CONCEPT NOTE

NUCLEAR EMERGENCIES

As human society has been beneficiary of advances of science and technology, it has also of late become victim of such advances due to their misuse in terrorist activities world over. In addition to the impacts of growing natural disasters mankind has become equally vulnerable to various man-made disasters. Nuclear and radiological emergencies are one such facet of the man-made disasters.

For improving the quality of life in the society, many countries in the world have embarked upon a large programme of using nuclear energy for generation of electricity. Further, the radioisotopes are utilized in a variety of applications in the non-power sector viz., in the field of industry, agriculture, medicine, research etc. Due to built in design features, inherent safety culture, the best safety practices and standards followed during various phases of construction and operation in these plants and effective regulation worldwide, the emissions of radioactive materials from routine operations of nuclear power plants does not normally require any protective actions on part of public. The radiation dose, to which the persons working in nuclear / radiation facilities are exposed to, is well within the permissible limits and risk of its impact in public domain is very low.

Although radiation releases from nuclear power-plant are very rare, but if they happen due to any reason, they can be devastating. Chernobyl is a good example. With modern reactor design, a catastrophic release of radiation is highly unlikely, but nevertheless, possible. This can happen due to factors beyond the control of the operating agencies e.g., human error, system failure, sabotage, earthquake, cyclone, flood, etc. In such situations, proper emergency preparedness plans must be in place so that there is minimum loss of life, livelihood, property and impact to the environment.

Any radiation incident resulting in or having a potential to result in exposure to and/or contamination of the workers or the public, in excess of the respective permissible limits can be termed as nuclear/radiological emergency. The longer a person is exposed to radiation, the greater the effect. A high exposure to radiation can cause serious illness or death.

The nuclear and radiological emergencies can be broadly classified in the following manner:

i) An accident taking place in any nuclear facility of the nuclear fuel cycle including the nuclear reactor or in a facility using radioactive sources, leading to a large scale release of radioactivity in the environment.

ii) A “criticality” accident in a nuclear fuel cycle facility where an uncontrolled nuclear chain reaction takes place inadvertently leading to bursts of neutrons and gamma radiations (as happened at Tokaimura, Japan).

iii) An accident during the transportation of radioactive material.

iv) A malevolent use of radioactive material as Radiological Dispersal Device (RDD) by terrorists for dispersing radioactive material in the environment.

v) A large-scale nuclear disaster, resulting from a nuclear weapon attack (as happened at Hiroshima and Nagasaki) which would lead to mass causalities and destruction of large area and property. Unlike a nuclear emergency, the impact of nuclear disaster is beyond the coping capability of the local authorities and such a scenario calls for handling at the national level. This topic is not within the scope of the congress.

Normally the nuclear or radiological emergencies arising in the nuclear installations are within the coping capability of the plant authorities. The nuclear emergency that can arise in nuclear fuel cycle facilities specially nuclear reactors and the radiological emergency due to malevolent acts of using RDDs are the two scenarios that are of major concern. In addition criticality accidents in Reprocessing plants and Transport accidents are two another areas of concern.

Because of their wide spread application, access to availability of radioactive sources has become easy. While their radioactive strength is in itself a deterrent to pilferage, the radioactive sources can still be stolen and used in a Radiological Dispersal Device(RDD) also known as Dirty Bomb.

Accidents during Transportation of Radioactive Materials are of low probability due to special design features of the containers involved and special safety and security measures which are laid down to be followed during actual transportation.

As regards vulnerability of various nuclear fuel cycle facilities to the terrorists attacks, these facilities have elaborate physical protection arrangements in place to ensure their security.

Driven by the requirement of ensuring all possible efforts to prevent any accident /emergency situation in the nuclear power plant, in the last 50 years power reactor design has undergone revolutionary changes in terms of improvement in fuel design, reactor design philosophy, instrumentation, safety considerations etc. In India, following 4 types of reactors are either in operation or under construction, therefore safety aspects of these reactors will be considered in particular by the Congress:

1. Pressurised Heavy water Reactor (PHWR)
2. Pressurised Water Reactor (PWR)
3. Prototype Fast Breeder Reactor (PFBR)
4. Advanced Heavy Water Reactor (AHWR)

The Nuclear Regulatory Authority in the country has the mandate to ensure that, while the beneficial aspects of nuclear programme and use of ionizing radiation are fully exploited, their use do not cause undue risk to public health and the environment. It has authority for issuance of licenses to nuclear and radiological facilities and ensuring compliance with the applicable standards and codes. It has powers, not only to license the operation of a facility but also to order partial or full shutdown of the facility that violates its guidelines.

The Atomic Energy Regulatory Board(AERB) in India, like all the regulator world over, requires that before a plant could be licensed to operate, the regulator must have "reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency." Emergency planning has been adopted as an added conservatism to the “defense-in-depth" safety philosophy, where the safety systems are inbuilt with adequate redundancy and diverse working principles. Defence-in-depth is structured in various levels. Several levels of protection and multiple barriers prevent the release of radioactive material to the public domain.

Similarly to meet the radiological emergencies in public domain like transport accident, handling of orphan sources, explosion of RDD, concept of Emergency Response Centers (ERCs) has been established in India. These centres should be spread throughout the country.

The task of these ERCs is to monitor and detect radiation sources, train the stakeholders, maintain adequate inventory of monitoring instruments and protective gears and provide technical advice to the first responders and local authorities.

The quality of the required emergency preparedness is maintained by periodic training courses for the on-site and off-site administrative personnel including the State Government officials and various other stakeholders. Also, the primary evaluation of the same is based on the periodic mock drills and exercises. The planning and preparedness for response to nuclear/radiological emergency will be integrated in an all hazards approach with the planning for response to all types of conventional emergencies. The confidence level in the community to handle any nuclear/radiological emergency can be enhanced only through education and awareness generation and preparedness

The response to a nuclear/radiological emergency in a nuclear facility has many elements in common with the response to other man-made and natural disasters, in terms of services like medical, fire & emergency services, police, civil defence etc. However, some special features of nuclear emergency will need to be taken care of additionally.

The conference will also discuss various issues so that nuclear / radiological emergency management system can be put on a holistic platform. Besides the core issues involved in the various components of DM continuum, issues related to availability of trained manpower, monitoring instruments and personal protective gears, shelters, transport and roads, medical facilities and trained doctors, alternate sources of food and water, communication, public awareness, teams of paramilitary forces, Police, Civil Defence, Home Guards, emergency response centres, strengthening the regulatory aspects, help from armed forces etc. will also be discussed.

As per the recently released NDMA guidelines on handling of nuclear and radiological emergencies, a holistic and integrated approach to management of disasters should be adopted covering all components of the disaster continuum viz., prevention, mitigation, preparedness, response, relief, rehabilitation, reconstruction, recovery etc. This deals with the capacity development for coping with nuclear / radiological emergency situations. This capacity needs to be enhanced at all levels; which calls for requisite financial, technical and infrastructural supports.

The National Vision is to prevent nuclear and radiological emergencies which are essentially man-made in nature. However, in rare cases of their occurrence, due to factors beyond human control, such emergencies will be so managed through certain pre-planned and established structural and non-structural measures by the various stakeholders, as to minimise risks to health, life and the environment.

There will be half a day session on this subject of handling of nuclear and radiological emergencies. It will start with a key note address followed by 2 invited talks and 10 oral presentations.

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SECOND INDIA DISASTER MANAGEMENT CONGRESS

NOVEMBER 4-6, 2009

SESSION PLAN

THEMATIC SESSION: NUCLEAR EMERGENCIES

Chairperson: Sh. B Bhattacharjee, Hon'ble Member, NDMA
Co-chairperson: Dr. M. C. Abani, Senior Specialist, NDMA
Rapporteur: Dr A. H. Khan, Raja Ramanna Fellow, BARC

Date: 4th November 2009
Time 12:00-13:10 hrs & 14:00 -16:45 hrs

Venue: Hall No. 6, Vigyan Bhavan, New Delhi

Time	Topic	Speaker
1200-1230	Key Note Address	Sh. S.K. Chande, Vice Chairman, AERB
1230- 1250	Invited talk	Sh. A.P. Joshi, Addl Secretary, DAE
1250-1310	Invited talk	Sh. D.K. Goyal, Executive Director, NPCIL
1310-1400	Lunch	
1400-1415	Post Radiological Nuclear Emergency Preparedness and Gaps	Sh. P. K. Bhatnagar, DLJ
1415-1430	NBC Disaster Management Services: Efforts and Preparedness at BEL	A.K. Atta, A.K. Shet and P. H. Jhaveri, BEL, Navi Mumbai
1430-1445	Role of Regulator in Control of Nuclear and Radiological Emergencies	S.K. Mishra, BARC, Mumbai
1445-1500	Emergency Preparedness in Indian Nuclear Power plants	Sameer Hajela and Sunil G. Ghadge, NPCIL
1500-1515	Leveraging Human Resources for Effective management of CBRN Emergencies	Rajesh Arora, Raman Chawla, Vinod Kumar, R. Goel, M. Silambarasan, R.K. Sharma and R.P. Tripathi,

		INMAS, Delhi
1530-1545	A Container based Nuclear Radioactivity Analysis Laboratory	Deepak Goplani, D.K. Rawat, Ravindra Kumar, R.P. Samant and Suresh Jyani, DLJ
1545-1600	Nuclear and Radiological Emergencies: Requirement of State of the Art Systems and Methodologies for Impact Assessment and Response	Pradeepkumar. K.S & D.N.Sharma Radiation Safety Systems Division, BARC,Mumbai
1600-1615	National Network for Early Detection of Nuclear Emergency: Indian Environmental Radiation Monitoring Network (IERMON)	C.K.G. Nair, M.D. Patel, S. Garg, M.P. Ratheesh, V.D. Puranik and H.S. Kushwaha HS& E Group BARC Mumbai
1615-1635	Report by Rapporteur	Dr. AH Khan
1635-1645	Closing Remarks	Session Chairperson