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Nuclear safety in India

5.1 India possesses a large and well established nuclear infrastructure.

5.2 India's civilian nuclear program was established in 1954, with the creation of the Government of India Department of Nuclear Energy and the Atomic Energy Commission. Civilian electricity generating nuclear reactors are run by a Government owned enterprise, the Nuclear Power Corporation of India.[1]

5.3 The first electricity generating reactor was brought on line at Tarapur in Mahrashtra in 1969, and at present India has in the vicinity of thirty electricity generating reactors in operation.[2]

5.4 At the time of writing, five reactors in three locations are in development. The reactors under construction are either the 700 megawatt Pressurised Heavy Water Reactor type first built in India in 1973, or the VVER[3] 1,000 megawatt type, a high pressure water reactor first built in India in 2014.[4]

5.5 The first VVER 1,000 megawatt type reactor was constructed in 1975 in the Soviet Union, and is reported to have a number of deficiencies, including:

- substandard wiring of the emergency electrical system and reactor protection system;
- fire protection systems that do not meet current standards;

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1 Government of India Department of Nuclear Energy, *About us*, (http://www.dae.nic.in/?q=node/634), viewed 20 January 2015.

2 Nuclear Power Corporation of India, *Plants under operation*, <http://www.npcil.nic.in/main/AllProjectOperationDisplay.aspx>, viewed 20 January 2015.

3 VVER means Vodo-Vodyanoi Energetichesky Reaktor, or 'water–water power reactor'. It is a more modern type of pressured water reactor.

4 Nuclear Power Corporation of India, *Plants under construction*, <http://www.npcil.nic.in/main/ConstructionDetail.aspx?ReactorID=91>, viewed 21 January 2015.

- deficient quality control in design and construction; and
- a less forgiving and stable reactor system than Western counterparts.[5]

5.6 The VVER reactors are the most modern in use in India and are equivalent to generation III reactors. It is not clear whether the reactors under construction in India incorporate improvements that deal with the identified deficiencies of these reactors.[6]

5.7 The best available reactors at the moment are generation IV reactors such as those being constructed by the United Arab Emirates, recently considered by the Committee.[7]

5.8 Generation IV reactors are expected to be built as a result of India's nuclear cooperation agreement with the United States.[8]

5.9 Evidence to the inquiry identifies three significant issues relating to the safety of nuclear facilities in India:

- the lack of separation between military and civilian nuclear facilities;
- the quality of regulation and oversight of nuclear facilities in India; and
- civil society concerns, such as the treatment of those opposed to the building of nuclear facilities.

5.10 These issues will be discussed in this Chapter.

Separation of Civil and Military nuclear facilities

5.11 As discussed in the previous Chapter, as a prerequisite for the transfer of nuclear materials to India, the Nuclear Suppliers' Group required India to separate its civil and military nuclear facilities and place the civil facilities under International Atomic Entergy Agency (IAEA) safeguards.[9]

5 United States National Nuclear Safety Administration, International Nuclear Safety Project, *The VVER-1 000*, <http://insp.pnnl.gov/-profiles-reactors-vver1000.htm>, viewed 21 January 2015.

6 United States National Nuclear Safety Administration, International Nuclear Safety Project, *The VVER-1 000*, <http://insp.pnnl.gov/-profiles-reactors-vver1000.htm>, viewed 21 January 2015.

7 Joint Standing Committee on Treaties, *Report 137*, tabled 18 March 2014.

8 Nuclear Power Corporation of India, *Plants under construction*, <http://www.npcil.nic.in/main/ConstructionDetail.aspx?ReactorID=91>, viewed 21 January 2015.

9 Minerals Council of Australia (MCA), *Submission 9*, p. 4.

5.12 In 2009, India concluded with the IAEA the *Agreement between the Government of India and the International Atomic Energy Agency for the Application of Safeguards to Civilian Nuclear Facilities* (the IAEA Agreement).[10]

5.13 The IAEA Agreement is, according to John Carlson, significantly more complex than Australia has dealt with in the past.[11]

5.14 For example, the IAEA Agreement applies only to nuclear materials imported under agreements that specifically apply the provisions of the IAEA Agreement.[12]

5.15 According to John Carlson, Australia has in the past interpreted the *Nuclear Non-Proliferation Treaty* (NPT), to which Australia is bound, as precluding any nuclear exports to countries that do not have a safeguards agreement with the IAEA applying to **all** nuclear material.[13]

5.16 The Australian Safeguards and Non-Proliferation Office (ASNO) explains that:

> The design of IAEA safeguards for India is specific to its situation. On the one hand, the presence of both civil and military nuclear facilities affects the scope of IAEA safeguards in India. But a consequence is that the frequency and intensity of the International Atomic Energy Agency's inspections of India's civil nuclear facilities is in fact greater than for most non-proliferation treaty parties. This offers helpful additional assurance that Australian-obligated nuclear material would not be diverted from peaceful use.[14]

5.17 The IAEA Agreement contains an Annex that lists the facilities that India wishes to place under IAEA safeguards. In effect, this means that there are three categories of nuclear facilities in India for safeguards purposes: military facilities; civilian facilities not covered by the IAEA agreement (or 'unsafeguarded'); and civilian facilities covered by the IAEA agreement ('safeguarded').[15]

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10 *Agreement between the Government of Australia and the Government of India on Cooperation in the Peaceful Uses of Nuclear Energy*, [2014] ATNIF26, preamble.

11 Mr John Carlson, *Submission 1*, p. 2.

12 Mr Carlson, *Submission 1*, p. 4.

13 Mr Carlson, *Submission 1*, p. 4.

14 Dr Robert Floyd, Director General, Australian Safeguards and Non-Proliferation Office (ASNO), Department of Foreign Affairs and Trade, *Committee Hansard*, Canberra, 12 February 2015, p. 2.

15 Mr Carlson, *Submission 1*, p. 6.

5.18 India's definition of unsafeguarded facilities includes civilian facilities considered to be of strategic national importance, and civilian facilities that are in the same complex as designated military facilities.[16]

5.19 Such facilities include civilian electricity generating fast breeder reactors used to produce military grade plutonium. Mr Carlson argues that the existence of unsafeguarded facilities effectively means that the separation of military and civilian nuclear facilities is a matter of administrative definition, rather than a reality.[17]

5.20 Under the IAEA Agreement, India is able to temporarily designate an 'unsafeguarded' facility as 'safeguarded.'[18]

5.21 According to Mr Carlson:

> The [IAEA] agreement has provisions on substitution of unsafeguarded for safeguarded material, exemption of material from safeguards in certain circumstances…suspension of safeguards, and termination of safeguards.[19]

5.22 At the time the inquiry commenced, the Annex to the IAEA Agreement listed only 14 of India's civilian nuclear facilities as 'safeguarded'. The list in the Annex contradicted statement in the National Interest Analysis (NIA) of the *Agreement between the Government of Australia and the Government of India on Cooperation in the Peaceful Uses of Nuclear Energy* (the proposed Agreement) that all civilian facilities were safeguarded.[20]

5.23 By June 2015, ASNO was able to reassure the Committee that:

> The commitment that India made on the separation of its civilian and military programs was to have 22 facilities that would be brought under IAEA safeguards. They have brought all 22 of those facilities under IAEA safeguards, so they have complied with and completed that process at this point in time.[21]

16 Mr Carlson, *Submission 1*, p. 7.
17 Mr Carlson, *Submission 1*, p. 7.
18 Mr Carlson, *Submission 1*, p. 6.
19 Mr Carlson, *Submission 1*, p. 8.
20 Mr Carlson, *Submission 1*, p. 7.
21 Dr Floyd, ASNO, *Committee Hansard*, Canberra, 15 June 2015, p. 7.

Nuclear regulation

5.24 The Australian Conservation Foundation (ACF) submission points out that, in 2012, the Indian Auditor General released *Report No. - 9 of 2012-13 for the period ended March 2012 - Performance Audit on Activities of Atomic Energy Regulatory Board (Department of Atomic Energy)*, which detailed a number of concerns about the regulation of nuclear energy in India.[22]

5.25 In particular, the Report identified deficiencies in: the independence of the nuclear safety regulator; the quality and number of nuclear safety plans; the adoption of international benchmarks for the inspection of nuclear facilities; and the preparation of decommissioning plans for nuclear power plants.[23]

5.26 In the Report, the Auditor General stated:

> Failure to have an autonomous and empowered regulator is fraught with grave risks as the recent report of the Fukushima Nuclear Accident Independent Investigation Commission has confirmed.[24]

5.27 The Report made a number of recommendations to rectify these deficiencies, including:

- establishing an independent nuclear regulator under law;
- developing required safety procedures expeditiously;
- making use of the IAEA to establish best practice for nuclear power plant inspections; and
- making plans, both administrative and financial, for the decommissioning of nuclear power plants when those plants are constructed.[25]

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22 Australian Conservation Foundation (ACF), *Submission 5*, p. 2.

23 Comptroller and Auditor General of India, *Report No. - 9 of 2012-13 for the period ended March 2012 - Performance Audit on Activities of Atomic Energy Regulatory Board (Department of Atomic Energy)*, pp VI-IX. <http://www.saiindia.gov.in/english/home/Our_Products/Audit_Report/Government_Wise/union_audit/recent_reports/union_performance/2012_2013/SD/Report_9/Exe_Summ.pdf>, viewed 5 May 2015.

24 Comptroller and Auditor General of India, *Report No. - 9 of 2012-13 for the period ended March 2012 - Performance Audit on Activities of Atomic Energy Regulatory Board (Department of Atomic Energy)*, p 73. <http://saiindia.gov.in/english/home/our_products/audit_report/Government_Wise/union_audit/recent_reports/union_performance/2012_2013/SD/Report_9/Chap_10.pdf>, viewed 24 August 2015.

25 Comptroller and Auditor General of India, *Report No. - 9 of 2012-13 for the period ended March 2012 - Performance Audit on Activities of Atomic Energy Regulatory Board (Department of Atomic Energy)*, pp IX-X. <http://www.saiindia.gov.in/english/home/Our_Products/Audit_Report/Government_Wi

5.28 In relation to the independence of the nuclear regulator in India Dr Mark Zirnsak of the Uniting Church of Australia Justice and International Commission, Synod of Victoria and Tasmania states:

> The concerns that we have raised which have come from analysis out of India, by an Indian academic particularly, have been the lack of independence of the regulatory body, the Atomic Energy Regulatory Board, and that it has been a longstanding recommendation that that body be made independent. Currently, it is still under the authority of the Indian government with the Indian government being able to interfere with, potentially, its operation as such.[26]

5.29 The ACF submission argues that these deficiencies have not been effectively resolved, and that the proposed Agreement should not be ratified until they are resolved.[27]

5.30 The Indian Government's response to the Report indicated that the recommendation would be implemented, and legislation was introduced into the Indian Parliament to establish an independent nuclear regulator.[28]

5.31 The Nuclear Threat Initiative found that India's nuclear materials security conditions could be improved by establishing an independent regulatory agency.[29]

5.32 The Committee also notes that in March 2015, the IAEA published some of the findings of a mission to India to investigate India's regulatory framework. The mission's findings appear to support the ACF's assertions regarding India's failure to rectify deficiencies identified in 2012.[30]

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se/union_audit/recent_reports/union_performance/2012_2013/SD/Report_9/Exe_Summ.pdf>, viewed 5 May 2015.

26 Dr Mark Zirnsak, The Uniting Church of Australia Justice and International Commission, Synod of Victoria and Tasmania, *Committee Hansard*, Melbourne, 18 May 2015, p. 5.

27 ACF, *Submission 5*, p. 2.

28 Mr Carlson, *Committee Hansard*, Canberra, 9 February 2015, p. 6.

29 Associate Professor Tilman Ruff, International Campaign to Abolish Nuclear Weapons (Australia) (ICAN), *Committee Hansard*, Melbourne, 18 May 2015, p. 14.

30 International Atomic Energy Agency (IAEA), March 2015, *IAEA Mission Concludes Peer Review of India's Nuclear Regulatory Framework*, <https://www.iaea.org/newscenter/pressreleases/iaea-mission-concludes-peer-review-indias-nuclear-regulatory-framework>, viewed 5 May 2015.

5.33 For example, the IAEA mission found that:

- the Indian nuclear regulatory agency was still not independent under law;
- the existing policies and arrangements at the nuclear regulator needed to be reviewed to ensure its independence;
- the frequency and quality of inspections at nuclear facilities was still not up to best practice standards; and
- there was still insufficient planning for the decommissioning of nuclear facilities.[31]

5.34 India's apparent failure to rectify specific problems that have been identified by a number of credible entities over a number of years is a concern to the Committee.

5.35 The Committee notes that, in Japan, despite an apparently robust regulatory environment, breaches of regulations contributed to the Fukushima facility accident. Australian nuclear material was in use at the Fukushima facility at the time of the accident.

5.36 The Committee believes that the Australian Government cannot overlook such clear warnings about the quality of India's nuclear regulatory framework.

5.37 Consequently, the Committee recommends that, should the proposed Agreement be ratified, uranium sales to India only commence when the following conditions are met:

- India has achieved the full separation of civil and military nuclear facilities as verified by the IAEA;
- India has established an independent nuclear regulatory authority under law;
- the Indian nuclear regulator's existing policies and arrangements have been reviewed to ensure its independence;
- the frequency, quality and comprehensiveness of onsite inspections at nuclear facilities have been verified by the IAEA as being best practice standard; and
- the lack of sufficient planning for the decommissioning of nuclear facilities has been rectified.

31 IAEA, March 2015, *IAEA Mission Concludes Peer Review of India's Nuclear Regulatory Framework*, <https://www.iaea.org/newscenter/pressreleases/iaea-mission-concludes-peer-review-indias-nuclear-regulatory-framework>, viewed 5 May 2015.

Recommendation 3

5.38 **Committee recommends that, should the *Agreement between the Government of Australia and the Government of India on Cooperation in the Peaceful Uses of Nuclear Energy* be ratified, uranium sales to India only commence when the following conditions are met:**

- **India has achieved the full separation of civil and military nuclear facilities as verified by the IAEA;**
- **India has established an independent nuclear regulatory authority under law;**
- **the Indian nuclear regulator's existing policies and arrangements have been reviewed to ensure its independence;**
- **the frequency, quality and comprehensiveness of onsite inspections at nuclear facilities have been verified by the IAEA as being best practice standard; and**
- **the lack of sufficient planning for the decommissioning of nuclear facilities has been rectified.**