

# IAEA - TECDOC - 1954

## Occupational Radiation Protection During the Decommissioning of Nuclear Installations

*Main Aspects of Management,  
Planning and Conduct*

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IAEA TECDOC SERIES

IAEA-TECDOC-1954

Practical Occupational  
Radiation Protection  
during the Decommissioning  
of Nuclear Installations

*Main Aspects of Management, Planning  
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# Contributors to Drafting & Review

- Belgium
- Canada
- France
- Germany
- India
- Lithuania
- Sweden
- United Kingdom
- United States of America

# TECDOC - 1954 Objective

- Provide practical information for management, planning and conduct for Occupational Radiation Protection in decommissioning for nuclear installations.



- Can be used in planning of new decommissioning projects and for improvements to existing decommissioning projects.

# TECDOC Highlights



# Highlights

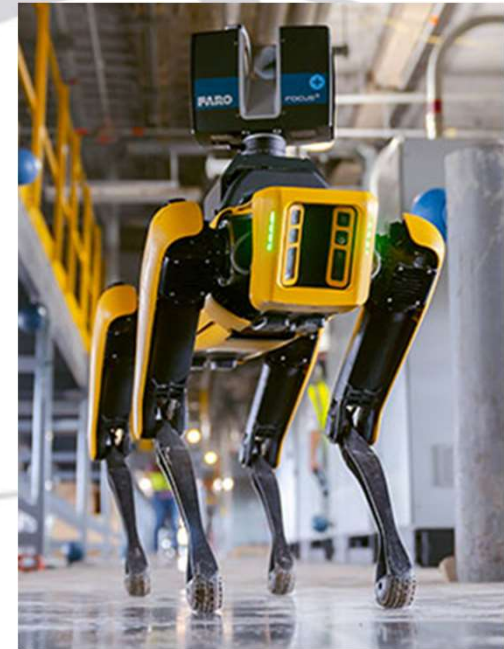
- Decommissioning should be considered in the actual design of the installation.
- During initial authorization for operation, a strategy should be developed that demonstrates feasibility of decommissioning activities for:
  - Planning for decommissioning,
  - Physical & radiological characterization,
  - Facility & site decontamination,
  - Dismantling and
  - Materials management.
- A final decommissioning plan is prepared when a nuclear installation ceases operation.

# Highlights continued

- Work activities during decommissioning are different than during the operational phase.
- Activities will be conducted in a continuously changing work environment.
- Decommissioning includes a range of different activities:
  - Dismantlement,
  - Decontamination,
  - Demolition of structures, systems and components (SSCs),
  - Erection of new SSCs.
- In addition to radiation exposure, workers are also subjected to other types of risks & hazards.



# Overview of TECDOC Contents



# Section 1 – Introduction

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## Section 2 – Impact on Workers

- Provides an overview of the impact of different decommissioning strategies, including:
  - Radiological hazards,
  - Industrial hazards,
  - Safety culture, and
  - Occupational Radiation Protection.



# Section 3 – Radiation Protection Programme

- Addresses organization, procedures and documentation including:
  - Development of a Radiation Protection Programme for decommissioning activities,
  - Guidance on organizational issues,
  - Radiation Protection training & qualification,
  - Information transfer & interaction strategies for Radiation Protection,
  - Optimization of protection & safety,
  - Dismantlement planning, and
  - Waste management

# General Guidance for Establishing & Maintaining the RP Programme

- RP Programme roles need to be clearly defined and documented.
- Overall decommissioning organization is expected to understand the radiation protection organisation's responsibilities.
- The person in charge of radiation protection is expected to have a position within the site management organization that allows participation in the high-level decision-making process.
- Designation of controlled areas and supervised areas should be proceduralised.

# General Guidance for Establishing & Maintaining the RP Programme

- General characteristics of a typical RP Programme include:
  - external and internal dosimetry,
  - access control,
  - permitting (e.g., Radiation Work Permit)
  - workers' job coverage,
  - instrumentation,
  - respiratory protection,
  - waste handling,
  - environmental, and
  - medical health surveillance.

# General Guidance for Establishing & Maintaining the RP Programme



- Decommissioning projects can be executed either sequentially or in parallel, introducing:
  - new working methods,
  - tools, and
  - changes in radiological conditions.
- Changes in the work environment (e.g., radiological risks and hazards, sources of radiation, work procedures and tools) need to be considered.
- Coordination of work activities is necessary to avoid negative impacts on radiation protection.

# General Guidance for Establishing & Maintaining the RP Programme

- Implementation of the RP Programme necessitates a holistic approach, including:
  - industrial safety,
  - occupational radiation protection, and
  - radioactive waste management.
- Assessment of decommissioning related risks and hazards will help to adequately allocate resources and revise the RP Programme.
- The use of a systematic graded approach in protection and safety (radiological and non-radiological) is essential in planning and conducting decommissioning activities.



# General Guidance for Establishing & Maintaining the RP Programme

- The ALARA approach will need to consider:
  - human factors,
  - organizational context,
  - changes in workplace situations,
  - safety culture,
  - as well as a number of factors to be balanced, considering both radiation protection as well as socio-economic issues.
- Radiation protection performance indicators need to be adapted to the dismantling activities, and new radiation protection indicators need to be defined (e.g., airborne alpha activity).



# RP Organisation

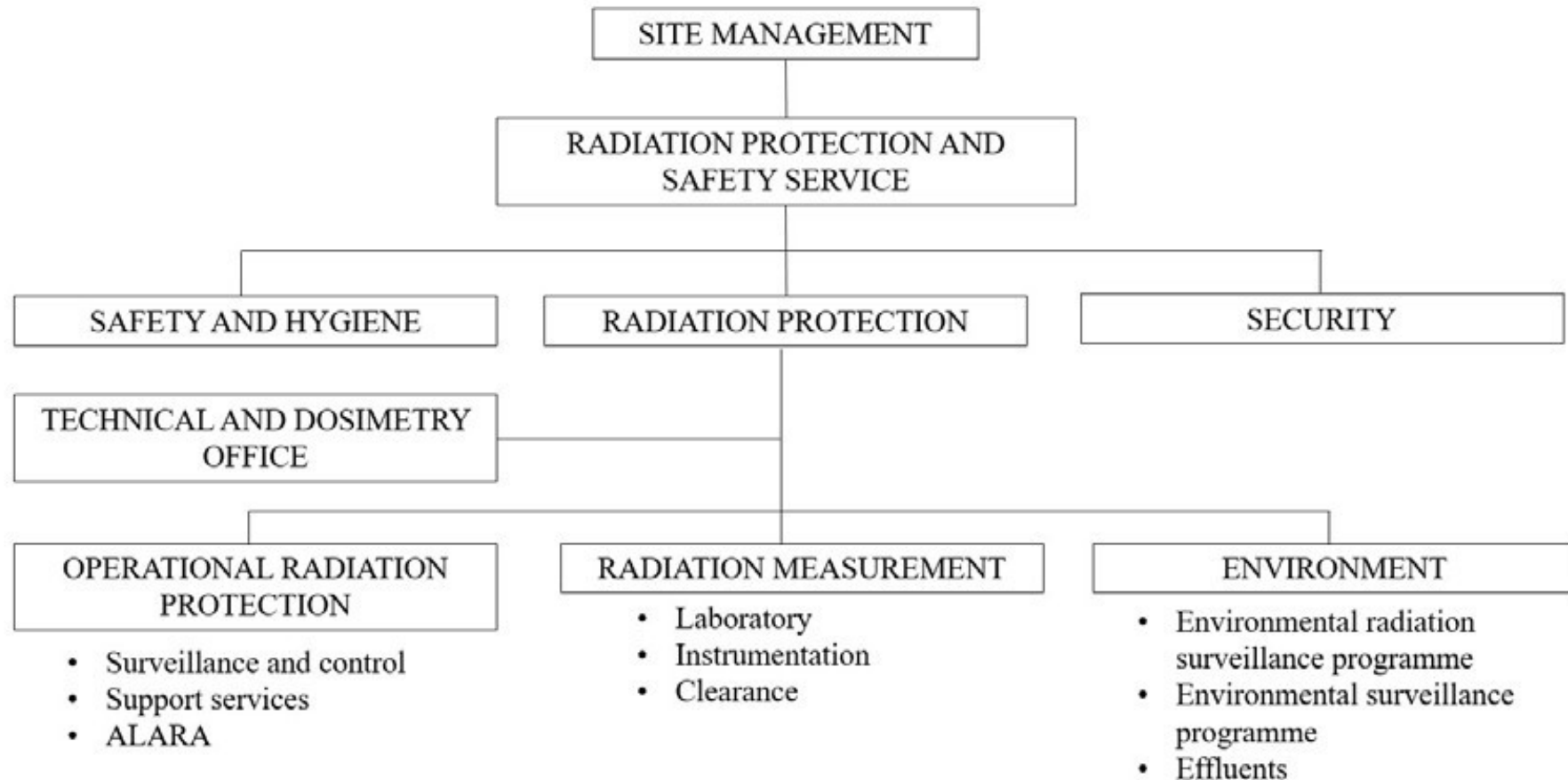
- Structured similar to an operating nuclear installation.
- A qualified radiation protection manager will be designated as the person with the overall responsibility for implementing the RP Programme.
- RP personnel (e.g., supervisors, technical support personnel, technicians) need to be assigned to provide expertise in each of the areas that make up the RP Programme.
- The RP organization is appropriately linked or integrated with the organization responsible for non-radiological hazards.
- Transfer of RP information throughout decommissioning is important.

TABLE 1. EXAMPLES FOR INFORMATION TRANSFER DURING DECOMMISSIONING

Involved parties	Contact opportunities	Objectives
Operator's staff and itinerant workers	Training programme	Knowledge transfer to new staff Communication of work procedures Assessment of work already completed
	Pre-job briefings	
	Post-job debriefings	
Radiation protection manager and plant decommissioning management	At the initial stages	Effective planning and execution of decommissioning
	More often as decommissioning progresses	
Radiation protection personnel and workers	Training programme	Knowledge transfer to new staff
Radiation protection management and management of subcontractors	Pre-job briefings	<p>To ensure the "leaders" in the radiation protection staff and workforce have a common understanding and agreement on the overall work plan and established controls (radiological and non-radiological hazards)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Focused on the work plan and controls.</li> <li><input type="checkbox"/> To discuss and document any differences in the conditions (radiological and/or non-radiological) encountered during the task, any problems encountered during execution of the task and possible solutions to resolve problematic issues.</li> <li><input type="checkbox"/> Ensure that expectations in workers' performance are understood and properly implemented.</li> </ul>
	Shift briefings	
	Continuously	

# RP Organisation Example

(courtesy of Vandellos NPP, Spain).



# Section 4 – Radiological Characterization and Site Preparation

- Discusses
  - Radiological characterization
  - Site preparation
  - Workplace monitoring
  - Individual monitoring
  - Radiation Protection facilities

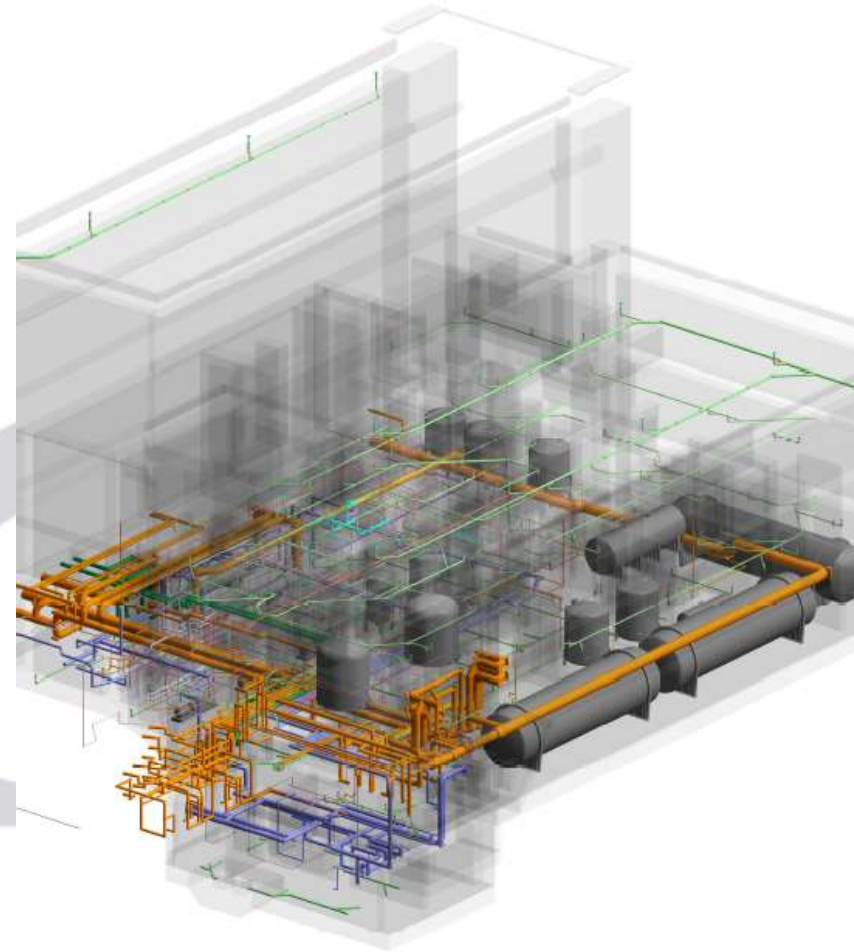


Sodium Treatment Facility at Creys Malville  
(courtesy of EDF, France).



# Section 5 – Non-Radiological Hazards

- Considers non-radiological hazards including
  - Electric shock
  - Oxygen deficient atmospheres
  - Asbestos
  - Heat stress
  - Falling debris



**In addition to the various examples discussed within the body of this TECDOC, appendices also contain examples of decommissioning topics.**

**Appendix I** Defining the process & criteria for detailed planning of RP

**Appendix II** Sample of work planning

**Appendix III** Example of the impact of protective suits on exposure time

**Appendix IV** Sample of a contamination map

**Appendix V** Sample of predefined sets of nuclide vectors

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