

## Chapter 8: Decommissioning of nuclear and radiation facilities

**Audit Objective: Whether there exists an adequate and effective regulatory system in the country for the decommissioning of nuclear and radiation facilities as well as a system for creation of decommissioning reserves**

### 8.1 Introduction

At the end of the life of any NPP, nuclear fuel cycle facility or radiation facility, it needs to be decommissioned<sup>29</sup>, decontaminated and demolished so that the site is made available for other uses.

The decommissioning activity for a NPP may be divided into three phases i.e. initial activities<sup>30</sup>, major decommissioning as well as storage and licence termination activities.

With a view to ascertaining the adequacy of the regulatory system with regard to units relating to decommissioning, Audit mapped the institutional arrangements in India vis-à-vis the recommended practices by IAEA, examined the status of decommissioning plans of units and the issues relating to funding of decommissioning of nuclear power plants.

### 8.2 International scenario vis-à-vis the Indian scenario

The comparative position of the legislative framework on provisions for the safe decommissioning of facilities, safe management and disposal of radioactive waste arising from facilities and activities and safe management of spent fuel is discussed in Table 10.

<sup>29</sup> Discontinuation of the use of radiation equipment or installation on a permanent basis, with or without dismantling the equipment, including removal or containment of radioactive material. The term includes all clean-up of radioactivity and progressive dismantling of the plant in case of a nuclear power plant.

<sup>30</sup> Shut down activities like removal of radioactive fuel, study of environmental impact and identification of site-specific decommissioning activities.

Table -10

Stipulated as per IAEA	Followed in Indian context	Audit's Remarks
<p>i. Role of the regulatory body should be clearly delineated, including the need to develop regulatory requirements and procedures for all stages of the decommissioning process. This is particularly important since decommissioning can extend over lengthy periods of time during which there should be no gaps in regulatory supervision and control.</p>	<p>AERB's Constitution Order of 1983 empowers it to issue codes and guides for nuclear and radiological safety, including those on decommissioning and advise AEC/DAE on technical matters including decommissioning of the plants under DAE.</p>	-
<p>ii. The basic structure and contents of the decommissioning plan should be codified.</p> <p>In view of the importance of the decommissioning plan, legislation can usefully identify key elements, although specific technical requirements could be left for implementing regulations.</p>	<p>The AERB Safety Manual on decommissioning of nuclear facilities has codified the basic structure and contents of decommissioning plans.</p>	<p>There is no legislative framework in India for decommissioning of nuclear power plants.</p>
<p>iii. There should be provision in law for regulatory approval for any change in ownership of a facility and responsibility of decommissioning.</p>	<p>There is no specific provision in law for regulatory approval for any change in ownership of a facility and responsibility of decommissioning.</p>	<p>Internationally benchmarked practices have not been adopted.</p>
<p>iv. The law should make clear how financial arrangements for decommissioning are to be handled.</p> <p>The law must also reflect as to how the costs of decommissioning are to be assessed, funded and managed till the time required for decommissioning.</p>	<p>There are no specific arrangements in law in India with regard to funding of decommissioning activity.</p>	<p>Internationally benchmarked practices have not been adopted.</p>

DAE further stated (February 2012) that the Atomic Energy Act, 1962 was for all aspects of handling, use and disposal of radioactive substances, which would encompass decommissioning also. It stated that the broad scope of decommissioning was already covered in various codes and guides of AERB.

The reply of DAE needs to be viewed in the light of international practices followed in other countries i.e., USA, UK, Canada, Spain, France, etc., including countries where nuclear energy is totally under the public sector. These countries have designated competent authorities, which are often nuclear regulators, who play a major role in approving the decommissioning strategies selected; review the cost estimates developed and also review the funding mechanism used to assure adequate funding for decommissioning. While the role of regulators is generally defined by law, the roles and duties of other interested parties are generally defined by the regulator.

**There is no legislative framework in India for decommissioning of nuclear power plants and AERB does not have any mandate except prescribing of codes, guides and safety manuals on decommissioning.**

### **8.3 Non-submission of proposal for decommissioning of any nuclear facility**

As per IAEA safety standards, a decommissioning plan should be developed for each nuclear facility to show that decommissioning could be accomplished safely. Further, all aspects should be taken into account for the eventual need to decommission a facility at the time it is being planned and constructed. The AERB Safety Manual on 'Decommissioning of Nuclear Facilities' was published in March 1998, to assist DAE units in formulating a decommissioning programme and in furnishing the required information to the regulatory body for authorisation for decommissioning. The manual stipulated that facilities which were already in operation should prepare preliminary decommissioning plans and submit them to AERB within five years of publication of the manual and new facilities, should do the same before the construction licences or operation licences were issued.

Of the 20 units of NPPs operating in the country at present, 10 plants came into operation before the publication of the AERB Safety Manual on 'Decommissioning of Nuclear Facilities'. None of these 10 plants had prepared preliminary decommissioning plans so far.

Ten plants, which came into operation after publication of the Safety Manual had also not prepared their decommissioning plans despite the requirement that these were to be prepared and submitted to AERB before the construction licences or operation licences were issued. This indicated that licences for operation were issued without AERB insisting upon

the submission of decommissioning plans. All NPPs in the country were operating without any decommissioning plans.

We observed that even after the lapse of 13 years from the issue of the Manual, NPCIL, the agency responsible for drawing up decommissioning plans for nuclear power plants, had not submitted decommissioning plans for any of its plants despite the fact that Tarapur Atomic Power Station (TAPS)-1 and 2 had already completed over 30 years of operation and the Rajasthan Atomic Power Station (RAPS)-1 was under shutdown condition since 2004.

AERB replied (February 2011) that the Manual published by it was advisory and neither mandatory nor recommendatory in nature.

It further stated (February 2012) that NPCIL had submitted notes on decommissioning aspects for TAPS-3 & 4, Kaiga-3 & 4, Rajasthan Atomic Power Project (RAPP)-5 & 6, Kakrapar Atomic Power Project (KAPP)-3 & 4 during the design review stage itself to AERB. As regards RAPS-1, the techno-economic feasibility of further operations was under review. As and when a decision was taken for decommissioning, detailed plans would be submitted to it for approval.

The reply of AERB only confirms that AERB does not have an adequate mandate in respect of decommissioning of NPPs, research reactors and other nuclear fuel cycle facilities. The fact remains that all the NPPs and research reactors in the country are operating without decommissioning plans and AERB, as a regulator, is not in a position to secure compliance with the provisions of its Manual on the plea that the safety of operating units does not get jeopardised in the absence of decommissioning plans. Inaction on the part of NPCIL reflects the lack of effectiveness of the regulator as there are no provisions in the Act or in the Constitution Order or in the rules which empower the regulator to ensure compliance.

**Even after the lapse of 13 years from the issue of the Safety Manual by AERB, none of the NPPs in the country, including those operating for 30 years, and those which have been shut down, have a decommissioning plan.**

#### 8.4 Adequacy of decommissioning of reserves and investment of Decommissioning Fund

As per the IAEA Safety Standards/Guides, a mechanism for providing adequate financial resources should be established to cover the costs of radioactive waste management and, in particular, the cost of decommissioning. It should be put in place before operation and should be updated as necessary. Consideration should also be given to providing the necessary financial resources in the event of premature shutdown of a facility.

DAE had issued a notification in December 1988 to levy a decommissioning charge of 1.25 paise per KWH energy sold from the nuclear power stations in the country. It had revised (October 1991) the levy of decommissioning charges to 2 paise per KWH energy sold. The notification stipulated that the receipts on account of decommissioning charges should be credited to a separate fund to be known as the 'Decommissioning Fund', to be maintained by NPCIL.

We observed that NPCIL had accumulated ₹920.22 crore in the Decommissioning Fund as of March 2011, along with a corresponding earmarked investment. As per a notification dated December 1988, NPCIL was to hold and manage the Decommissioning Fund on behalf of the Government.

While reviewing the adequacy of the decommissioning reserve, we observed that the Organisation for Economic Co-operation and Development (OECD) had published a study of decommissioning of nuclear plants, in which decommissioning cost estimates by various member countries such as Belgium, Germany, Italy, USA etc had been indicated. We also observed that considering the span of the decommissioning periods, the cost of decommissioning could exceed the cost of construction of such facilities, after providing for inflation. AERB had not worked out the decommissioning cost formula in any of its documents.

We observed that NPCIL was collecting the levy amounts for decommissioning of power plants on behalf of the Government and these were being credited to the Decommissioning Fund account. An expert committee had been constituted (September 2006) by the Government to judge the adequacy of the Decommissioning Fund, among its other responsibilities.

We observed that this Committee had, in its recommendations of June 2009, expressed its inability to accurately estimate the decommissioning levy since the calculations were very sensitive to the assumptions regarding the escalation rate and the interest rate. The committee, therefore, recommended retention of the levy of 2 paise/kWh and recommended that a review should be undertaken in future when better estimates were

available for future expenditure on decommissioning at the end of reactor lives. However, no further action on the same had been taken since 2009.

Neither the Atomic Energy Act, 1962 nor the Rules framed under it had any provisions for creation and calculation of decommissioning reserves by the utilities. Besides, AERB had no role to play either in the creation of the Fund or in ensuring the adequacy of the Fund. We observed that DAE was continuing with the policy domain of decommissioning even after formation of AERB, which clearly indicated that the role of AERB was limited to prescribing standards, codes and guides.

DAE stated (February 2012) that the issue of decommissioning charges could be looked into.

**Neither the Atomic Energy Act, 1962 nor the Rules framed thereunder have any provision for creation of decommissioning reserves by the utilities. Besides, AERB has no role to play in ensuring availability of adequate funds in it. Decommissioning charges had not been revised since 1991.**

### Recommendations

18. The Government may set up clear timelines within which Nuclear Power Plants, which are in operation and those which are in the course of being set up, should prepare and obtain approval for their decommissioning plans.
19. The role of AERB with reference to decommissioning may be strengthened in terms of the guidelines of the International Atomic Energy Agency in the matter.
20. 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.