DISCLAIMER

The information contained in this document cannot be changed or modified in any way and should serve only the purpose of promoting exchange of experience, knowledge dissemination and training in nuclear safety.

The information presented does not necessarily reflect the views of the IAEA or the governments of IAEA Member States and as such is not an official record.

The IAEA makes no warranties, either express or implied, concerning the accuracy, completeness, reliability, or suitability of the information. Neither does it warrant that use of the information is free of any claims of copyright infringement.

The use of particular designations of countries or territories does not imply any judgment by the IAEA as to the legal status of such countries or territories, of their authorities and institutions or of the delimitation of their boundaries. The mention of names of specific companies or products (whether or not indicated as registered) does not imply any intention to infringe proprietary rights, nor should it be construed as an endorsement or recommendation on the part of the IAEA

Principles and Requirements

Goals of Emergency Preparedness and Response

Lecture

Introduction

- **Despite all precautions that are taken in design and operation of nuclear facilities and conduct of nuclear activities, there remains possibility that failure or mishap may lead to emergency**

- **Objective of this lecture is to present goals and practical objectives of emergency preparedness and response in case of nuclear or radiological emergency**

Content

- Goals of emergency response
- Post-emergency preparedness and response goals
- Why plan and preparedness?

- Summary

Goals of Emergency Response

- **Safety Fundamentals publication in regard to sources:**
  - ***Protection objective:* to prevent occurrence of deterministic effects in individuals ….. and to ensure that all reasonable steps are taken to reduce the occurrence of stochastic effects …**
  - ***Safety objective:* to protect individuals, society and the environment from harm …**

Goals of Emergency Response (1)

- **Safety Fundamentals publication in regard to nuclear installations**
  - ***Radiation protection objective:* To ensure …. mitigation of the radiation consequences of any accident**
  - ***Technical safety objective:* To take all reasonably practical measures to prevent accidents in nuclear installations and to mitigate their consequences ….**

Goals of Emergency Response

- **New Preparedness and Response Safety Requirements**
  - **Take mitigatory action at the scene;**
  - **Prevent deterministic effects;**
  - **Render first aid and treat radiation injuries;**
  - **Reasonably reduce stochastic effects**
  - **Reasonably limit non-radiological effects;**
  - **Reasonably protect the environment**
  - **Reasonably prepare for the resumption of normal activity**

Take mitigatory Action at the Scene

- Responsibility of the operator (people at scene)
- Immediate actions to preventing/ reducing releases and/or exposures and other source of hazards
- Experience shows - must have arrangements to:
  - Recognize an emergency condition
  - Direct the immediate mitigatory action actions
  - Must address serious – unlikely- emergencies
  - Consider all aspect of the mitigatory action and condition present during the emergency
  - Requires immediate action by the operator

Lessons Learned

- During several emergencies staff could not mitigate the problem
  - Did not know actions to take to solve problem
  - Where over confident or unsure
  - Did not have equipment needed
  - Did not have protection they needed
  - Off-site support was not obtained promptly
  - Off-site support was not prepared

Prevent Deterministic Effects

- **Taking urgent protective action to keep the dose below the deterministic effects threshold**
- **Best accomplished by taking action before a release or exposure when severe conditions are detected in the facility**
- **Immediate response needed by the operator**

Lessons Learned

- **Experience shows workers and respond at greatest risk**
  - **Did not knowing what to do**
  - **Where not provided with appropriate equipment**
  - **All possible people/conditions not considered**
    - **In plant operators**
    - **Off-site responders**
    - **People in near-by areas**

Render First Aid and Treat Radiation Injuries

- Immediate response needed
- First to arrive immediately provide emergency aid to treat life threatening injuries
- Specialized treatment of contamination and radiation injuries
  - Triage injured patients
  - Decontaminate
  - Obtain specialist assistance
- Experience shows
  - Fear of radiation may interfere with initial treatment
  - Severe radiation injuries require specialized treatment

Lessons Learned

- **Poor medical treatment of overexposure**
  - **Facility and local medical staff did not gather information to determine appropriate treatment**
  - **Local medical staff treated overexposure without consulting experts**
  - **Result - great unnecessary suffering**

Reasonably Reduce Stochastic Effects

- Take action to avert dose consistent with international guidance (GILs and GALs)
- Must develop OIL for use during emergency
- Taking action at much lower levels does more harm (psychological & economic) than good (reduction in cancer risk)
- Experience shows you can not develop reasonable criteria during an emergency
- Must develop criteria in advance as part of preparedness

Reasonably Limit Non-radiological Effects

- Includes unwarranted relocation (loss of income and home), unwarranted abortions, unwarranted restriction on sale of local goods
- Caused by
  - Developing criteria at the time
  - Poor communication with media and people
  - Unrealistic fears of radiation due to conflicting and non-informative information from the technical community and so-called experts resulting inappropriate action taken to address radiological concerns.

How to Reduce Psychological Effects

- Provide on-going, regular updates on emergency to:
  - people who may be affected
  - people who think they may be affected
- Give clear, simple and timely advice
- Make sure that information is consistent
  - single authority for information
- Promptly correct false information
- Ensure protective actions are justified
- Do not compromise recovery
- Consider education and counselling

A call from CNN is an emergency

- There will be significant media and public reaction to actual or perceived risk
- Poor response can have very severe consequences
- All facilities need some preparations:
  - Local population and officials must be informed of nature and risk of the operations
  - Must have provision for immediate response to media inquires Response should be coordinated locally and a single location

Reasonably Protect the Environment

- Limiting spread of contamination
- Take remedial actions taken to reduce environment impact (e.g. decontamination) that do more good than harm
  - Control access
  - Control agriculture and water supplies
  - Control forestry, fisheries and natural environment
  - Control transportation and trade
  - Manage waste
- Do not compromise recovery

Prepare for Resumption of Normal Activity

- **Resumption of normal life is essential to eliminating many of the non-radiological consequences**
- **Experience shows if there is no existing criteria concern about inconsequential contamination and misconception about risks often delay or prevent people returning**
- **Experience show we (radiation community) can not say enough is enough – but need to**

Experience Shows

- **Have procedures and training if immediate response is needed**
  - **In many emergencies – in appropriate immediate action resulted in or made emergency worse**
  - **Examples TMI & Chernobyl NPP accidents, San Salvador - irradiation facility**
    - **Staff did not recognize the problem or know to what to do immediately Did not recognized severe conditions**
    - **Did not know what initial actions to take**
    - **Planning needed**
    - **Classification (criteria, actions)**

Experience Shows (1)

- **Be prepared for later response if needed**
  - **In many emergencies –criteria for long term actions (e.g., relocation, compensation , medial screening) were not justified and may have done more harm than good**
  - **Difficult if not impossible to develop justified criteria at the time of an emergency**
    - **Emotional atmosphere**
    - **Loss of trust**
    - **Political pressure**
  - **Develop basic criteria for long tem action in advance**

Experience Shows (2)

- Lack of a coordinated response
  - Many locations being used to coordinate the response and make public statements
    - Owner/operator
    - National officials
    - Local official
- Result
  - Confusion
  - Consistent public statements
  - Loss of trust

Post-emergency Preparedness Goal

- **Preparedness goal is**
  - **To ensure that arrangements are in place to protect public health, welfare and environment and to develop and implement justified and optimised longer-term countermeasures in managed, controlled, coordinated and effective way**

Post-emergency Response Goals

- **Response goals are to:**
  - **Reduce, to extent practicable, occurrence of adverse health effects in public and emergency workers**
  - **Limit occurrence of other adverse consequences of radiation emergency and protective actions taken**
  - **Protect, to extent practicable, environment**
  - **Achieve, to extent practicable, resumption of "normal" living conditions**

Decision-maker Objectives

- Decide and effectively implement appropriate countermeasures and establish criteria for terminating them
- Establish "safe" and/or "normal" living conditions
- Provide appropriate health and medical follow-up to public and emergency workers

Decision-maker Objectives (1)

- **Provide for ongoing common language dialogue with public concerning effects, risks and appropriate actions to reduce consequences**

- **Terminate countermeasures when no longer justified**

Why?

- **Did 2000 or more children suffer from thyroid cancer that could have been easily avoided? (Chernobyl)**
- **Was an accident with no significant radiological consequents off-site viewed as a nuclear disaster by many (costing > $100,000,000)? (Japan)**
- **Were many people relocated, with all the associated social and psychological harm, from areas where contamination levels posed no radiological risk? (Chernobyl)**
- **Why did doctors treating radiation injures cause unnecessary suffering?**

Answer!

Lack of prior preparations for actual or perceived radiation emergency!

Conclusion: Why Plan and Preparedness?

- **Because accidents happen**
- **Because planning helps save lives and minimize risks to health and environment**
- **Because response with planning costs less than response without planning**
- **Because response without plans can affect credibility of authorities**

To Conclude

- **Practical goal of emergency preparedness may be expressed as**

To ensure that arrangements are in place for a timely, managed, controlled, coordinated and effective response at the scene and at the local, regional, national and international level, to any nuclear or radiological emergency

Summary

- Events requiring immediate and planned response can occur
- These events could involve actual or perceived risk
- poor response can result in significant health, psychological or financial consequences, unnecessary suffering
- Some limited planning is always needed

Where to Get More Information

- Lectures in modules III1 and III2
- References on cover page