

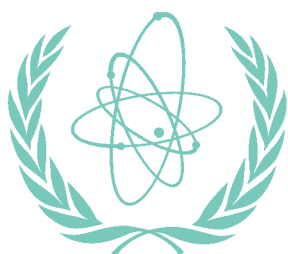
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TRAINING FOR
RADIATION EMERGENCY
PREPAREDNESS AND RESPONSE

EMERGENCY PREPAREDNESS
AND RESPONSE

Generic Procedures for Response to a Nuclear or Radiological Emergency at Research Reactors – Training Materials



IAEA

International Atomic Energy Agency

Foreword

Under Article 5.a(ii) of the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention), one function of the IAEA is to assist a State Party or a Member State when requested in developing appropriate training programs for personnel to deal with nuclear accidents and radiological emergencies. These training materials are intended to be used for that purpose and supplement the IAEA publication “Generic Procedures for Response to a Nuclear or Radiological Emergency at Research Reactors (EPR-RESEARCH REACTOR, 2011)”.

IAEA Safety Standards Series No. GS-R-2 “Preparedness and Response for a Nuclear or Radiological Emergency”, which establishes the requirements for an adequate level of preparedness for and response to a nuclear or radiological emergency in any State, contains a requirement “To ensure that arrangements are in place for a timely, managed, controlled, coordinated and effective response at the scene...”. The training material and the publication are intended to assist Member States meet the requirements of GS-R-2 and enhance their preparedness by providing guidance on the response to emergencies at research reactor facilities in Threat Category II and III.

The IAEA officer responsible for this publication is G. Winters of the Department of Nuclear Safety and Security.

Background

Emergencies can occur at a research reactor at any time, even with the best preventative measures in place. Experience shows that even relatively minor reactor emergencies can have a severe social, economic and psychological impact nationally and internationally. In order to minimize these impacts, effective action by the reactor facility personnel and close coordination with local and national officials is essential. This response may include local emergency services (e.g. local medical, law enforcement, and fire brigades). Within hours, national officials may also have an important role to play in supporting the response at the local level. Since reactor emergencies are rare, local responders have little or no experience in dealing with this type of emergency and inexperience often leads to an inadequate response.

The IAEA publication “Generic Procedures for Response to a Nuclear or Radiological Emergency at Research Reactors (EPR-RESEARCH REACTOR, 2011)” guides States in their response to a research reactor emergency. The information within includes action guides for the facility emergency response team, instructions, practical procedures and tools and can be easily adapted by a State to build a basic capability to respond to a research reactor emergency. The materials on this CD are designed to train the reactor facility responders on how to apply “Generic Procedures for Response to a Nuclear or Radiological Emergency at Research Reactors (EPR-RESEARCH REACTOR, 2011)” in order to effectively respond to a research reactor emergency.

Structure

These materials are designed for use at a standard training course on response to research reactor emergencies. They contain information on:

- Emergencies at Research Reactors and Lessons Learned

- Objectives, Concepts and Basic Principles of Emergency Response
- Concepts of Operations and Responsibilities
- Accident Management vs Emergency Management
- Emergency Classification
- Urgent Protective Actions
- Instructing, Warning and Informing the Public
- Action Guides and Response Priorities
- Medical Management Overview
- On-scene Emergency Medical Response
- Infrastructure Elements
- Emergency Monitoring and Assessment
- Non-radiological Safety at Research Reactors
- Developing Emergency Response Capability – Step-by-step Process
- Outlines of Emergency Plans and Procedures
- Discussion Problems
- Development and Implementation of an Action Plan
- Preparation of a Specific Action Plan
- Exercise Preparations
- Exercise Controller and Evaluator Training

Additionally, the CD contains an example schedule of the core material and a workshop manual.

The information is presented in the form of seminars and work sessions. A table top exercise is also included on the CD-ROM for additional training. In addition to these training materials the CD-ROM contains copies of many of the other IAEA publications used as references in the seminars.

The core material is suitable for a one-week course; however, there is more material on the CD-ROM than can be effectively presented in this time. A course may be tailored to the needs of the facility by replacing core seminars with others on the disc, or by expanding the course to more than a week, depending on the objectives of the course and existing level of preparedness by the facility.

Objectives

- to present guidance and instructions for facility response to a research reactor emergency as described in “Generic Procedures for Response to a Nuclear or Radiological Emergency at Research Reactors (EPR-RESEARCH REACTOR, 2011)”;
- to present a research reactor facility response organization, action guides for the facility emergency response team members, and tools for organizing and retaining important information to manage and coordinate the response;

- to train facility responders on application of “Generic Procedures for Response to a Nuclear or Radiological Emergency at Research Reactors (EPR-RESEARCH REACTOR, 2011)”;
- to provide information on how to be able to customize the package, and to organize and conduct a national course on facility response to a research reactor emergency.

Target audiences

- Research reactor facility staff
- Off-site responders who may be needed as emergency workers during a research reactor emergency: law enforcement personnel, fire brigade, emergency medical service
- National officials and emergency services managers who will support the response to a research reactor emergency at the local and national level

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IAEA Training Course for Research Reactor Emergency Response

Notes for Instructor

The material for this course consists of several Power Point modules for presenting the material, three manuals, a set of test questions and a sample schedule.

The Workshop Manual will require some modifications to characterize the specific course, location, instructors and other information specific to the planned course. Each participant should receive a copy of the Workshop Manual.

The tabletop exercise manual is separated into two parts. Section 1 is for all participants and provides background information for the scenario and the rules for conduct of the tabletop exercise. Sections 2 and 3 are for only the controllers and evaluators. These sections provide the detailed timeline and information injects needed for the conduct of the exercise. Changes to the scenario will require corresponding changes to these manuals.

A test is provided for evaluation of the participants. It may be omitted if desired, or supplemented with additional questions.

There are more Power Point modules than can be effectively presented in a one week course so some selection process is needed. A complete list of all the modules, with learning objectives and duration is provided to work up a set of presentations that the requesting organization judges to best fits their needs. This should be provided to the requesting organization for their input. The duration of the TTX is also flexible.

The core schedule included with the other files is a starting point for the actual schedule and presents material in a logical order. Module 17 is useful because it requires extensive class participation and this module should be worked into the schedule at some point. It could even be presented in several shorter sessions, perhaps as a closing break from lectures at the end of each day.

Some duplication is still present in the modules and that may be reduced at the judgment of the Technical Officer in consultation with the requesting organization and the assigned instructors. Except for the TTX there are no practical exercises in this set of modules. There are two work sessions – Module 19 – which also requires Module 18 to prepare the participants for the work session, and Module 17 which is discussed above.

A 60-minute video reconstructing the SL-1 reactor emergency may also be added. This event was an inadvertent criticality at a US research reactor and resulted in the death of the three operators at the reactor. The video is available from the IAEA Library. The IAEA Library also contains as a 2 DVD set the original film that reported on the SL-1 accident, however, the video quality is poor and the video format has caused problems in previous uses. Any videos planned to be used should be viewed to verify they are suitable.

The module “Role of the IEC is not included since it requires frequent updates. The most recent version of the presentation given to IEC visitors is a good starting point. This module works best if it is about 30 minutes long. A copy of a recent version may be obtained from the IEC, IAEA if it is to be included in the course.

A description of the Power Point modules follows:

Module 1: Emergencies at Research Reactors and Lessons Learned

Learning objectives: Upon completion of this module, the participants will:

- be able to list types of potential radiological emergencies at research reactors, and know examples of reactor and facility set-ups that can give rise to such accident
- learn experiences from accidents at research reactors
- be able to list the main consequences of these emergencies
- be able to list the principle lessons learned

Activity: Seminar, questions and discussions

Duration: 1 hr

Materials and equipment needed: none

Module 2: Objectives, Concepts and Basic Principles of Emergency Response – Part 1

Learning objectives: Upon completion of this module, the participants will:

- understand the reasons for emergency planning (EP) and the scope of those plans
- be able to describe the intervention principles
- describe the emergency worker (EW) guidance exposure limits
- list the EP Objectives

Activity: Seminar, questions and discussion

Duration: 1 hr

Materials and equipment needed: none

Module 3: Objectives, Concepts and Basic Principles of Emergency Response – Part 2

Learning objectives: Upon completion of this module, the participants will:

- list the IAEA threat categories
- list the emergency classes and protective action zones
- be able to describe the basic response strategy: CLAIM
- understand some of the most significant challenges that need to be addressed when planning for research reactor emergencies

Activity: Seminar, questions and discussion

Duration: 1.5 hr

Materials and equipment needed: none

Module 4: Concepts of Operations and Responsibilities

Learning objectives: Upon completion of this module, the participants will:

- Understand the importance of assigning responsibilities
- Be able to use the worksheet provided to identify and resolve gaps and conflicts in responsibility
- Understand the role and importance of the Concept of Operations in coordinating the planning
- Be able to develop a basic Con-ops for events possible at research reactors
- Know how to ensure planning for a research reactors is integrated with national planning

Activity: Seminar, questions and discussion

Duration: 1 hr

Materials and equipment needed: Worksheets for “Identification and Assignment of Critical Tasks”

Module 5: Accident Management vs Emergency Management

Learning objectives: Upon completion of this module, the participants will:

- know basic concept of accident management and why do we need that accident management
- become aware of accident prevention and accident mitigation process
- become aware of accident mitigation measure
- understand the EOP development guides and procedure
- understand how emergency management differs from accident management
- understand the Facility Response Manager responsibilities
- know the phases of emergency management

Activity: Seminar, questions and discussion

Duration: 1 hr

Materials and equipment needed: none

Module 6: Emergency Classification

Learning objectives: Upon completion of this module, the participants will:

- know the emergency classification
- be able to use tools in IAEA EPR-RESEARCH REACTOR for emergency classification

Activity: Seminar, questions and discussion

Duration: 1 hr

Materials and equipment needed: none

Module 7: Urgent Protective Actions

Learning objectives: Upon completion of this module, the participants will:

- know human exposure pathways in nuclear or radiological accident
- be able to list the elements of a protective action decision making strategy
- be able to list protective actions
- know the characteristics of specific protective action
- understand the role of intervention and operational intervention levels
- know the guidance values for limiting exposure of Emergency Workers

Activity: Seminar, questions and discussion

Duration: 1.5 hr

Materials and equipment needed: none

Module 8: Instructing, Warning and Informing the Public

Learning objectives: Upon completion of this module, the participants will:

- know why it is important to communicate with the media
- know the basic ways of communication with the media and the public in an emergency
- be able to determine when and about what to inform
- become aware of basic principles of communication
- be familiar with the communication methods and means

Activity: Seminar, questions and discussion

Duration: 30 – 45 minutes (The material and the time required may be modified by incorporating presentations from the facility Public Information office)

Materials and equipment needed: Media Briefing/Interview Planner Worksheet (one copy for each student)

Module 9: Action Guides and Response Priorities

Learning objectives: Upon completion of this module, the participants will:

- understand a suggested Emergency Response Team organization
- be able to list the responsibilities of each Team member
- be able to list the priority actions and expected timing
- understand how and when the organization may be modified

Activity: Seminar, questions and discussion

Duration: 2 hr

Materials and equipment needed: none

Module 10: Medical Management Overview

Learning objectives: Upon completion of this module, the participants will:

- be able to list health effects of radiation
- understand the difference between deterministic and stochastic health effects
- understand the role and place of medical preparedness and response in the overall organizational emergency response structure
- be able to list infrastructure and functional requirements for medical response preparedness
- be aware of the importance of psychological effects of radiological accidents

Activity: Seminar, questions and discussion

Duration: 1 hr

Materials and equipment needed: none

Module 11: On-scene Emergency Medical Response

Learning objectives: Following this module the participants will

- understand the role and tasks of Emergency Medical Responders
- know the basic steps in contaminated casualty handling
- know the interactions between different response groups on-scene
- be acquainted with basic decontamination procedure

Activity: Seminar, questions and discussion

Duration: 1 hr

Materials and equipment needed: none

Module 12: Infrastructure Elements

Learning objectives: Upon completion of this module, the participants will:

- know and understand what the infrastructure and functional requirements contained in EPR-METHOD 2003 mean in practice in the context of research reactor emergency planning

Activity: Seminar, questions and discussion

Duration: 1 hrs

Materials and equipment needed: none

Module 13: Emergency Monitoring and Assessment

Learning objectives: Upon completion of this module, the participants will:

- list the objectives of emergency monitoring
- understand generic emergency monitoring organisation
- describe emergency monitoring and sampling strategy in small and large scale accidents
- determine staff qualification requirements
- list basic survey methods
- comprehend the QA and QC systems in emergency monitoring and sampling

Activity: Seminar, questions and discussion

Duration: 1 hr

Materials and equipment needed: none

Module 14: Non-radiological Safety at Research Reactors

Learning objectives: Upon completion of this module, the participants will:

- be aware of non-radiological safety issues at research reactors

Activity: Seminar, questions and discussion

Duration: .5 hr

Materials and equipment needed: none

Module 15: Developing Emergency Response Capability – Step-by-step Process

Learning objectives: Upon completion of this module, the participants will:

- know that developing a national capability requires a systematic approach
- become aware that EPR-METHOD 2003 recommends a ten-step process
- know that this process is modular, requires extensive consultation with all relevant organizations and that it is iterative
- understand the main elements of the ten-step process and considerations in their implementation
- know the objective of writing a plan
- know the importance of structuring the plan for future revisions
- know the principal components of a national plan

Activity: Seminar, questions and discussion

Duration: 1 hr

Materials and equipment needed: none

Module 16: Outlines of Emergency Plans and Procedures

Learning objectives: Upon completion of this module, the participants will:

- understand the requirements for writing an emergency response plan
- be aware of QA elements for emergency plan
- be acquainted with the off-site an on-site emergency plan's outline
- understand the process of developing and writing an implementing procedure
- be aware of quality assurance requirements in developing procedures
- be able to list parts and elements of a generic procedure
- be able to write an implementing procedure

Activity: Seminar, questions and discussion

Duration: 1 hr

Materials and equipment needed: none

Module 17: Discussion Problems

Learning objectives: Upon completion of this module, the participants will have demonstrated their level of understanding of the material presented in the training course.

Activity: Work session

Duration: 1 hr

Materials and equipment needed: none

Module 18: Development and Implementation of an Action Plan

Learning objectives: Upon completion of this module, the participants will:

- understand the need to develop an action plan as a follow up to this workshop
- understand basic project management principles
- know what a project management plan should contain
- be familiar with the project management process

Activity: Seminar, questions and discussion

Duration: 1 hr

Materials and equipment needed: none

Module 19: Preparation of a Specific Action Plan

Learning objectives: Upon completion of this module, the participants will:

- be able to identify country specific needs
- be able to develop an appropriate action plan within an appropriate project management structure

Tasks:

- to identify specific needs for the respective country
- to draft the framework of a project management plan for the respective country
- to discuss the drafted project management plan

Activity: Work session, discussion

Duration: 1 hr

Materials and equipment needed: Work session notes

Module 20: Exercise Preparations

Learning objectives: Upon completion of this module, the participants will:

- Be informed of the exercise conduct

Tasks:

- to identify rooms used for the exercise
- initial locations of the players
- how the exercise will be controlled

Activity: Lecture, discussion

Duration: 0.5 hr

Materials and equipment needed: Work session notes

Module 21: Exercise Controller and Evaluator Training

Learning objectives: Upon completion of this module, the participants will:

- Understand the responsibilities of each controller and evaluator

Tasks:

- Describe control of the exercise
- Give guidance to each controller and evaluator

Activity: Lecture, discussion

Duration: 1.5 hr

Customizing the Tabletop Exercise

This one is not especially challenging since there is no off-site exposure to be concerned about. It is a good exercise for a facility that has not run exercises on itself and needs to be exposed to the method.

A facility which may not find much challenge in this exercise could be challenged with a more significant release, or with a complicating concurrent problem. The exercise data would need to be revised if the release was to be larger, and some problem with the ventilation system would have to be postulated to make a larger release feasible.

An alternative complication could be the discovery of an orphan source located beyond the site boundary during the process of surveying at the site boundary. Data would need to be prepared for this alternative scenario. If the presumption in the scenario was that there was no readily available environmental monitoring support off-site, then the off-site response team would have to make arrangements with the facility to perform the monitoring, at least to the extent that established a safety boundary around the orphan source. It would add another level of coordination between the facility and the off-site response team. Discussion of evaluating how long the source had been present and who might have received exposure from it should be included.

When this TTX was conducted in 2010 at a national training course in Chile, the course schedule was provided with time for the facility emergency group to train themselves. The same time period was used to allow the off-site group to train themselves, and the course instructors to train the controllers and evaluators. The large size of that class allowed evaluators to be assigned to the two emergency control centers in addition to the exercise controllers. Except for one controller, all controllers and evaluators were selected from the class participants. They did a credible job and returned excellent constructive criticism on the response. A comment from several participants on the response teams was that more training time would have been useful. An opportunity for the facility group and the off-site group to collectively discuss arrangements could also have been provided if more schedule time was devoted to training for the exercise.

Arrangements where phone communication is limited also impose restrictions on some of the information injects since some are supposed to be actual phone calls. Consider this in the arrangements, and work around the problem. The reporters could, and did in the TTX in Chile, actually enter the emergency response centers to demand information rather than phone in for information.

The TTX ended with a press conference demanded by a government Minister. The off-site team was given 30 minutes to prepare, and chose who would present a spokesperson. The off-site team also chose the four or five representatives who formed the panel that addressed the media, although there was only one spokesperson. While this adds to the length of the overall exercise, it adds the dimension of dealing with the media. The evaluators and controllers acted as the media for this part of the exercise.

Some of the Injects were customized to represent organizations in Santiago, Chile, such as newspapers, radio stations and the name of the regulating organization. These may be altered to match the location of the assumed facility in the TTX.