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PREPARATION OF RADIATION EMERGENCY PLAN FOR RADIATION FACILITIES AND ACTIVITIES

REGULATORY GUIDE

PAKISTAN NUCLEAR REGULATORY AUTHORITY

PREPARATION OF RADIATION EMERGENCY PLAN FOR RADIATION FACILITIES AND ACTIVITIES

ABSTRACT

The possibility of radiation emergency, in the facilities and activities where radiation source(s) (i.e. radioactive material and/or radiation generators) are produced, handled, used, stored, disposed or transported, cannot be ruled out. PNRA Regulations require availability of radiation emergency plan, that covers all activities under the responsibility of the licensee, to be adhered to in the event of an emergency. The arrangements for preparedness and response to radiation emergencies are described in radiation emergency plan of the facility/activity. This document is prepared to provide guidance, on preparation of radiation emergency plan, to the licensees of radiation facilities and activities.

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1. INTRODUCTION

The ever increasing application of ionizing radiations in various sectors such as industry; medical; agriculture; energy; and research and development; requires having emergency preparedness and response arrangements in place to cater for the potential radiation emergencies associated with them. Clause 5(2)(b) of PNRA Regulations for the Licensing of Radiation Facility(ies) other than Nuclear Installation(s) - (PAK/908), requires submission of radiological emergency plans, if required by the Authority, at the time of licensing. Moreover, clause 9(2)(e) of PNRA Regulations on Management of a Nuclear or Radiological Emergency - (PAK/914) requires that "*the licensee of facility or practice in hazard[1]category I, II, III or IV shall prepare an emergency plan that covers all activities, under its responsibility, to be adhered to in the event of an emergency and it shall be submitted to the Authority*". Currently, the guidance on radiation emergency preparedness and response arrangements for facilities in hazard category I and II (i.e. nuclear power plants and research reactors) is widely available. However, a very limited guidance is available for facilities and activities in hazard category III and IV. This is mainly due to the difference in quantity, quality and usage of radiation source(s) (radioactive material and radiation generators) and wide range of potential hazards associated with them. This regulatory guide will be helpful in overcoming the deficiency of the guidance material in this regard. A criteria to facilitate the licensees, for determination of hazard category of radiation facilities and activities falling in hazard category III and IV such as industry, medical, agriculture, and research & development, is given at Annexure-I.

2. OBJECTIVE

The objective of this regulatory guide is to provide guidance to the licensees of radiation facilities and activities for preparation of radiation emergency plan.

3. SCOPE

This regulatory guide will be applicable to the licensees of radiation facilities and activities, in hazard category III and IV (as given in Annexure-I) only, for the preparation of radiation emergency plans.

4. CONTENTS OF RADIATION EMERGENCY PLAN

All radiation facilities and activities should develop radiation emergency plan for response to emergencies, involving radiation source(s), as per requirements of PNRA Regulations PAK/914. The extent of emergency preparedness and response necessary for each facility and activity should be determined through careful evaluation of the potential for an emergency, as well as its severity.

In devising a radiation emergency plan, it should be ensured that the plan is brief, specific response actions are described and emergency response organization is clearly defined. The plan should also cover the range of emergency situations/conditions and corresponding response mechanism against each emergency situation/condition that may occur at a facility or activity.

An individual (e.g. radiation protection officer/emergency coordinator) should be made responsible for developing the emergency plan, its implementing procedures, record keeping, preparation of exercise scenarios, conduct of emergency drills/exercises, and training of the facility staff etc. Responsible individual may involve relevant personnel from within their organization/group for development of these documents.

Following should be the general contents of an emergency plan:

4.1 Introduction of the Facility/Activity

Introduction of radiation emergency plan should contain sufficient information on type of the facility/activity with complete details of radiation source(s), layout (plan/map) of the facility, address and location of facility/activity relative to the areas accessible to public e.g. educational institutes, hotels, parks etc.

[1] Hazard categories as defined in Table-1 of PNRA Regulations PAK/914

4.2 Objective and Scope

The objective and scope of the radiation emergency plan of a facility or activity need to be clearly described in this section.

4.3 Hazard Assessment of the Facility/Activity

This section of the radiation emergency plan should include the details regarding assessment of potential hazards/risks associated with the facility/activity. Hazard category of a facility/activity is determined by the Authority, in accordance with the criterion given in Annexure-I, whereas, the assessment of hazards/risks associated with the facility/activity is the responsibility of the applicant/licensee. This assessment should be conducted prior to the preparation of emergency plan and should, at least, take account of the following:

- Identification of all sources of exposures;
- Estimation of radiation doses that could be received by workers/public in case of an emergency;
- Potential effects on the environment;
- Full range of postulated events;
- Identification of population at risk;
- Effect on/of other facilities and activities at the site; and
- Areas (on-site & off-site)/locations for which a radiation emergency could warrant protective and response actions.

The hazards not involving radiation exposure to environment but capable of stimulating or worsening the radiation emergency situation should also be considered while preparation of radiation emergency plan. Such hazards may include fire, flood, earthquake, bomb threat etc.

4.4 Assessment and Declaration of Radiation Emergencies

The emergency plan should also include a description of the methodology and instrumentation used for assessing the radiation emergency, along with its consequences. The criteria for transition from normal to emergency operations as well as the parameters upon which the decision of declaration of emergency has to be taken should be identified and described in this section of radiation emergency plan. The process of declaration of emergency including the format for communication and announcements to be made should also be clearly defined, both, for working and off-working hours.

4.5 Emergency Response Organization

The emergency response should be promptly executed and managed without jeopardizing safety. The licensee is responsible to ensure that arrangements for a timely, managed, controlled, coordinated and effective emergency response are in place. The licensee should establish and maintain an appropriate Emergency Response Organization (ERO) responsible for implementing suitable arrangements throughout the emergency. The ERO should take all reasonably practical measures to prevent accidents and/or mitigate their consequences, if they occur. The role and responsibilities of each individual of ERO, responsible for response to a radiation emergency, should be clearly defined/allocated in radiation emergency plan. The ERO should deploy coordinated efforts to cope with complete range of postulated events with the identified role of individuals for different emergency situations. Arrangements should be in place to dispatch an emergency response team to the scene for assessing the hazards involving radiation source(s), assessing radiological conditions, mitigating the radiological consequences and managing/controlling the exposure to emergency workers.

Response to radiation emergency involving loss/theft of a radiation source(s), contamination of individuals/area, and overexposure to individuals should be prompt in order to minimize the hazards and mitigate the consequences.

Following functional areas should be considered while designing/establishing an ERO:

- Emergency coordination
- Facility operation & services
- Radiation protection
- Security and traffic control
- Public information
- Fire safety and hazardous material control
- Medical services
- Coordination with on-site individuals and off-site authorities

Organizational chart of emergency response setup should be included in the plan. An example of organizational setup during the course of an emergency is given in Annexure-II, however, licensee of each facility/activity may have its own organizational arrangements for response to a radiation emergency according to its available resources.

4.6 Notification Point

The licensee should establish a notification point which have arrangements to receive notification and to initiate promptly the predetermined actions to activate the emergency response. The notification point should be able to be alerted at all times for promptly responding to or initiating a response to an emergency. The notification point is held responsible for sending emergency notifications of an actual or potential radiation emergency at the facility to the concerned local/national authorities/organizations.

4.7 Responsibilities of Emergency Response Organization Personnel

4.7.1 Emergency Director/Coordinator

The emergency director/coordinator should have authority for over all command and control of emergency response personnel/groups/committees of the facility and works in close liaison with offsite response organizations. This position carries the responsibility and authority to initiate a response action necessary to mitigate the consequences. In case of emergency, emergency director/coordinator should coordinate with Head of each functional area, as applicable; to implement corrective actions in specified areas. Head of each functional area should report to emergency director/coordinator. These individuals and any other committee (advisory/supervisory) along with emergency director comprise the ERO. The emergency director/coordinator should act as a point of contact between the offsite and onsite response personnel to ensure effective coordination.

The emergency director/coordinator should be made responsible to declare and terminate the radiation emergency as per criteria for declaration and termination of radiation emergencies. The individual designated as emergency director/coordinator may not always be immediately available when an emergency situation arises. Hence, it is essential that his/her alternate should also be designated. The initial responder will be the person in-charge until the emergency director/coordinator or his/her designated alternate arrives, at which time the command will be transferred and responsibilities appropriately divided. The radiation emergency plan should clearly specify the lines of authority, not only for the position of Emergency Director, but also for the Head of each functional group. The duties of emergency director/coordinator should be clearly defined in radiation emergency plan/procedures.

4.7.2 Radiation Protection Officer

In this section, the role and responsibilities of Radiation Protection Officer (RPO) and other emergency workers should be clearly described. The RPO is responsible for immediate assessment of actual or potential exposure to radiation, in order to determine the appropriate level of protection during emergency response. The RPO should also make necessary arrangements for dosimetry, bioassay, decontamination and environmental monitoring, wherever applicable.

4.7.3 Security and Access Control

The role and responsibilities of facility security personnel are described in this section of radiation emergency plan. The facility security personnel should be trained and equipped to handle and control the emergency situations. The major responsibilities of security personnel during the emergency response may include the following:

- Evacuation of facility personnel
- Establishment and control of assembly areas
- Personnel counting
- Access control
- Arrangements for escape of facility personnel (if required)
- Arrangements of transportation and means of communication for emergency teams, and
- Liaison with local law enforcement agencies and rescue services during emergency response

4.7.4 Facility Services Group

This section of the plan contains necessary detail regarding responsibilities of services group of the facility during emergency response. This group is generally responsible for ensuring availability of essential services such as; electricity, water, ventilation, heating, and cooling at the facility. The provision and maintenance of these services normally require round-the-clock availability of personnel familiar with their operations. The in-charge or supervisor of facility services group should be designated as one of the emergency response team member. The services group of the facility is responsible for damage assessment, repair work, technical support and liaison with public utility suppliers. In addition, these personnel should be trained to conduct repair of facilities and equipment during an emergency situation.

4.7.5 Fire Protection and Other Hazard Control Group

The individual assigned with the responsibility for fire protection must be included in advisory/supervisory committee of the facilities/activities having their own fire protection group. This individual should posses broad knowledge of the facility's fire potential, facility layout, engineered fire protection systems and availability and capabilities of equipment and personnel. The training of fire protection group should be arranged and ensured through their involvement in emergency drills/exercises conducted on periodic intervals. Whereas, the facilities not having a full-time fire marshal or fire protection department would rely on response from local fire protection department. The role of the off-site support agencies, such as Fire Brigade and Police, may vary considerably and should be incorporated into the emergency plan of the facility. Contact details of local police and fire protection department should also be included in this section of radiation emergency plan.

Radiation emergencies may also involve other hazardous materials, such as chemical, biological and infectious agents, carcinogens and cytotoxic materials/substances etc. The industrial safety personnel of the facility responsible for hazardous material control, may provide valuable assistance to Emergency Director/Coordinator during emergency response.

4.7.6 Public Information Officer

The information regarding availability and responsibilities of Public Information Officer (PIO) should be outlined in this section of emergency plan. The PIO should be a designated official of the facility responsible for timely release of necessary information to the media and public. The Emergency Director/Coordinator may also act as PIO. Information to the news media should be prepared, reviewed and released by PIO, after approval from the management (if required). A copy of the information should also be shared with PNRA using the contact details provided in Annexure - III. The information provided should be simple, useful, timely, consistent and appropriate. It is important that PIO is aware, and keeps the media apprised, of the developing situation. The PIO must have basic understanding of radiation and its terminology. The public information responsibility should not be left to the officials who are responding to the emergency e.g. providing emergency medical care

or fire fighting etc. The PIO should also be capable to denounce the incorrect information and rumors in addition to responding the requests from public and media for obtaining updated information.

4.7.7 Medical/ Health Professional(s)

A medical/health professional is a valuable member of an emergency response team. The responsibilities of medical/health personnel should be outlined in this section. If medical care is not available within a facility, liaison/interface with suitable hospitals capable of handling and treatment of exposed/contaminated individuals should be established. The licensee should ensure that the medical/health professional(s) responsible for provision of emergency medical care is provided with necessary training of emergency response and he/she participates in periodic emergency drills/exercises conducted at the facility.

4.8 Emergency Plan Implementing Procedures

Emergency plan implementing procedures (EPIPs) should describe the actions necessary to achieve the objectives of emergency plan. If the emergency plan is complicated, it should be implemented with the help of EPIPs. The emergency plan of the facility/activity should include the list of EPIPs relevant to the plan and all enlisted procedures should be developed, approved and made readily available. These EPIPs may also be included in the emergency plan as Annexes (if possible).

4.9 Instructions and Warnings to the Public/Workers

The arrangements for issuance of instructions and warning to the public and workers at the facility should be described in the radiation emergency plan. The information should be provided in simple (preferably local) language. The means for notification of emergency to the workers and public at the facility/site (e.g. sirens, hooters, announcements and warning lights etc.) should be described in the plan. In case of lost, stolen or illicitly removed radiation source, the mechanism to inform the public/ target groups off the site should also be described in radiation emergency plan.

4.10 Restriction of Affected Area

The access to affected area of facility/activity should be restricted for public/non-emergency workers. The strategy for actions such as restricting public/non-emergency workers, cordoning off the area, and displaying warning signs and symbols should be included in the emergency plan. Criteria for restriction of access and clearance of affected area should also be included in the emergency plan.

4.11 Protection of Emergency Workers

The workers taking part in response to radiation emergency are considered as emergency workers. The emergency workers from the off-site authorities who may take part in response activities should be informed about the risk of radiation exposure and the meanings of radiation signs and placards. The arrangements for the protection of emergency workers should be described in radiation emergency plan. These arrangements may include Personal Protective Equipments (PPEs) and personal dosimetry etc. The emergency workers should be designated and trained to undertake an intervention in the following situations:

- to save lives or to prevent serious injury, including severe deterministic health effects;
- to avert a large collective dose;
- to prevent the development of catastrophic conditions.

The emergency workers should be instructed to follow ALARA principle (i.e. keeping their doses As Low As Reasonably Achievable, by considering applicable economic and social factors) while performing emergency response actions. The mechanism for managing, controlling and recording the doses received by emergency workers should be described in emergency plan.

4.12 Emergency Facilities, Supplies and Equipment

The licensee should make available all necessary emergency response facilities and equipment to the emergency response teams. Adequate facilities and equipment should be readily available and operable all the times. The equipment must be calibrated and consistent with the requirements described in the emergency plan.

The licensee should consider provision of the following facilities, supplies and equipment (also known as components/elements of emergency response infrastructure) to the emergency response teams, as appropriate, for immediate and effective response to radiation emergencies:

- Copies of the approved emergency plan and EPIPs
- Seating place for emergency director/coordinator and support personnel
- Communication arrangements between emergency responders, onsite emergency organization and off-site response organizations/authorities
- Updated list of emergency response personnel (chain of command) along with their contact details
- Personal protective equipment (e.g. lead apron, face masks, gloves, shoe cover, paper suits etc.)
- Active dose monitoring devices (e.g. Pen Dosimeter, Electronic Personal Dosimeter - EPD etc.)
- Radiation detection/survey equipment
- Decontamination arrangements/kit
- Source handling and recovery tools (e.g. long tong, shielded container etc.)
- Arrangements for radioactive waste management
- Air sampling and counting equipment
- Facility floor plans, layouts and maps
- Other logistic support as necessary

The communication system must be able to maintain communication between members of each response team and the notification point, as well as communication with off-site response organizations such as police, fire protection department and hospitals etc. Communication equipment may include, dedicated telephone lines, mobile phones, two-way radios and fax machines. The use and installation of communication equipment and networks must commensurate with the level of emergency.

4.13 Coordination with Off-site Organizations/Authorities

If the nature of emergency response requires involvement of off-site organization/authorities, then emergency plan should; identify those authorities; include their contact details and explain procedure of coordination with them. The licensee should, in case of any radiation emergency, immediately inform National Radiation Emergency Coordination Center (NRECC) at PNRA HQs Islamabad and concerned Regional Nuclear Safety Directorate (RNSD) of PNRA. The contact details of NRECC and respective RNSD should be included in radiation emergency plan of the facility/activity as given in Annexure-III. The notification regarding incidents/accidents should be made immediately but not later than one hour to PNRA as per "Incident Reporting Performa" provided as Annexure-IV.

4.14 Termination of Radiation Emergency

The parameters upon which the decision of termination of emergency has to be taken should be identified and described in this section of radiation emergency plan. The process of termination of emergency should also be clearly defined for working and off-working hours including communication and announcements to be made.

4.15 Recovery and Rehabilitation

The arrangements for transition from emergency phase to recovery operations should be described in radiation emergency plan. Decisions to withdraw restrictions and other measures, if any, imposed during response to radiation emergency should be made by formal process. The principles and criteria for recovery and rehabilitation of the facility/activity from emergency phase to routine work should be included in radiation emergency plan. The recovery operation may include recovery of source(s), repairs to the equipment and buildings, waste disposal or decontamination of the affected site and surrounding area etc. The radioactive waste thus generated should be managed as per requirements of Regulations on Radioactive Waste Management - (PAK/915) and corresponding regulatory guides issued there under.

4.16 Training/ Education of Personnel and Conduct of Emergency Exercises

Training and education of response personnel is crucial for effective emergency management. Emergency exercises provide the opportunity to test the capabilities of facility and its personnel. For these reasons the schedule and requirements of training and exercises should be included in the emergency plan. The facility should ensure that emergency worker who may have a role in radiological emergency should have participated in training/retraining or refresher course annually. The conduct of radiation emergency exercises should be planned at least once in a year considering different times and seasons.

4.17 Record Keeping and Report Preparation

This section of radiation emergency plan describes the policy and strategy for keeping and maintaining necessary record and reports. The emergency plan should include the procedure of record keeping for all incidents and it should identify responsible person for preparation of post incident report. The plan should also describe the procedure of reporting the incidents/emergencies to PNRA. The following record should be maintained, where applicable:

- Emergency worker dose record
- Radiation monitoring and contamination level record
- Emergency drills/exercises and actual incidents, and
- Equipment calibration record, etc.

4.18 Additional Information

In this section of radiation emergency plan, the facility/activity may describe any additional information that is not covered in above sections and is deemed to be essential for that facility/activity.

4.19 References/Applicable Code and Standards, Tables and Annexure

The references of the documents and applicable code and standards used for preparation of the plan along with the tables and annexes (if any) should be included at the end of the plan and should be appropriately referred in the text.

4.20 Definitions and Abbreviations

A separate section to define/explain all the technical terms and abbreviations used in the plan should also be included in the document.

5. REVISION OF RADIATION EMERGENCY PLAN

The radiation emergency plan of the facility or activity should be reviewed/revised at least once in five years or whenever necessary in the light of lessons learned from emergency exercises/drills, national and international experience feedback, revision in the reference documents and day to day activities. The revised emergency plan should be submitted to PNRA for review and approval.

6. QUALITY ASSURANCE

Quality assurance is an essential element to ensure a high degree of availability and reliability of all the supplies, equipment, communication systems and arrangements necessary to perform the functions in a radiation emergency. Arrangements for inventories, supplies, tests and calibration of equipment should be made to ensure that these equipment and supplies are available and functional for the use during an emergency response.

7. REFERENCES

1. Regulations for the Licensing of Radiation Facility(ies) other than Nuclear Installation(s) - (PAK/908)
2. Regulations on Management of a Nuclear or Radiological Emergency - (PAK/914) (Rev.0)
3. Regulations on Radiation Protection - (PAK/904)
4. Regulations on Radioactive Waste Management - (PAK/915)
5. Categorization of Radioactive Sources, Safety Guide No. RS-G-1.9, IAEA, Vienna 2005
6. Security of Radioactive Sources, Nuclear Security Series No. 11, IAEA, Vienna 2009
7. Dangerous Quantities of Radioactive Material (EPR-D-Values), IAEA, Vienna 2006
8. NCRP Report No. 111 “Developing Radiation Emergency Plans for Academic, Medical or Industrial Facilities” (NCRP August 1991)

DEFINITIONS

(a) “activities” means: the production, use, import and export of radiation sources for industrial, research and medical purposes; the transport of radioactive material; the decommissioning of facilities; radioactive waste management activities such as the discharge of effluents; and some aspects of the remediation of sites affected by residues from past activities

(b) “Authority” means Pakistan Nuclear Regulatory Authority established under Section - 3 of the Pakistan Nuclear Regulatory Authority Ordinance, 2001.

(c) “dangerous source” means a source that could, if not under control, give rise to exposure sufficient to cause severe deterministic effects, this categorization is used for determining the need for emergency response arrangements and is not to be confused with categorizations of sources for other purposes.

(d) “decontamination” means complete or partial removal of contamination by a deliberate physical, chemical or biological process.

(e) “emergency” means a non-routine situation that necessitates prompt action, primarily to mitigate a hazard or adverse consequences for human health and safety, quality of life, property or the environment. This includes nuclear and radiological emergencies and conventional emergencies such as fires, release of hazardous chemicals, storms or earthquakes. It includes situations for which prompt action is warranted to mitigate the effects of a perceived hazard.

(f) “emergency plan” (also known as radiation emergency plan) means a description of the objectives, policy and concept of operations for the response to an emergency and of the structure, authorities and responsibilities for a systematic, coordinated and effective response.

(g) “emergency preparedness” means the capability to take actions that will effectively mitigate the consequences of an emergency for human health and safety, quality of life, property and the environment.

(h) “emergency response” means the performance of actions to mitigate the consequences of an emergency for human health and safety, quality of life, property and the environment. It may also provide a basis for the resumption of normal social and economic activity.

(i) “emergency worker” means a worker who may be exposed in excess of occupational dose limits while performing actions to mitigate the consequences of an emergency for human health and safety, quality of life, property and the environment.

(j) “licensee” means the holder of a current licence.

(k) “notification point” means a set up in facilities in hazard category III and IV which have arrangements to receive notification and to initiate promptly the predetermined actions to activate the emergency response .

(l) “practice” means any human activity that introduces additional sources of exposure or exposure pathways or extends exposure to additional people or modifies the network of exposure pathways from existing sources, so as to increase the exposure or the likelihood of exposure of people or the number of people exposed.

(m) "radiation facility" means any premises where radiation source (radioactive material or radiation generator) is acquired, produced, manufactured, processed, reprocessed, repaired, used, handled, extracted, imported, exported, stored, installed, operated, maintained, converted or disposed off.

(n) “response organization” (or an emergency response organization) means an organization designated or otherwise recognized as being responsible for managing or implementing any aspect of an emergency response.

(o) “source” (also known as radiation source) means anything that may cause radiation exposure, such as by emitting ionizing radiation or by releasing radioactive substances or materials, and can be treated as a single entity for protection and safety purposes, this includes all types of radiation generators and radioactive materials.

Annexure - I

Criteria[2] for Hazard Categorization of Radiation Facilities/Activities

A. Hazard Category - III Facilities/Activates

If all or any one of the following conditions exists, then the radiation facilities/activities will lie in Hazard Category - III:

1. Facilities with potential, if shielding is lost, of direct external (shine) dose rates of more than 100mGy/hr at 1m.
2. Facilities/activities having Category[3] 1 and Category 2 sources (including sources used for Sterilization, Irradiations, Industrial Radiography, Teletherapy and High Medium Dose Brachytherapy).
3. Industrial irradiation facilities, Radiopharmaceutical facilities, Hospitals, Sealed Source Manufacturing facilities and Research Laboratories that could give rise to severe deterministic health effects that warrant urgent protective actions on the site.

B. Hazard Category - IV Facilities/Activities

If all or any one of the following conditions exists, then the radiation facilities/activities will lie in Hazard Category - IV:

1. Operators of mobile dangerous sources with potential, if shielding is lost, of direct external (shine) dose rates of more than 10mGy/hr at 1m.
2. Facilities/activities having Category 3 sources (including sources used for Gauges, Well Logging, Mobile Dangerous Sources, Industrial Radiography Sources, Radio Thermal Generators, Nuclear Powered Satellites, Large Scrap Metal Processing Facilities, National Border Crossing and Facilities with Fixed Gauges with Dangerous Sources) and Nuclear Weapon Accident (Pu dispersal), if Pu spread to 1- Km^2.
3. Transportation of radioactive materials with following types: Type A package (UN 2915, 3332), Type B package (B (U) and B (M), UN2916, UN2917), Type C package (UN3323), Special Arrangements (UN2919) and Package containing fissile material (UN2977, 3324-3331).

C. Hazard Category - None Facilities/Activities (Facilities which do not lie in any Hazard Category)

Facilities/activities with following conditions will be considered in Hazard Category - None:

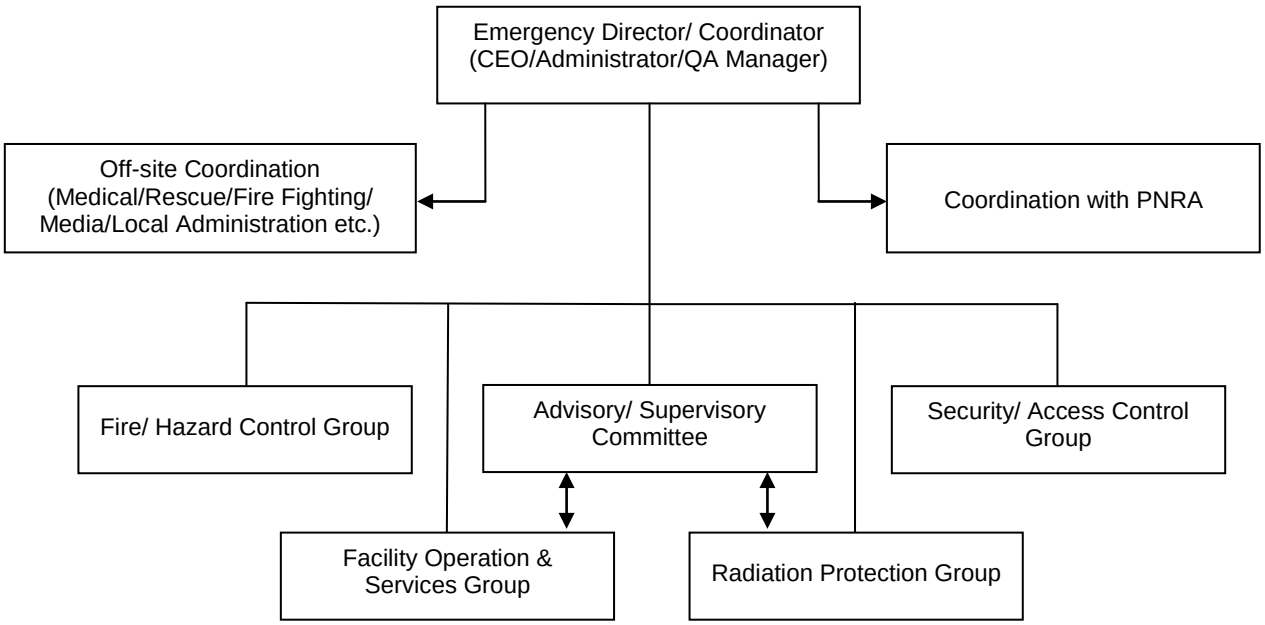
1. Activities involving sources with potential, if shielding is lost, of direct external (shine) dose rates of less than 10mGy/hr at 01 meter.
2. Facilities/activities having Category 4 and Category 5 sources (including sources used for Moisture Density Gauge, Static Eliminator, Tritium Exit Signs, Pu Pacemaker and Consumer Products).
3. Facilities using radio-pharmaceuticals with very small potential for exposure above occupational limits.
4. Transportation of radioactive materials with following types: Excepted Packages (UN2910, 2911, 2909, 2908), Industrial Packages (UN2912, 3321, 3322, 2913), Package containing UF6, UN 2978.

[2] Hazard categorization is based on IAEA-EPR Methods (2003)

[3] This categorization is based primarily on the potential for sources (i.e. radioactive material) to cause deterministic health effects (Nuclear Security Series No. 11, Security of Radioactive Sources, IAEA, 2009)

Annexure - II

Example of Emergency Response Organization Setup



Annexure - III

Contact Details of PNRA

1. National Radiation Emergency Coordination Center (NRECC), PNRA HQs, Islamabad

Phone: 051-9262019

Fax: 051-9260201

Officer Incharge (NRECC): 0300-8540319

Alternate Officer Incharge (NRECC): 0334-5131978

Toll Free Number: 0800-77766

E-mail: nrecc@pnra.org

Mailing Address: Officer In-charge NRECC, PNRA HQs, Mauve Area, G-8/1, Islamabad

2. Regional Nuclear Safety Directorate - I (RNSD - I), PNRA HQs, Islamabad

Phone: 051-9263019

Fax: 051-9263009

E-mail: rnsd1@pnra.org

Mailing Address: Director RNSD-I, PNRA HQs, Mauve Area, G-8/1, Islamabad

3. Regional Nuclear Safety Directorate - II (RNSD - II), Chashma Site, Mianwali

Phone: 0459-924294

Fax: 0459-924308

E-mail: rnsd2@pnra.org

Mailing Address: Director RNSD-II, Chashma Site, Kundian, District Mianwali

4. Regional Nuclear Safety Directorate - III (RNSD - III), Karachi

Phone: 021-99266282

Fax: 021-99266280

E-mail: rnsd3@pnra.org

Mailing Address: Director RNSD-III, 42-C, 24th Commercial Street, Phase-II Extension, DHA, Karachi

Annexure - IV

INCIDENT REPORTING PROFORMA

(To be Used in Case of an Emergency at a Radiation Facility/Activity)

Incident Date: ☐☐-☐☐-20☐☐ (dd-mm-yyyy)	Incident Time: _____ (AM/PM)
Facility Type: ☐ Diagnostic Radiology ☐ Radiotherapy ☐ Nuclear Medicine ☐ Industrial Radiography ☐ Irradiators ☐ Nuclear Gauges/ Oil Well Logging ☐ Education/ Research ☐ Other_____ (Please Specify)	**Nature of Incident**: ☐ Undue/ Over exposure of worker/ patient/ public ☐ Source lost/ stolen/ theft ☐ Spill/ dispersion of radioactive material ☐ Orphan source found ☐ Contamination ☐ Internal exposure due to ingestion/inhalation ☐ Transport accident ☐ Any other
Name and location of facility/site where incident occurred: _____ _____ City:_____	Contact No.: _____
Facility Licensed with PNRA: Yes ☐ No ☐	License Number:_____ (If licensed)
Incident abstract: (Brief description of event) (Use another sheet if required)	
Sender details: Name: _____ Designation: _____ Contact No.:_____ Reporting Time: _____(AM/PM) Signature with date:_____	

Please send filled performa to:

National Radiation Emergency Coordination Center (NRECC)

PNRA HQs, Mauve Area, G-8/1, Islamabad.

Phone: 051- 9262019, Cell: 0300 - 8540319

Fax: 051- 9260201, Email: nrecc@pnra.org

PAKISTAN NUCLEAR REGULATORY AUTHORITY

P.O. Box 1912, Islamabad

www.pnra.org