a state can always circumvent legal hurdles by declaring that it alone will handle the consequences.

21. In this regard it is interesting to look at the Indian example first. In most countries nuclear plant operators are liable for any damage caused in the event of an accident, against which they take out liability insurance. However, until 2010 when the government passed its Civil Liability for Nuclear Damage Act, India had been a notable exception with reactor suppliers potentially liable for damages in the event of an accident. This had provided an additional level of security beyond that which could be provided by the state. However it was a strong discouragement to would-be suppliers. The 2010 legislation makes Indian operators primarily liable for any nuclear accident, but still keeps open the possibility of recourse to suppliers. In February 2016, India ratified the IAEA's Convention on Supplementary Compensation for Nuclear Damage.

[7] "PPP seeks debate on N-waste," *Dawn*, 25 May 2006; http://www.dawn.com/news/193857/ppp-seeks-debate-on-n-waste

[8] Faiza Ilyas, "'Nuclear plant project okayed after secret hearing'," *Dawn*, 3 February 2014; https://www.dawn.com/news/1084496

[9] "The PAEC asked to review N-plants' safety," *Dawn*, 4 April 2011; https://www.dawn.com/news/618449/newspaper/column

22. Pakistan is not known to have made any specific demands upon Chinese nuclear suppliers in the matter of nuclear liability. Instead it appears to have chosen the default option – all liabilities to be handled by Pakistan – in the event of a nuclear accident. The procedure determining the amount of compensation to be paid in such an eventuality is unknown and this issue has not been discussed publicly. Victims of industrial, rail, road and air accidents are provided varying amounts. These seem to be arbitrarily determined by the head of government, or perhaps lower functionaries.

International Links

23. In the early 1960s, Pakistan had virtually no nuclear scientists or technologists. Moreover, the low level of scientific education meant that the pool of potential manpower was small – much smaller than India's, for example. Creation of a nuclear infrastructure required sending large numbers of Pakistanis overseas for specialized training. Significantly, all those who contributed to Pakistan's nuclear programs in an important way, both military and civil, were educated in British, American and Canadian universities.

24. Today the PAEC allows its employees to pursue higher studies abroad and often facilitates its employees to participate in training courses, conferences, meetings, workshops, seminars, symposia, etc. held in foreign countries. It also maintains international links on nuclear reactor operations and safety matters and currently has technical representatives at the Pakistan embassies in Beijing, Vienna and Geneva. There is a resident liaison engineer at WANO-Tokyo and a KANUPP representative at the CANDU Owners Group in Toronto.[10]

25. Pakistan is a party to the Convention on the Physical Protection of Nuclear Material (CPPNM), the Convention on Nuclear Safety, the Convention on Early Notification of a Nuclear Accident, and the Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency. At the 2014 Nuclear Security Summit held in Washington, Pakistan ratified the 2005 Amendment to the CPPNM.[11]

Nuclear Safety Culture

26. The culture of a group – in particular, that of a nuclear organization – defies precise definition. A non-academic definition could be: this is how we do things around here. Bad practices had turned the Chernobyl operators into becoming risk takers, leading to the world's worst nuclear disaster so far.

27. Undoubtedly some cultures are much more prone to taking risks, believing that a divine power will ensure protection. This is reflected in driving habits, maintenance quality of aircraft, inclination to use life insurance, etc. Unless one assumes that nuclear plant operators in Pakistan carry social assumptions that are radically different from those of other Pakistanis, there is certainly cause for worry.

28. Pakistan has seen more disasters than most due to callous indifference of the authorities. An ammunition dump placed in the middle of a city (Ojhri Camp in Rawalpindi) blew up, killing and maiming thousands; an entire newly constructed university campus at Khairpur with nearly 30 buildings came crashing down after some high rains; trains have crashed many times a year, dams and bunds have collapsed, etc. There is no tradition of detailed inquiry reports following these disasters, or of releasing them to the public. There is no history of any high official being punished. Instead, the disaster is described as an act of God.

29. Today the PAEC claims that in its 40 years of operation the KANUPP reactor has never discharged a significant amount of radiation into Karachi's environment. However there is no independent means of verifying whether this is true or false. Individuals not belonging to the PAEC or PNRA are forbidden from attempting to monitor radiation levels near any nuclear facility.

[10] The CANDU Owners Group is a private, not-for-profit international corporation funded voluntarily by CANDU operating utilities worldwide, Canadian nuclear laboratories and supplier participants.

[11] http://www.mofa.gov.pk/pr-details.php?mm=MzYwNA

Regional Nuclear Safety Cooperation

30. As nuclear adversaries, Pakistan and India have the capacity to wreak enormous destruction upon each other by targeting the other's nuclear facilities. Article 56(1) of the 1977 Additional Protocol I to the Geneva Convention stipulates that "Works or installations containing dangerous forces, namely dams, dykes and nuclear electrical generating stations, shall not be made the object of attack, even where these objects are military objectives, if such attack may cause the release of dangerous forces and consequent severe losses among the civilian population."[12]

31. In this respect the India–Pakistan Non-Attack Agreement,[13] signed on 31 December 1988 and in force since 1 January 1991, was a milestone. Article 1(ii) of the agreement defines nuclear installation or facilities against which attack is prohibited as "nuclear power and research reactors, fuel fabrication, uranium enrichment, isotopes separation and reprocessing facilities as well as any other installations with fresh or irradiated nuclear fuel and materials in any form and establishments storing significant quantities of radio-active materials." In Article 2 the agreement stipulates that "Each Contracting Party shall inform the other on 1st January of each calendar year of the latitude and longitude of its nuclear installations and facilities and whenever there is any change." So far both countries have abided by the agreement and have exchanged lists at the beginning of every year since 1991.

32. Another agreement, also bilateral, provides for immediate exchange of information between the two countries in the event of any accident relating to nuclear weapons, under their respective jurisdiction and control, which could create the risk of radioactive fallout, with adverse consequences for both sides, or create the risk of an outbreak of a nuclear war. According to a statement issued by the Pakistan Foreign Office on 21 February 2017, the agreement was extended for another five years (2017–22).[14]

33. This development came at a time when the relationship between the two countries is currently at its lowest point due to months of tensions along the Line of Control (LoC) and working boundary. The two countries were on the brink of war in September 2016 after India claimed to have carried out so-called surgical strikes inside Pakistani Kashmir just days after 19 Indian soldiers were killed when their base was stormed by militants in the disputed Kashmir region.

A Litmus Test

34. As noted in paragraph 5 above, construction started in 2014 on two 1,100-megawatt reactors manufactured by the China National Nuclear Corporation. Costing $4.8bn apiece, a $6.5bn presumably soft loan from China made the deal possible. When completed in 2022/2023, the two reactors will operate in close proximity to Karachi.

35. Alarmed by the Fukushima disaster, citizen groups have asked for the reactors to be relocated away from the city. A temporary court stay order was obtained, where the petitioners pleaded that the PAEC had not followed the environmental protection procedures laid down by law by calling for a public meeting. However, this objection was easily overcome after the PAEC/PNRA bussed in their supporters to the legally mandated public meeting. Thereafter construction soon resumed.

36. Detailed arguments against locating the reactors on Karachi's shore can be found in a published article that was used by the citizens group.[15] A summary follows:

i. Nuclear emergencies are unlikely but possible. The 15km evacuation zone proposed by the PNRA/ PAEC is unrealistic since the area covered could be

[12] https://ihl-databases.icrc.org/customary-ihl/eng/docs/v2_rul_rule42

[13] http://www.nti.org/media/pdfs/aptindpak.pdf?_=1316555923

[14] http://www.mofa.gov.pk/pr-details.php?mm=NDc4Mg

[15] Pervez Hoodbhoy, Zia Mian and A. H. Nayyar, "The nuclear shadow over Karachi," *Newsweek*, 17 March 2014; http://newsweekpakistan.com/the-nuclear-shadow-over-karachi/

much larger depending on the severity of the accident, wind direction, etc. At Fukushima, six years after the accident, there remains a 20km zone where inhabitants may not return. The US Nuclear Regulatory Commission guidelines specify that a reactor should be located so that there are not more than 500 people per square mile in any direction to a distance of about 32km of the site.[16] These guidelines say clearly "A reactor should not be located at a site whose population density is well in excess of the above value." By the PAEC's own counting, there are 8 million people within 32km of the site, a population density of 6,450 people per square mile, more than ten times larger than the population density considered acceptable by the US Nuclear Regulatory Commission.

ii. It is inconceivable that Karachi, a city of 23 million people, could be evacuated in the event of a nuclear crisis. By the time the reactors come on line, the population will have increased by yet another quantum jump. Disaster response capabilities such as firefighting are very limited and mobility is hampered by frequently clogged roads and with time this situation will worsen. An evacuation would be extremely chaotic and very different from Japan's disciplined evacuation of the Fukushima area.

iii. The ACP-1000 reactors are of untested design and have never been built even in China. Advocates claim these reactors are based on a Chinese adaptation of a long-established nuclear reactor type but with added safety features. Although the reactor is still in the process of design, they expect it to work safely and well. But this first-of-a-kind reactor may not actually behave as it should. According to IAEA sources, Pakistan has not requested a safety review of the ACP-1000 design even though it is committed to buying two reactors of this type. Moreover operating them in Pakistan would make them more prone to design faults,[17] as well as operator error. One expects that operators will lack the intimate knowledge of design and software issues that they might have at an indigenous reactor.

iv. Karachi lies in a seismically active zone. In its design calculation the PAEC seems to assume that the largest possible earthquake that might happen off the Makran Coast, shaking Karachi and unleashing a tsunami, would be a magnitude 8.3 event. This was the size of the 1945 Makran earthquake. But new scientific research, published in 2013 by a team from Britain's National Oceanography Centre and Canada's Pacific Geoscience Centre, found that the largest earthquake in the Makran area may in fact be considerably larger than what the PAEC has assumed. The lead author of the study concluded that, "Past assumptions may have significantly underestimated the earthquake and tsunami hazard in this region."[18] The new research suggests the Makran area is capable of producing earthquakes as large as magnitude 9.2. An earthquake of this size would be significantly larger than the magnitude 9 earthquake that hit Fukushima in March 2011. It would release over 20 times the energy of a

[16] http://www.nrc.gov/reading-rm/doc-collections/reg-guides/environmental-siting/rg/04-007/

[17] A troubling precedent suggests the need for caution. In the 1990s China designed and built a prototype nuclear reactor at Qinshan. An accident in 1998 due to a design flaw shut it down for a year: http://news.bbc.co.uk/2/hi/asia-pacific/386285.stm. Initially the Chinese nuclear designers and operators could not understand or fix the problem, and had to contract a US company for the repair work. One part of the reactor had to be redesigned. After this China did not build any more reactors of the Qinshan design for itself, but as noted at paragraph 3, continued to sell this type of reactor to Pakistan; the last of the four such reactors will start operation at Chashma in 2017/2018.

[18] "Western Indian Ocean earthquake and tsunami hazard potential greater than previously thought," *ScienceDaily*, 13 May 2013; https://www.sciencedaily.com/releases/2013/05/130513103731.htm

magnitude 8.3 earthquake, assumed by the PAEC in its studies of the earthquake risk at the Karachi reactor site.

v. A terrorist attack against the KANUPP reactors cannot be ruled out because many successful attacks have been carried out by religious terrorists against even the most highly-guarded military institutions in Pakistan.[19] These include the general headquarters of the army, the Mehran naval base, and the Kamra air force base. Hence there is little reason to believe that nuclear reactors would be invulnerable to attack.

vi. The government's response to past disasters has often been poor and, whatever is promised now, may not be delivered in case of a large-scale emergency. Amid the country's 2010 floods, which left one-fifth of Pakistan inundated, the president and prime minister displayed a notable lack of urgency. The National Disaster Management Authority performed sluggishly. Populations downstream from the floods were not given the warnings they needed. Pakistan's ubiquitous armed jihadist groups substituted for the state in many places,[20] just as they had done following the country's 2005 earthquake.

Conclusion

37. Pakistan has shown it welcomes interacting with the outside world on reactor management and safety. This is, of course, to be encouraged. At the same time, one needs to be clear that this does not fundamentally change attitudes or create a culture of nuclear safety. In fact, these external links – particularly with the IAEA – are often used to validate claims that Pakistan's civil nuclear operations are safe. Such claims must be discounted. After the Fukushima accident, while addressing the IAEA Board of Governors and the world on 21 March 2011, the Director-General of the IAEA explained that "we are not a 'nuclear safety watchdog'" and that the "responsibility for nuclear safety lies with our Member States."[21]

38. The safety of nuclear power in Western countries is a matter of open debate that is likely to continue for long. Because of experience gained from nuclear accidents – and even more from the challenges raised by an aroused citizenry – nuclear systems have become progressively safer. However nuclear power in less open societies remains largely opaque and immune from public scrutiny. This must change in favour of more transparency and more meaningful interactions between the nuclear power regulatory bodies and the larger community.

[19] Jon Boone and Emma Graham-Harrison, "Taliban groups launch attacks in Pakistan and Afghanistan," *Guardian*, 21 January 2014; http://www.theguardian.com/world/2014/jan/20/taliban-groups-attacks-pakistan-afghanistan

[20] Syed Shoaib Hasan, "'Hardline' groups step in to fill Pakistan aid vacuum," *BBC News*, 10 August 2010; http://www.bbc.co.uk/news/world-south-asia-10925400

[21] Yukiya Amano, "Introductory Statement to Board of Governors," 21 March 2011; https://www.iaea.org/newscenter/statements/introductory-statement-board-governors-22

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