



**FORMAT AND CONTENT OF DECOMMISSIONING
PLAN FOR RADIATION FACILITIES**

REGULATORY GUIDE

PAKISTAN NUCLEAR REGULATORY AUTHORITY

For Further Details

Directorate of Regulatory Framework

PAKISTAN NUCLEAR REGULATORY AUTHORITY

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1. INTRODUCTION

Pakistan Nuclear Regulatory Authority (PNRA) is vested with the responsibility for regulatory control and supervision of all matters related to nuclear safety and radiation protection in Pakistan. Further, PNRA is empowered to devise, adopt, formulate and enforce rules, regulations, orders or codes of practice for nuclear safety and radiation protection. PNRA has established a comprehensive regulatory framework for an effective regulatory control which is being continuously strengthened through development of new Regulations and Regulatory Guides (RGs).

According to PNRA Regulations for the Licensing of Radiation Facility(ies) other than Nuclear Installation(s) - (PAK/908) and Regulations on Decommissioning of Facilities using Radioactive Material - (PAK/930), the applicants or licensees of radiation facilities are required to submit decommissioning plans for approval by the Authority. The applicant/licensee is required to submit Initial Decommissioning Plan (IDP) with the application for acquiring license to establish the facility. Periodic revisions of the IDP are made during the lifecycle of the facility. However, the licensee should submit the Final Decommissioning Plan (FDP) for approval by the Authority with the application for acquiring authorization to decommission the facility.

Generally, decommissioning plans of radiation facilities contain detailed information which includes planning of decommissioning, conduct of administrative and technical decommissioning actions to remove facilities from regulatory control. Planning for decommissioning begins at the design stage and continues throughout the lifetime of the facility.

This RG provides standard format and content to applicant/licensee for preparation of decommissioning plans for radiation facilities. It should be noted that the format and content of decommissioning plan described in section 5 of this RG are applicable to both IDP and FDP.

2. OBJECTIVE

The objective of this RG is to provide guidance to the applicant/licensee to prepare the decommissioning plans of radiation facilities as per prescribed format and content.

3. SCOPE

This RG is applicable to applicant/licensee of radiation facilities for which IDP and FDP are required to be submitted as per Regulations PAK/908 and PAK/930.

4. GENERAL GUIDELINES

The applicant/licensee should follow the guidelines given below during the preparation of decommissioning plan:

- i. Provide relevant, clear, concise and factual information;
- ii. Provide ‘Table of Contents’ including Headings, Annexures, List of Figures and Tables along with page numbers;
- iii. Ensure that definitions and abbreviations are consistent throughout the document;
- iv. Avoid duplication of information by providing reference to relevant section (where necessary); and
- v. Add legible drawings, layouts, maps, and tables.

5. FORMAT AND CONTENT OF DECOMMISSIONING PLAN FOR RADIATION FACILITIES

5.1 Simple Radiation Facilities

The following sections describe the content and level of detail that should be included in a Decommissioning Plan of simple radiation facilities like Full-Fledged Medical Centre; Nuclear Medicine or Cardiology Centre; Radiotherapy Centre; Blood Irradiators; Industrial Radiography with Sources (radioactive material); Oil Well Logging; Nuclear Gauges; Manufacturers of Consumer Products (having radioactive material as an integral part); Cargo or Vehicle Scanners with Sources (radioactive material); Agricultural Irradiators or any other facility considered by the Authority.

5.1.1 Introduction

This section should describe the introduction of the facility (i.e., name, location and map of the facility), operational history of the facility including list of incidents/accidents (if facility is already under operation), types of activities being performed at the facility, types of radioisotopes being used and inventory of radioactive material at the facility.

5.1.2 Responsibilities

Responsibilities of persons involved in the administrative and technical decommissioning activities should be described in this section.

5.1.3 Conduct of Decommissioning Actions

This section should describe:

- i. Information of structures/equipment that require decontamination & dismantling along with techniques and steps to be followed for decontamination & dismantling activities including steps for removal of radiation trefoils and notices (if any);

- ii. Estimation of waste quantities;
- iii. Steps to be followed for the management of solid waste and effluent discharge (if any); and
- iv. Process to deposit Disused Sealed Radioactive Sources (DSRS) at the designated facilities or returned to the supplier.

5.1.4 Radiation Protection

This section should describe:

- i. Radiation protection principles (e.g., time, distance and shielding) applied during decommissioning of facility;
- ii. Arrangements for personal monitoring including type of radiation measuring and monitoring devices (e.g., Film badge, Thermo-Luminescent Dosimeter (TLD) badge, Pocket Dosimeter); and
- iii. Means of area monitoring at the facility along with methodology for conducting final radiological survey at the conclusion of the decommissioning actions to confirm that no radioactive traces or contamination have been left on the site.

The applicant or licensee may refer relevant section of Radiation Protection Program related to decommissioning, if such information is already provided.

5.1.5 Financial Resources

This section should address cost estimates based on cost of labor, waste management and disposal etc. This section should also address the availability and maintainability of financial resources during lifetime.

5.1.6 Definitions and Abbreviations

This section should describe the definitions and abbreviations used in the decommissioning plan.

5.2 Complex Radiation Facilities

The following sections describe the content and level of detail that should be included in a Decommissioning Plan of complex radiation facilities like Manufacturers/producers of Sources (radioactive material); Industrial Irradiators or any other facility considered by the Authority.

5.2.1 Introduction

This section should describe introduction of the facility i.e., name, location and

map of the facility including the list of existing licenses (if any), operational history of the facility including list of incidents/accidents (if facility is already under operation), types of activities being performed at the facility and types of radioisotopes being used and inventory of radioactive material at the facility.

5.2.2 Decommissioning Strategy

This section should describe the measures to be taken for immediate decommissioning strategy and the proposed end state of the facility (e.g., unrestricted or restricted use, total removal of all structures or reuse of some structures or parts of the facility)

As per National Policy, immediate decommissioning is a preferred strategy for radiation facilities.

5.2.3 Management System for Decommissioning

This section should describe the proposed organizational structure, responsibilities and authorities of the individual in the organization including the required qualification & training at the time of decommissioning of the facility.

This section should also describe the methods for retention of records (e.g. significant events and incidents during operational life, record of modifications and maintenance records, decommissioning record, receipt, storage, transfer or disposal of radioactive sources/waste) and reports that are relevant for decommissioning. The responsibility for the retention of these records should be assigned clearly.

5.2.4 Safety Assessment

This section should describe:

- i. Safety assessment for decommissioning of the facility by identifying the potential hazards, scenarios or initiating events for analysis of normal and abnormal situations such as natural phenomena i.e., earthquake, fire, flooding etc. and manmade events;
- ii. Protective measures for preventing or minimizing the likelihood of their occurrences and for mitigating their potential consequences; and
- iii. Predicted/expected doses during the normal and abnormal situation including limits and conditions for decommissioning.

5.2.5 Project Schedule and Conduct of Decommissioning Actions

A decommissioning project schedule should be established for the overall management of the decommissioning. This section should include project schedule and work breakdown structure describing decommissioning actions, individual tasks and

interdependences between tasks.

This section should also describe information of structures and equipment that require decontamination & dismantling/demolish along with techniques and steps to be followed for decontamination & dismantling/demolish activities including steps for removal of radiation trefoils and notices (if any).

5.2.6 Radiation Protection

This section should describe:

- i. Radiation protection principles (e.g., time, distance and shielding) applied during decommissioning of facility;
- ii. Arrangements for personal monitoring including type of radiation measuring and monitoring devices (e.g., Film badge, Thermo-Luminescent Dosimeter (TLD) badge, Pocket Dosimeter); and
- iii. Means of area monitoring at the facility.

The applicant or licensee may refer relevant section of Radiation Protection Program related to decommissioning, if such information is already provided.

5.2.7 Emergency Arrangement

This section should describe:

- i. Information about possible emergency situations and their potential consequences;
- ii. Organization/group responsible to deal with such emergency situations and their responsibilities;
- iii. Arrangements for emergency preparedness during decommissioning; and
- iv. Reporting process of safety significant incidents to the Authority.

The applicant or licensee may refer relevant section of Radiation Emergency Plan related to decommissioning, if such information is already provided.

5.2.8 Physical Protection

This section should describe arrangements for the physical protection of the radioactive material/source at the time of decommissioning of facility along with the measures to be taken for its control.

The applicant or licensee may refer relevant section of Physical Protection Plan related to decommissioning, if such information is provided.

5.2.9 Waste Management

This section should identify those radioactive waste streams/sources or radioactive material that will be generated at the time of decommissioning along with the estimated volume.

This section should also describe:

- i. Steps to be followed for the management of solid waste and effluent discharge (if any);
- ii. Process to deposit DSRS at the designated facilities or returned to the supplier; and
- iii. Process for the clearance of radioactive waste (if any) from regulatory control.

The applicant or licensee may refer relevant section of Radioactive Waste Management Program related to decommissioning, if such information is provided.

5.2.10 Operating Experience Feedback

This section should elaborate the Operating Experience Feedback (OEF) of similar radiation facilities (if any) which will be utilized during decommissioning.

5.2.11 Financial Resources

This section should address conservative cost estimates which cover all actions required to execute the decommissioning. The costs associated with decommissioning include costs for the following:

- i. Pre-decommissioning actions; and
- ii. Decommissioning actions, including cost of labor, decontamination, dismantling/demolish of equipment/structure, waste management and disposal.

This section should also address the availability and maintainability of financial resources during lifetime.

5.2.12 Final Radiological Survey

This section should describe:

- i. Methodology for conducting the final radiological survey along with map or drawing of the area to be surveyed;
- ii. Type of equipment, instrument used for the final radiological survey; and

- iii. Information about the evaluation and record maintenance of the results of final radiological survey to demonstrate that end state criteria (i.e., total effective dose to a member of the critical group distinguishable from background radiation not greater than 0.3 mSv per year) is met.

5.2.13 Definitions and Abbreviations

This section should describe the definitions and abbreviations used in the decommissioning plan.

6. REVISION/ UPDATE OF DECOMMISSIONING PLAN

The licensee should review IDP after every five (05) years and update it accordingly (if required). In case of any change in the processes/practices, design or technology; change of the selected strategy or end state; change in estimation of radiological inventory; the licensee should submit the FDP to the Authority for approval well before its implementation.

7. REFERENCES

- [1]. Pakistan Nuclear Regulatory Authority (PNRA), Regulations on Decommissioning of Facilities Using Radioactive Material - (PAK/930), 2016, Gazette of Pakistan, Islamabad.
- [2]. Pakistan Nuclear Regulatory Authority (PNRA), Regulations for the Licensing of Radiation Facility(ies) other than Nuclear Installation(s) - (PAK/908), 2019, Gazette of Pakistan, Islamabad.
- [3]. International Atomic Energy Agency (IAEA), Decommissioning of Facilities (GSR Part 6), 2014, Vienna.
- [4]. International Atomic Energy Agency (IAEA), Decommissioning of Medical, Industrial and Research Facilities (SSG-49), 2019, Vienna.
- [5]. International Atomic Energy Agency (IAEA), Decommissioning of Small Medical, Industrial and Research Facilities (TRS No. 414), 2003, Vienna.



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