

## Executive Summary

### *Why did we decide to examine this issue?*

Radiation and radioactive substances have many beneficial applications, ranging from power generation to uses in medicine, industry and agriculture. At the same time, the risks of radiation that may arise from these applications to the people working in these fields, the general public and the environment are enormous and therefore, need to be assessed and controlled effectively. Since radiation risks can transcend national borders, international co-operation is essential to promote and enhance global safety by exchanging experiences as well as by improving capabilities for controlling hazards, preventing accidents, responding to emergencies and mitigating any harmful consequences.

In India, the Atomic Energy Regulatory Board (AERB) was set up in 1983 under the Atomic Energy Act 1962 to carry out certain regulatory and safety functions envisaged under the Atomic Energy Act.

The national and international regulatory scenario and criticality of the issue of radiation risks and safety prompted us to undertake a study of the structure and status of AERB and the effectiveness of its role as the nuclear regulator of India.

### *What were our audit objectives?*

The objectives of this performance audit were to examine whether:

- i. AERB has the necessary legal status, authority, independence and adequate mandate to fulfil the responsibilities expected of a nuclear regulator.
- ii. AERB, keeping in view the international recommendations and local requirements, has been able to develop safety policies in nuclear, radiological and industrial safety areas as well as safety codes, guides and standards for siting, designing, constructing, commissioning, operating and decommissioning different types of nuclear and radiation facilities.
- iii. AERB has been able to regulate nuclear and other radiation utilities through a system of consents effectively.
- iv. AERB has ensured compliance of the prescribed regulatory requirements by nuclear power plants, other nuclear facilities and radiation facilities through a system of efficient regulatory inspection and enforcement.
- v. AERB is monitoring and discharging its responsibilities relating to radiation exposure to occupational workers and members of the public and release of radioactive substances in the environment in an efficient and effective manner.
- vi. emergency preparedness plans are in place for nuclear and radiation facilities and during transport of large radioactive sources, irradiated fuel and fissile material.

- vii. adequate and effective regulatory systems exist in the country for decommissioning of nuclear and radiation facilities and creation of decommissioning reserves.
- viii. the regulator has taken adequate measures for maintaining liaison with international bodies dealing with nuclear regulatory issues.

**What did our performance audit reveal?**

It revealed that:

**Regulatory framework for nuclear and radiation facilities**

*Although international commitments, good practices and internal expert committees’ recommendations were available, the legal status of AERB continued to be that of an authority subordinate to the Central Government, with powers delegated to it by the latter.*

*AERB did not have the authority for framing or revising the rules relating to nuclear and radiation safety.*

*The maximum amounts of fines were too low to serve as deterrents against offences/contraventions related to nuclear and radiation facilities which involve substantial risks. Further, AERB had no role in deciding the quantum of penalties and no powers with regard to imposition of the same.*

*(Paragraph 2.3, 2.5, 2.8)*

**Development of safety policy, standards, codes and guides**

*AERB failed to prepare a nuclear and radiation safety policy for the country in spite of a specific mandate in its Constitution Order of 1983. The absence of such a policy at a macro-level can hamper micro-level planning of radiation safety in the country.*

*AERB had not developed 27 safety documents despite recommendations of the Meckoni Committee in 1987 and the Raja Ramanna Committee in 1997 to expedite development of safety documents. There were significant delays in development of the safety documents test-checked in audit.*

*(Paragraph 3.1, 3.2)*

**Consents**

*The consenting process and system for monitoring and renewal were found to be weak in respect of radiation facilities. This led to a substantial number of units of radiation facilities operating without valid licences. Non-availability of basic licence documents in files also indicated deficiencies in the maintenance of important consent files.*

*Around 91 per cent of the medical X-ray facilities in the country had not been registered with AERB and, as such, were out of its regulatory control.*

*The Supreme Court had directed (2001) the setting up of a Directorate of Radiation Safety (DRS) in each State for regulating the use of medical diagnostic X-rays. However, as on date (July 2012), out of 28 States and*

	<p>seven Union territories, DRS had been set up only in Kerala and Mizoram.</p> <p>AERB had not framed any rules to prescribe and fix the fees for recovery of the cost of services rendered for the regulatory and consenting process, as a result of which, it had to bear the cost of the consenting process.</p> <p style="text-align: right;">(Paragraph 4.2 &amp; 4.3)</p>
<p><b>Compliance and enforcement of regulatory requirements</b></p>	<p>Frequencies of regulatory inspections had not been prescribed for radiation facilities. In the absence of any benchmarks laid down by AERB, we compared the performance of AERB in carrying out such inspections of radiation facilities with the periodicity (lowest frequency from range) suggested by IAEA-TECDOC<sup>1</sup> and observed that :</p> <ul style="list-style-type: none"> <li>• AERB had not conducted 85 per cent regulatory inspections for both industrial radiography and radiotherapy units, even though these were identified as having a high radiation hazard potential.</li> <li>• There was a shortfall of over 97 per cent in the inspection in the case of diagnostic radiology facilities every year which showed that AERB was not exercising effective regulatory oversight over units related to the health of the public.</li> </ul> <p>AERB had failed to enforce safety provisions and compliance with its own stipulations even when its attention was specifically drawn to deficiencies in the case of units in Kerala.</p> <p style="text-align: right;">(Paragraph 5.2, 5.6)</p>
<p><b>Radiation protection</b></p>	<p>The functions of monitoring of radiological exposure as well as the responsibility of radiological surveillance of Nuclear Power Plants (NPPs) lay with the operators of NPPs. Consequently, AERB had no direct role in conducting independent assessments and monitoring to ensure radiological protection of workers despite being the nuclear regulator of India.</p> <p>AERB did not have a detailed inventory of all radiation sources to ensure effective compliance of regulations for safe disposal of disused sources.</p> <p>There were no proper mechanisms in place to ensure/verify that :</p> <ul style="list-style-type: none"> <li>• radioactive waste had actually been disposed off safely after utilisation.</li> <li>• the sources for which consents for transport of radioactive material for safe disposal had been given, had really been disposed off or not.</li> </ul>

<sup>1</sup> IAEA Technical Documents

<p><b>Emergency preparedness for nuclear and radiation facilities</b></p>	<ul style="list-style-type: none"> <li>• <i>the radioactive sources did not get out of regulatory control. The regulatory response mechanism to trace and discover lost and/or orphan radioactive sources in the country was not effective.</i></li> </ul> <p style="text-align: right;"><i>(Paragraph 6.3, 6.4)</i></p> <p><i>On-site emergency preparedness plans were being put in place by the Plant Managements of NPPs and nuclear fuel cycle facilities were being tested by them. Though actual periodic exercises prescribed, based on various types of emergencies were conducted by them, AERB only reviewed the reports of these exercises and did not directly associate itself in these exercises, even as observers.</i></p> <p><i>Off-site emergency exercises carried out highlighted inadequate emergency preparedness. Further, AERB was not empowered to secure compliance of corrective measures suggested by it.</i></p> <p><i>No specific codes on emergency preparedness plans for radiation facilities such as industrial radiography, radiotherapy and gamma chambers etc had been brought out although the hazard potential of these were rated as high.</i></p> <p style="text-align: right;"><i>(Paragraph 7.3, 7.4)</i></p>
<p><b>Decommissioning of nuclear and radiation facilities</b></p>	<p><i>There was no legislative framework in India for decommissioning of nuclear power plants and AERB did not have any mandate except prescribing of codes, guides and safety manuals on decommissioning.</i></p> <p><i>Even after the lapse of 13 years from the issue of the Safety Manual relating to decommissioning by AERB, none of the NPPs in the country, including those operating for 30 years and those which had been shut down, had a decommissioning plan.</i></p> <p><i>Neither the Atomic Energy Act, 1962 nor the Rules framed thereunder had any provision for creation of decommissioning reserves by the utilities. Besides, AERB had no role to play in ensuring availability of adequate funds.</i></p> <p style="text-align: right;"><i>(Paragraph 8.2, 8.3, 8.4)</i></p>
<p><b>Maintaining liaisons with international bodies dealing with nuclear regulatory issues</b></p>	<p><i>Although AERB maintained liaisons with international nuclear organisations, it was slow in adopting international benchmarks and good practices in the areas of nuclear and radiation operation.</i></p> <p><i>AERB had not yet availed of the opportunity of the peer review and appraisal services of IAEA to get its regulatory framework and its effectiveness reviewed by them.</i></p> <p style="text-align: right;"><i>(Paragraph 9.2, 9.3)</i></p>

## What do we recommend?

- *The Government may ensure that the nuclear regulator is empowered and independent. For this purpose, it should be created in law and should be able to exercise necessary authority in the setting of regulations, verification of compliance with the regulations and enforcement of the same in the cases of non-compliance.*
- *The maximum amount of fines leviable as per the Atomic Energy Act may be reviewed and AERB as the regulator, may be empowered to take recourse to a range of remedies, including penalties proportionate to the severity of the violations.*
- *A nuclear and radiation safety policy may be framed in a time-bound manner.*
- *The 27 codes and guides required for nuclear and radiation safety, out of which 11 were identified in 2001, may be developed expeditiously.*
- *The licensing process for radiation facilities may be strengthened to bring all the radiation facilities in the country under the regulatory control of AERB.*
- *The process of setting up Directorates of Radiation Safety in all the States as per the Supreme Court directive may be speeded up.*
- *AERB may frame rules for levying suitable fees for recovering the cost of the consenting process from licensees and the amounts of levies so made should be reviewed and revised from time to time.*
- *AERB may strengthen the processes of regulatory inspections of nuclear and radiation facilities by:*
  - *prescribing periodicities of regulatory inspections by conducting risk analyses and keeping international benchmarks for such inspections in view;*
  - *undertaking regulatory inspections in terms of the norms prescribed by IAEA for radiation facilities;*
  - *stipulating the timely issuance of regulatory inspection reports and securing compliance thereof.*
- *The regulatory role of AERB may be strengthened by bringing the monitoring agencies viz. Health Physics Units, Environmental Survey Laboratories etc. under the direct control of AERB.*
- *AERB may strengthen its system to ensure continuous updating of its inventory of all radiation sources till date to prevent radioactive sources from going out of regulatory control and ensure safe disposal of disused sources.*
- *AERB may be more closely associated with on-site emergency preparedness exercises.*

- *The Government may set up clear timelines within which NPPs, which are in operation and those which are in the course of being set up, should prepare and obtain approval for their decommissioning plans.*
- *The financial arrangements for decommissioning may be laid down more clearly and the decommissioning charges reviewed on a periodic basis with a view to ensuring their adequacy.*
- *AERB may avail of the peer review and appraisal services of IAEA to help make the nuclear regulatory infrastructure effective and sustainable.*

### ***What was the response of the Department of Atomic Energy to our recommendations ?***

The Department of Atomic Energy acknowledged the concerns highlighted by us. While there were no specific assurances giving time-lines within which our recommendations would be acted upon, we were assured that these were being looked into.