

Emergency Preparedness and Response

Lecture # 2

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Course**

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EEP Elements



➤ **Functional Elements**

- **activities which are needed to provide effective response**

➤ **Infrastructural Elements**

- **deal with more tangible issues, which are needed to be established or performed beforehand and are related to preparedness phase**

➤ Establishing Emergency Management and Operations

- Facility organisation usually has the highest degree of readiness, it is often also the authority for recommending what immediate public protective actions should be implemented in the area closest to the facility
- Local or regional off-site authorities, however, usually have command and control over the implementation of public protective actions
- Once activated, they may also have decisional authority over those public protective actions
- Therefore, it is important that the decision-making process be properly documented and understood by all response organisations

➤ Identifying, Notifying and Activating

- There should be a clear and effective way for key response organisations to be alerted of an emergency and to mobilize required personnel, 24 hours a day, seven days a week
- The requirement for notification and activation should be linked to the emergency classification
- Emergency response organisations are normally required to be partially activated during a Site Area Emergency, and fully activated during a General Emergency
- Notification must be prompt enough to enable response organisations to perform their required functions effectively and should be based on the emergency classification

➤ Taking Mitigatory Action

- For nuclear power plants accident mitigation refers to the need for emergency operating procedures dealing with upset events and accidental conditions
- Emergency operating procedures are often based on design basis accidents, i.e., accidents that have been analysed and are the basis for the design of safety systems
- Severe Accident Management Guidelines (accidents can evolve to conditions that are beyond those which were the basis for the design) are required by international requirements and are being implemented in nuclear facilities around the world

➤ Urgent Protective Actions

- **Urgent protective actions must be implemented promptly to be effective and thus require quick decision-making and are applicable over a short period of time (days/weeks)**
- **Urgent protective actions include sheltering, evacuation and, where radioactive iodine may be released, stable iodine administration**

➤ Urgent Protective Actions Strategy

- **A major problem with many emergency plans is that urgent protective action cannot be implemented promptly because the decisions making and planning process begins when the emergency occurs.**
- **Urgent protective actions must be integrated into protective action strategy that will be implemented promptly.**
- **Factors such as availability of transport and effectiveness of shelters and other local characteristics must be considered.**
- **Provisions must be in place to implement the strategy promptly (best accomplished by pre-planning to implement the strategy immediately upon declaration of an emergency)**

➤ Urgent Protective Actions Strategy

- IAEA developed a basic strategy for severe nuclear power plant accidents. The strategy calls for prompt implementation of the following upon declaration of a General Emergency at an NPP:
 - 1) Evacuation or substantial shelter for the population within the PAZ;
 - 2) Sheltering, in their homes, of the population within the UPZ;
 - 3) Restrictions on eating possible contaminated food out to 300 km;
 - 4) Prompt monitoring of the UPZ and beyond to identify and evacuate hot spots; and
 - 5) Iodine thyroid blocking

Functional Element



- **Issuing Instruction and Warnings to the Potentially Affected Public**
 - **Advance information to the potentially affected public**
 - The information on the response to a nuclear emergency should be provided in advance within the emergency zones
 - This information usually contain the nature of the hazard, how people will be warned or notified, and on the actions to be taken in case of an emergency.
 - This information can be disseminated as brochures, leaflets, calendars and television or radio information programmes
 - It is advisable to periodically assess the effectiveness of this public information programme.

Functional Element

- **Issuing Instruction and Warnings to the Potentially Affected Public**
 - **Information on protective actions after an accident with the potential for off-site impacts occurs**
 - **Affected public must be alerted promptly and be provided with instructions on appropriate protective actions**
 - **Fixed sirens and centrally activated radios within homes are effective in providing these warning signals**
 - **Other means for notification such as loudspeakers operated from police or fire fighting vehicles and door-to-door notification are effective in providing warning signals within these time frames**

➤ Protecting Emergency Workers

- **Emergency workers are those people charged with attempting to reduce the impact of an accident on personnel, the population, and/or the environment**
- **According to IAEA ,emergency workers include anyone needed to implement urgent protective action (e.g., bus drivers) or to take action to mitigate the accident (e.g., on-site damage control)**
- **Must include off-site personnel who may respond on site such as fire brigades, law enforcement or medical teams.**

➤ Protecting Emergency Workers

- IAEA states that emergency workers should be aware of the risks and be trained
- IAEA has also established guidance concerning appropriate dose limits for emergency workers depending on their functions
- The dose to any one in general should not exceed their annual occupational dose limit
- The only exception is for undertaking life-saving actions or actions that can avert a large collective dose or prevent the development of catastrophic conditions

➤ **Managing the Medical Response**

- **Effective medical response is a necessary element of an overall response to nuclear or radiological emergencies**
- **The basic principles of the medical handling of exposed persons are based, to a large degree, on the methods used for handling other types of accidents, taking into account the specificity of the possible health effects of radiation and problems with contamination**
- **Medical handling in an emergency situation is normally divided into medical care on-site (more often for workers) and medical care off-site (for workers and affected population)**

➤ **Managing the Medical Response**

- **For situations involving a large number of exposed persons, one of the usual procedures is triage of persons**
- **These are actions to sort the patients into classes on the basis of their injury and/or disease, to expedite clinical care and maximize the use of the available clinical services and facilities**
- **The basic principle is that treatment of serious or life-threatening injuries must take priority over other actions**
- **Medical staff dealing with contaminated persons should wear protective clothing (overalls, masks, plastic gloves, and overshoes, as required) and personal dosimeters and should be monitored for possible contamination**

Functional Element



➤ Keeping the Public Informed

- In general, all nuclear and radiological emergencies are perceived as dangerous and they receive an immense amount of media, public and political attention
- Since the media are often the primary source of public information during an emergency, the provisions should be in place to respond to public and the media concerns effectively during an emergency.
- Best done from a single location (PIC – Public Information Centre), where all key stakeholders should be present, i.e. operator, regulatory authority, local and state authorities.

Functional Element



➤ Keeping the Public Informed

- **Attempting to provide information from several locations or being slow, contradictory when providing information to the media has resulted in loss of trust by the public**
- **Public needs a plain language explanation of the risks, of action they can take to reduce their risk and of action being taken to ensure that they and their loved ones are safe**
- **Some of the public information staff should have a dedicated role to monitor media information and to promptly respond to misleading, inaccurate or confusing information. This will also help to identify inappropriate reactions by the public during an emergency**

➤ Longer-Term Protective Actions

- Longer-term protective actions include relocation, resettlement, agricultural countermeasures, and medical follow-up of the affected population
- These measures are implemented in the late or the recovery phase of the accident, after the release has stopped
- There will be tremendous pressure from the public, media and political officials after the initial response to take actions to return things to normal
- It is not easy to plan in detail for longer-term protective actions. However, some basic planning is essential. The basic criteria and process to be followed must be established before an emergency.

➤ Longer-Term Protective Actions

- Relocation and resettlement are protective actions intended to reduce the dose from long-term exposure (months to years) from ground contamination resulting from a plume or other contaminating event
- Difference between relocation and resettlement is the duration. Relocation is temporary, while resettlement can be permanent
- Relocation and resettlement should only be considered in cases where contamination is such that people would have to be prevented from returning to the affected area for several weeks or more
- International criteria, and the long-term social and psychological impact must be considered

➤ Longer-Term Protective Actions

- Food restrictions are used to protect from ingestion of locally produced or imported contaminated food
- It is prudent to impose an immediate ban on food grown in affected areas until the radionuclide concentrations can be carefully assessed.
- As a guide, it is suggested that priority for food control and sampling be established when gamma readings near the ground exceed $1 \mu\text{Sv/h}$
- If restricting foods will result in starvation, then the food action levels would need to be adjusted

➤ Mitigating the Non-Radiological Consequences

- The Chernobyl accident demonstrated that psychosocial impacts often outweigh the radiological health effects
 - Emergency plans should explicitly recognize the significance of the psychosocial dimension and make provisions to reduce the detrimental effects it can create
- Measures that should be considered include:
- Informing the affected population accurately and promptly of the accident's progression, the risks that are involved, and the protective actions being taken;

Functional Elements



➤ Mitigating the Non-Radiological Consequences

- Keeping sheltered, evacuated, or relocated people informed of the expected time at which they may return to normal activities and/or return to their homes
- During an emergency the public, political and media pressure will be immense to implement long term programmes based on the perceived radiological risk rather than on actual radiological risk
- This pressure can substantially be reduced by establishing in advance the process and criteria, based on international standards, for making long term decisions and by ensuring that all the parties involved in the decision making process, including the media and public, are aware of the actual radiation risks

Infrastructural Elements



- **Infrastructural elements are elements which can not be separated into preparedness and response,**
- **They can be represented as the issues related to authority, organization and coordination**
- **More tangible ones, such as plans, procedures, facilities, equipment, as well as crosscutting issues, such as training, exercises and quality management.**

Infrastructural Elements



- **Authority;**
- **Coordination of emergency response**
- **Plans and procedures**
- **Logistical support and facilities**
- **Training, drills and exercises**
- **A quality assurance programme**

➤ Authority

- Authorities, roles and responsibilities of all response organizations should be allocated for all phases of emergency response
- Typically this is documented as part of the appropriate national and local emergency response plans
- For each response organization a single position must have the authority and responsibility to direct its response actions
- Responsibility for co-ordination of the entire response must be clearly assigned to a single person (i.e. commander or head of the lead institution for the emergency response - national co-ordinating authority)

➤ Coordination of Emergency Response

- **Effective and practical preparedness and response coordination mechanisms must be established for any type of emergency, and coordination arrangements must be formalized within each major emergency response organisation**
- **There have been radiological emergencies in which different responding organizations were unaware of or did not recognize the responsibilities of the other response organizations; this resulted in delay and confusion, especially when dealing with local officials**

➤ Plans and Procedures

- **All response organisations should have emergency response plans and procedures in place.**
- **The particular challenge is the large number of organisations that are often involved in response activities**
- **It was said that the staff at the Chernobyl nuclear power plant when the accident happened in April 1986 were very brave but they did not know what to do early in the emergency**

➤ Logistic Support and Facilities

- All response organisations should have suitable equipment and facilities for supporting their functional role
- Equipment and facilities used under normal conditions are not adequate during emergencies
- As an example, overloading and sometimes breakdown of public telephone networks (land line and mobile networks) in the vicinity of an emergency often occur shortly after the public becomes aware of events that they perceive as significant — not necessarily always emergencies
- Hence, provisions should be made to provide key players with robust and reliable communication channels

➤ Training Drills and Exercises

- Training and exercises are an essential part of an effective emergency preparedness programme
- In general, it is recommended that training and exercises for facility personnel be held several times a year
- For off-site organisations, this constitutes a substantial investment in finances and human resources
- The training and exercise programme for off-site organisations should take into account the role of each organisation, its critical needs for responding to radiological or nuclear emergencies, and the value of the training and exercises

➤ Quality Management Programme

- Response organisations including operator establish a comprehensive quality management programme
- Regulatory body should play an important role in promoting quality management
- All significant emergencies need to be carefully investigated, analyzed and the quality management system shall ensure that the appropriate response actions were taken and identified deficiencies corrected

● Thanks