

PROVISIONS OF SOME IAEA SAFETY PUBLICATIONS FOR DECOMMISSIONING OF NUCLEAR FACILITIES

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Summary

An analysis of the provisions of three main safety publications of the IAEA in relation to decommissioning plan and decommissioning planning is made from the point of view of their deployment and of the licences provided by regulatory body in the design, construction, commissioning, operation, final shutdown and decommissioning phases of a nuclear facility with regard to nuclear research reactors.

Decommissioning is a phase in the life cycle of the nuclear reactor that is addressed from the initial design phase.

For the definition of decommissioning activity there are considered, for comparison, also the Joint Convention and a document of the European Commission.

The provisions of the IAEA publications are the base for national regulations issuance and a good understanding is required.

IAEA SAFETY PUBLICATIONS CONSIDERED

(Why these publications?)

- WS-G-2.1 – Decommissioning of Nuclear Power Plants and Research Reactors, Vienna, October 1999.
- SRS-45 – Standard Format and Content for Safety Related Decommissioning Documents, Vienna, July, 2005.
- WS-R-5 – Decommissioning of Facilities Using Radioactive Material, October 2006.

OBJECTIVE OF SAFETY PUBLICATIONS CONSIDERED

Provisions in Safety Standards Series No. WS-G-2.1

(Pages 1 and 2)

OBJECTIVE

1.5. The objective of this Safety Guide is to provide guidance to national authorities, including regulatory bodies, and operating organizations to ensure that the decommissioning process for nuclear power plants and research reactors is conducted in a safe and environmentally acceptable manner.

1.7. This Safety Guide mainly addresses the radiological hazards resulting from the activities associated with the decommissioning of nuclear reactors, primarily with decommissioning after planned final shutdown.

Provisions in Safety Reports Series No. 45

(FOREWORD)

The present Safety Report provides information on the content and format for the decommissioning plan and supporting safety related documents. Its scope includes information that is relevant to all types of nuclear facilities, ranging from nuclear power plants and reprocessing facilities to university laboratories and manufacturing plants. By using a graded approach in the application of this Safety Report, the owner of a facility can provide the information necessary to allow the regulatory body to determine if the decommissioning activities have been properly evaluated with respect to safety.

Provisions in Safety Standards Series No. WS-R-5

(page 3)

1.9. This publication deals with all phases of decommissioning and also establishes requirements for the period after the permanent planned shutdown of a facility at the end of its operational lifetime. However, most of the provisions contained in this safety standard can also be applied to decommissioning after an abnormal event that has resulted in serious damage to or the contamination of a building, or simply after a premature shutdown. This publication applies to all types of facility, including nuclear power plants, research reactors, fuel cycle facilities, manufacturing plants, medical facilities, research and university laboratories and other research facilities. It does not apply to mill tailings, waste disposal sites or waste repositories.

DEFINITION OF DECOMMISSIONING

Provisions in Safety Standards Series No. WS-G-2.1

(Page 3)

2.1. The term decommissioning refers to administrative and technical actions taken to allow removal of some or all of the regulatory controls from a nuclear facility (except for a repository, which is, by definition, subject to closure and not decommissioning). These actions involve decontamination, dismantling and removal of radioactive materials, waste, components and structures. They are carried out to achieve a progressive and systematic reduction in radiological hazards and are taken on the basis of preplanning and assessment to ensure safety during decommissioning operations.

2.2. The time period to the decommissioning activities for nuclear power plants and research reactors may typically range from a few years to decades (for example, to allow for radioactive decay). As a consequence, decommissioning may be carried out in one continuous operation following shutdown or in a series of discrete operations over time (i.e. phased decommissioning).

Provisions in Safety Reports Series No. 45

(Page 1)

As with any industrial process, the end point of a facility's lifetime is planned and actions are taken to remove the facility from service when it is no longer needed. This is also the case with facilities that have used radioactive material except that they have been under regulatory control and have special needs that require addressing. The process of removing these facilities from regulatory control is called decommissioning.

Provisions in Safety Standards Series No. WS-R-5

(page 1)

1.1. The term ‘decommissioning’ refers to the administrative and technical actions taken to allow the removal of some or all of the regulatory requirements from a facility (except for a repository, for which the term ‘closed’ and not ‘decommissioned’ is used). A facility, as used in this Safety Requirements publication, means a building and its associated land and equipment in which radioactive material is produced, processed, used, handled or stored on such a scale that consideration of safety is required.

1.3. A facility is considered decommissioned when an approved end state¹ has been reached. Subject to national legal and regulatory requirements, this end state encompasses partial or full decontamination and/or dismantlement, with or without restrictions on further use.

Provisions in Safety Standards Series No. WS-R-5 (cont.)

(pages 4 and 16)

1.11. The management and disposition of new and spent nuclear fuel and waste generated during operations are not normally considered part of decommissioning activities, but are addressed as part of operations.

8.8. A proper waste management path shall be established for all waste streams arising from decommissioning activities. If a final decision on disposal has not been made for particular waste types, the operating organization shall arrange for the safe storage of the waste until its final disposition is completed. If operational waste or nuclear fuel remains at the site after permanent shutdown of a facility, then such material shall be removed and transported to an authorized facility in compliance with applicable regulations, or else the approved decommissioning plan shall address the management of these materials.

JOINT CONVENTION
ON THE SAFETY OF SPENT FUEL MANAGEMENT AND
ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

(Article 2., Definitions)

- (b) *"decommissioning"* means all steps leading to the release of a nuclear facility, other than a disposal facility, from regulatory control. These steps include the processes of decontamination and dismantling;

COMMISSION RECOMMENDATION
of 24 October 2006
on the management of financial resources for the
decommissioning of nuclear installations, spent
fuel and radioactive waste
(2006/851/Euratom)

(Section 2, Definitions)

- (a) '*decommissioning*' shall mean all activities covering the technical decommissioning of the nuclear installation (decontamination, dismantling and demolition) and waste management (management and disposal of radioactive waste and spent fuel) leading to the release of the nuclear installations from radiological restrictions;

Conclusion

The definition can serve to the aim of the documents (as that in 2006/851/Euratom).

PLANNING OF DECOMMISSIONING

Provisions in Safety Standards Series No. WS-G-2.1

(Page 13)

2.15. Experience has shown that, provided that these actions are properly planned and implemented, decommissioning of nuclear reactors and management of the resulting radioactive materials can be accomplished without undue risk to or radiological impacts on workers, the public or the environment.

Decommissioning can be facilitated by planning and preparatory work undertaken during the entire lifetime of the nuclear installation. These actions are intended to minimize the eventual occupational and environmental impacts which can occur during the active and passive processes undertaken during decommissioning.

2.16. Decommissioning should be considered in the design and operation phases. However, many of the nuclear power plants and research reactors have been operating for many years, and decommissioning may not have been considered at the design stage. The planning of decommissioning for such installations should recognize this, and planning should start as early as possible. Most of the guidance given in this Safety Guide will be applicable to this situation.

Provisions in Safety Reports Series No. 45

(page 1)

Planning for decommissioning starts during the initial design of the facility and ends with the final release of the facility by the regulatory body.

Provisions in Safety Standards Series No. WS-R-5

(pages 1 and 11)

1.4. Decommissioning can be divided into preparatory and implementation phases, both of which are discussed in this publication. Preparations for decommissioning include the development of a decommissioning strategy, initial decommissioning planning and radiological characterization of the facility. Implementation of decommissioning includes preparation of a final decommissioning plan and its submission to the regulatory body for authorization or approval, management of the project and implementation of the plan, management of the waste and demonstration that the site meets the end state criteria defined in the plan.

5.10. Prior to the implementation phase of decommissioning activities, a final decommissioning plan shall be prepared and submitted to the regulatory body for approval. This plan shall define how the project will be managed, including: the site management plan, the roles and responsibilities of the organizations involved, safety and radiation protection measures, quality assurance, a waste management plan, documentation and record keeping requirements, a safety assessment and an environmental assessment and their criteria, surveillance measures during the implementation phase, physical protection measures as required, and any other requirements established by the regulatory body.

Extent of Decommissioning

- Spatial extent: to a established controlled area
- Temporal extent: with a planned strategical duration (preparation and implementation)
- Action extent: performed administrative and technical activities for regulatory control release
- Effect extent:
 - A clean (cleaner) site released without (with) restrictions
 - Radioactive waste in storage or disposed well addressed in decommissioning activity

Actions in decommissioning

Administrative actions:

- Decommissioning planning in concordance with chosen strategy
- Radiological characterization plan
- Radiological characterization report
- Decommissioning plans and support documents
- Approvals and authorizations
- Management of the project
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Technical actions:

- Radiological characterization
- Decontamination
- Dismantling
- Demolition
- Removal of radioactive waste
- Final survey
-

INITIAL PLANNING

INITIAL PLANNING

5.6. An initial plan for decommissioning should be prepared and submitted by the operating organization in support of the licence application for the construction of a new reactor. Although the level of detail in the initial plan will necessarily be lower than that in the final decommissioning plan, many of the aspects listed in para. 5.11 should be considered in a conceptual fashion. A generic study showing the feasibility of decommissioning may suffice for this plan, particularly in standardized installations. Depending on applicable regulations, the plan should address the costs and the means of financing the decommissioning work.

2.3.2. Types of decommissioning plan

Decommissioning plans are developed in three stages during the life of the facility: an initial plan, updated plans and a final decommissioning plan.

The initial plan is prepared during the design stage of the facility. This plan is normally required before the regulatory body will provide an operating licence. A minimal amount of detail may be provided and many of the conclusions can be based on realistic assumptions. Some of the information identified in Table 1 may not be available and should be added later during the periodic review and revision of the initial plan. This initial decommissioning plan focuses on major pieces of equipment, facility structure, types and expected quantities of radionuclides to be used or handled, major processes, design drawings and process flow diagrams. The primary purpose of this version of the plan is to:

Provisions in Safety Standards Series No. WS-R-5

(pages 10 and 11)

5.4. For new facilities, consideration of decommissioning shall begin early in the design stage and shall continue through to the termination of the practice or the final release of the facility from regulatory control. The regulatory body shall ensure that operators take into account eventual decommissioning activities in the design, construction and operation of the facility, including features to facilitate decommissioning, the maintenance of records of the facility, and consideration of physical and procedural methods to prevent the spread of contamination.

5.6. The operating organization shall prepare and submit an initial decommissioning plan together with the application for authorization to operate the facility. This initial decommissioning plan is necessary to ensure that sufficient funds will be available for decommissioning, to facilitate early planning for minimization of the need for decontamination, and to provide for early acquisition and maintenance of records important for decommissioning.

FINAL PLANNING

Provisions in Safety Standards Series No. WS-G-2.1

(Page 14)

5.9. When the timing of the final shutdown of a nuclear reactor is known, the operating organization should initiate detailed studies and finalize proposals for decommissioning. Following this, the operating organization should submit an application containing the final decommissioning plan for review and approval by the regulatory body. The decommissioning plan may require amendments or further refinements as decommissioning proceeds, and may require further regulatory approval.

Provisions in Safety Reports Series No. 45

(page 8)

The final decommissioning plan is normally prepared before the facility permanently ceases operation, except when the facility is to go into a deferred dismantling mode. If this is the case, the plan is finalized approximately three to five years before the safe enclosure phase ends.

Approval by the regulatory body is normally needed before implementation of the final decommissioning strategy, i.e. decontamination and dismantling. This plan is the basis for the development of the detailed work instructions and procedures.

Provisions in Safety Standards Series No. WS-R-5

(page 12)

5.11. During the preparation of the final decommissioning plan, the extent and type of radioactive material (irradiated and contaminated structures and components) at the facility shall be determined by means of a detailed characterization survey and on the basis of records collected during the operational period. If nuclear material or operational waste remains at the facility, this radioactive material shall be included in the characterization survey.

Provisions in Safety Standards Series No. WS-R-5

(page 15)

8.2. The operating organization shall inform the regulatory body prior to shutting down the facility permanently. If a facility is shut down and no longer used for its intended purpose, a final decommissioning plan⁵ shall be submitted for approval within two years of the cessation of the authorized activities, unless an alternative schedule for the submission of the final decommissioning plan is specifically authorized by the regulatory body. The operating organization shall not implement the decommissioning plan until the regulatory body has approved it. Any amendments to this plan shall also be submitted to the regulatory body for approval. The operating organization shall ensure that the facility is maintained in a safe configuration until the approval of the decommissioning plan.

⁵ The final decommissioning plan is that version of the decommissioning plan submitted for approval to the regulatory body prior to implementation of the plan. During implementation of this final plan revisions or amendments may subsequently be needed as the activity progresses.

Conclusions

Decommissioning activity can be divided in:

- Preparatory decommissioning phase (development of a decommissioning strategy, initial decommissioning planning and radiological characterization) ;
- Implementation decommissioning phase (preparation of a final decommissioning plan and its submission to the regulatory body for authorization or approval, management of the project and implementation of the plan, management of the waste and demonstration that the site meets the end state criteria defined in the plan).

When normally begins the implementation decommissioning phase with the preparation of the final decommissioning plan, before cessation of the operation (SRS-45, page 8) or in transition period after cessation of operation (WS-R-5, page 15)?

Conclusions (cont.)

There are defined 3 stages for decommissioning plan:

- Initial decommissioning plan;
- Updated decommissioning plans (preliminary plans);
- Final decommissioning plans.

The initial decommissioning plan is required by regulatory body before to provide the:

- construction licence, as provided in WS-G-2.1 (page 13) ? We consider in Romania as preferable option.
- operation licence, as provided in SRS-45 (page 7)and WS-R-5 (pages 10-11)?

The final decommissioning plan is