Chapter 7: Emergency preparedness for nuclear and radiation facilities

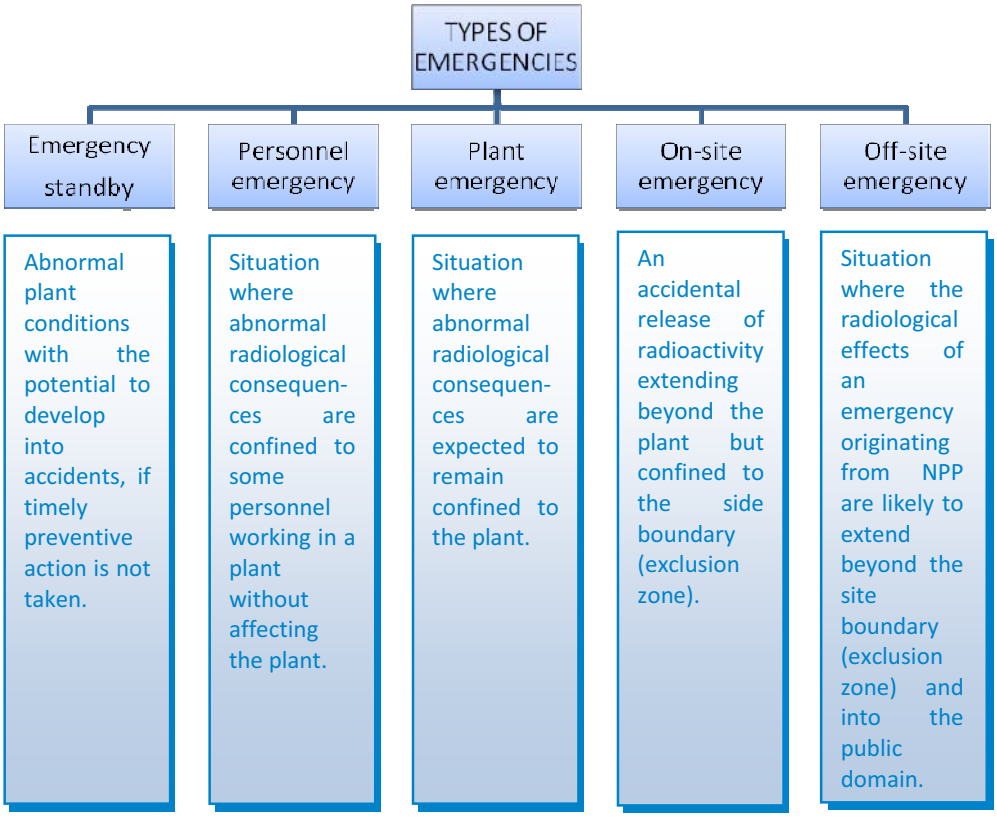
Audit Objective: Whether emergency preparedness plans are in place for nuclear and radiation facilities and during transport of large radioactive sources, irradiated fuel and fissile material

7.1 Introduction

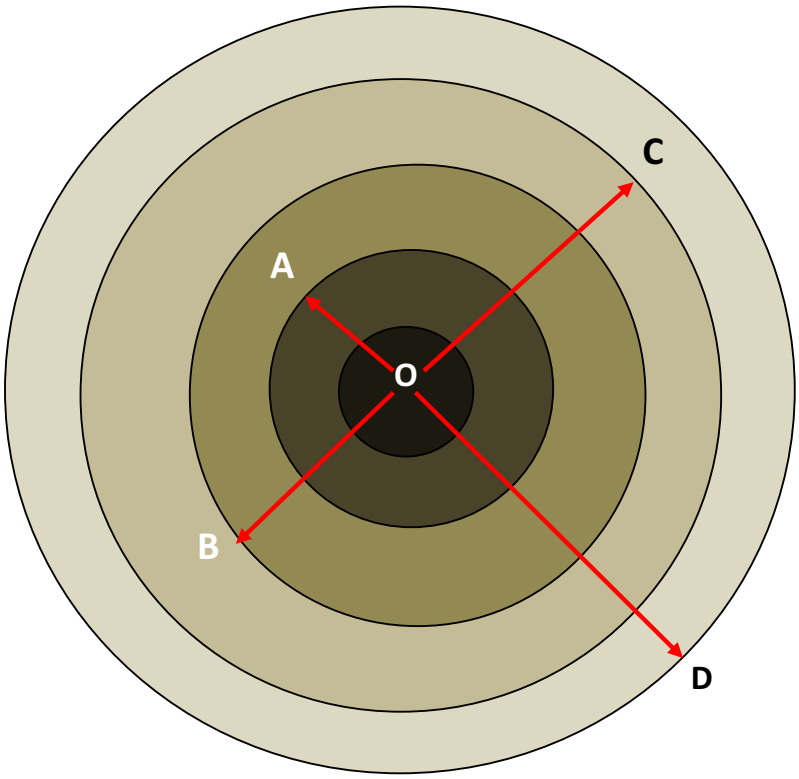
In addition to the safety standards to be adopted for creating and operating nuclear and radiation facilities, as per Article 16 of the Convention on Nuclear Safety of IAEA, AERB has to ensure development of emergency response plans in conformity with international practices so that any eventuality with a potential to result in undue radiological risks to plant, personnel and the public, is handled effectively.

Based on the radiological conditions and their consequences, emergencies at nuclear facilities are categorised as emergency standby, personnel emergency, plant emergency, on-site emergency and off-site emergency. These are explained in Chart – 2 below.

Chart - 2



The exclusive zones for emergency preparedness are depicted in the diagram below:



OA: plant area, OB: 1.6 km, OC: 5 km, OD: 16 km

Type of emergency	Affected zones	Responsible agency
Emergency standby	Stack location (O)	Plant Management
Emergency standby	Plant area (OA)	Plant Management
Personnel emergency	Plant area (OA)	Plant Management
Plant emergency	Plant area (OA)	Plant Management
On-site emergency	Exclusion zone (OB)	Plant Management
On-site emergency	Sterilised zone (OC)	Plant Management
Off-site emergency	Emergency planning zone (OD)	Plant Management, district authorities, State government and NDMA

Source : AERB Safety Guide no. AERB/SG/O-6 titled 'Preparedness of the operating organisation for handling emergencies at nuclear power plants'

7.2 International scenario vis-à-vis the Indian scenario

Article 16 of the Convention of Nuclear Safety of the IAEA, ratified by the Government of India on March 31, 2005, stipulates that each contracting party should take appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency. For any new nuclear installation, such plans should be prepared and tested by the regulatory body, before it commences operations. Each contracting party should take appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.

The IAEA Handbook on Nuclear Law corroborates the above by providing the three aspects of emergency planning relating to regulatory bodies requiring specific inclusion in national nuclear legislations. The comparative position of the legislative framework on emergency planning stipulated by IAEA and as followed by India is detailed below:

Stipulation as per IAEA	As followed in India
1. The role of the regulatory body in approving emergency response plans for facilities utilising nuclear material or radiation sources should be spelt out.	Emergency preparedness plans prepared by the plant Management of NPPs and nuclear fuel cycle facilities should be approved by AERB.
2. The role of the regulatory body in providing expert information and assistance to other governmental bodies and the public in the case of emergencies involving radioactive material should be spelt out.	As per the Constitution Order dated 15 November 1983, AERB should take such steps as is necessary to keep the public informed about major issues of radiological safety significance. As regards off-site emergency response plans, the responsibility rests with district authorities, with assistance from the facility operators, AERB, and the Crisis Management Group (CMG[28]) under the overall coordination of the National Disaster Management Authority (NDMA).
3. The role of the regulatory body in implementing certain international legal commitments such as those under the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear	India is party to the Convention on Early Notification of a Nuclear Accident (1986), the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986), the Convention on the Physical Protection of Nuclear Material (1979) and the International Convention

[28] Crisis Management Group is immediately activated in the event of any nuclear/radiological emergency in the public domain and would coordinate the additional technical resources required by the affected NPP to handle the emergency and is chaired by Additional Secretary, DAE.

Accident or Radiological Emergency should be spelt out.	for Suppression of Acts of Nuclear Terrorism (2005), Convention on Nuclear Safety (ratified in 2005) and complies with their obligations. However, the role of AERB in relation to implementing international legal commitments has not been specifically defined in its constitution order.

7.3 Emergency preparedness plans for nuclear power plants

Preparedness and responses to emergencies are important responsibilities of an operating organisation, which has to establish and maintain the necessary emergency plans and procedures for all emergencies by having an on-site emergency preparedness plan and an off-site emergency preparedness plan. The off-site emergency plan is the combined responsibility of the operator, the district authorities and other associated authorities such as NDMA, the CMG of DAE, etc. The other emergency plans fall within the domain of responsibility of the operator. AERB has the responsibility to ensure that these emergency preparedness plans are submitted by the operators to it for approval, review and updation.

We reviewed the regulatory effectiveness of systems and procedures relating to emergency preparedness, both on-site and off-site and the general adequacy of emergency preparedness and coordination between various authorities, without going into the effectiveness of emergency preparedness plans as they are technical in nature. Our findings in respect of both on-site and off-site preparedness are detailed in the succeeding paragraphs:

7.3.1 On-site emergency preparedness

On-site emergency preparedness plans are put in place by the plant Managements of NPPs and nuclear fuel cycle facilities. These emergency preparedness plans are tested by actual periodic exercises prescribed, based on the types of emergencies, by the plant Managements of NPPs. Plant emergency exercises (PEE) are conducted once in a quarter, while site emergency exercises (SEE) are conducted once a year. AERB only reviews the reports of these exercises conducted by the plant Managements and does not directly associate itself in these exercises, even as observers of PEE and SEE.

As the nuclear safety regulator, AERB should associate itself as an observer in these exercises on selection basis to exercise adequate regulatory supervision in these exercises.

DAE welcomed the suggestion of Audit, stating (February 2012) that AERB was contemplating deputing observers during on-site exercises on a sample basis.

7.3.2 Off-site emergency preparedness

For the purpose of planning an off-site emergency, an emergency-planning zone (EPZ) is specified up to a 16 km radius from the plant. The Emergency Response Manual of AERB specifies the criteria to determine an off-site emergency. The protective measures in the public domain are also specified in the Manual. These measures have to be implemented by the district officials under the direction of the district authority, who is designated as the Off-Site Emergency Director (OED). The OED is the chairman of the Off-Site Emergency Committee (OEC) and is responsible for convening the OEC when the report of the initiation of an emergency is received. Its members include the chiefs of all public services relevant to the management of any emergency in the public domain.

The State Governments approve and issue the off-site emergency plans after review by AERB. The emergency response plans provide guidance to ensure that the NPPs and off-site authorities develop and maintain compatible emergency plans. In order to test these plans, periodic off-site emergency exercises (OSEE) are carried out, involving the station authorities, district administrations and members of the public.

Review in audit of off-site emergency preparedness in the country revealed the following:

(a) In the case of NPPs, the OSEE are conducted once in two years, in coordination with district authorities and the public. We observed that there was no significant deviation in the conduct of OSEE and AERB was associated with these exercises as an observer. In all, 26 such emergency exercises were conducted during the period 2005-2011 in various NPPs and AERB submitted observer's reports to the plant authorities and the CMG for taking necessary action to rectify/revise the offsite emergency plans.

(b) Low population density in emergency zones and proper approach roads to plant sites enable effective responses in case of any emergencies. We reviewed the NPP sites at Tarapur, Kalpakkam and Kaiga and observed that there was no proper approach road from the Palghar Tahsildar Office to the Plant site of the Tarapur Atomic Power Station and also that the population had increased manifold in the emergency zone at the site due to large scale industrial activity in the Maharashtra Industrial Development Corporation area at Tarapur. These bottlenecks would pose serious impediments in speedy responses for rescue of affected people in case of any emergency.

AERB stated (February 2012) that presently, it was not mandated to take follow-up action with the district / State authorities on deficiencies in emergency preparedness pointed out by it. However, it was considering asking the plant Managements to obtain and submit

information on the status of corrective measures taken subsequent to the OSEEs by the local authorities.

The reply confirms the weakness in the regulatory regime since the AERB has no authority to enforce rules in the instances of malpractices and departures from the approved plans.

Off-site emergency exercises carried out highlighted inadequate emergency preparedness. AERB is not empowered to secure compliance of corrective measures suggested by it.

7.4 Emergency plans for radiation facilities

It was observed that codes for emergency preparedness plans for NPPs and nuclear fuel cycle facilities of DAE had been framed and issued, but no specific codes on emergency preparedness plans for other types of radiation facilities such as industrial radiography, radiotherapy and gamma chambers etc had been brought out even though the hazard potential of these were rated as high. We observed that the number of radiation applications in various areas has grown continuously and high strength radioactive sources were being used extensively in industry, hospitals and other irradiation facilities.

DAE stated (February 2012) that though in their assessment, emergency preparedness in radiation facilities had been addressed adequately in the present system of regulation, the suggestion could be examined.

Recommendations

15. AERB may be more closely associated with on-site emergency preparedness exercises.

16. AERB may be empowered to secure compliance of the corrective measures suggested by it for strengthening the emergency preparedness of plant sites.

17. AERB may strengthen the regulatory aspect of emergency preparedness in the area of other radiation facilities by prescribing codes for emergency preparedness plans based on the assessment of risk factors of each facility and suitable procedures for securing compliance to the requirements prescribed in the codes.