Safety Requirements for Decommissioning of Research Reactors

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Background

• IAEA Statute:
  • Develop safety standards
    Nuclear safety
    Radiation Safety
    Waste Safety
    Transport Safety
  • Provide for their application
    Peer reviews
    Technical cooperation
    Training
    Exchange of information
    Research and development

Safety Standards Hierarchy

Safety Fundamentals
Safety Requirements
Safety Guides
Safety Reports
Safety Standards on Decommissioning

- Safety Requirements on Decommissioning of Facilities (DS333) in print
- Safety Requirements on Legal and Governmental Infrastructure, GS-R-1
- Decommissioning of Nuclear Power Plants and Research Reactors (WS-R-2.1 of 1999)
- Decommissioning of Medical, Industrial and Research Facilities (WS-G-2.2 of 1999)
- Decommissioning Fuel Cycle Facilities (WS-G-2.4) 2001
- Application of the Concepts of Exclusion, Exemption and Clearance (RS-G.1.7) 2004
- Release of Sites from Regulatory Control upon the Termination of Practices (DS-332)
- Safety Assessment of Decommissioning of Nuclear Facilities DS376 (in preparation)
Factors Affecting the Regulatory Process

- Legal systems
- Distribution of authorities among governmental agencies
- Ownership and organisation of nuclear industry
- Availability of qualified personnel and financial resources
- Waste management infrastructure, policies and strategies
- Spent fuel management, policies and strategies
- Funding arrangements (private and state owned facilities) for decommissioning, SF and radioactive waste management
- Prime responsibility for safety - operator

Regulatory Framework

- Legal framework
- Responsibilities
  - State
  - Regulatory Body
  - Other competent authorities
  - Operator
  - Waste management organization
- Regulations
  - Scope of regulation
  - Requirements and criteria
- Mechanisms
  - Authorization
  - Enforcement
  - Appeal
  - Release from regulatory control
Safety Requirements on Decommissioning

General

• Activities associated with the decommissioning as part of the original practice and BSS shall be endorsed
  • dose limits for normal exposure of workers and members of the public shall be applied – 20 mSv per year averaged over 5 years
  • clearance, exemption and exclusion principles apply – 10 µSv/a
  • limitation and optimisation shall applied with due regard to dose constraints – less than 300 µSv/a

• Environmental protection
  • during the entire decommissioning process and
  • beyond if a facility is released with radiological constraints
### Safety Requirements

- **Consideration of decommissioning at design stage**
- **The preferred decommissioning strategy shall be immediate dismantling.**
  - Justification for deferred dismantling or entombment options
  - deferred dismantling justification for no undue burdens are imposed
- **Consideration of non-radiological aspects of the hazards, such as those due to industrial safety issues or chemical waste**
- **Provisions for mitigation of potential exposures that may result from an emergency or accident.**

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### Safety Requirements

- **States** shall include provisions in their national legal framework for:
  - Clear responsibilities of regulators and operators
  - decommissioning, including the preparation of **decommissioning strategies and plans**
  - establishment of an **independent regulatory body for controlling decommissioning activities**
  - establishment of **funding mechanisms** for decommissioning and identification of responsibilities
  - development of a system for the **management of the material resulting from decommissioning.**
  - Ensure continuity of responsibilities
Safety Requirements

• The Regulatory Body shall establish
  • Control of protection of health, safety and environmental protection
  • All phases of decommissioning, from the initial plan to the final release of the facility from regulatory control
  • Assist in developing policies regarding decommissioning

Safety Requirements

• Develop regulations and guidance
  • criteria for determining when a nuclear facility, or part of a facility is permanently shutdown
  • safety and environmental criteria for the decommissioning, including:
    • conditions on the end points of decommissioning
  • limits and conditions for the removal of controls for facilities containing radionuclides and criteria for the clearance of material during and following decommissioning
Safety Requirements

• Issues licences/authorisations

• require baseline survey of the site, including radiological conditions, prior to construction to obtain information that can be used for comparison purposes with the end state after decommissioning.

• ensure that adequate arrangements to provide funding for decommissioning are in place before issuing an operating authorization.

• Liaise with other competent authorities

Safety Requirements

• Performs inspection and review of the operator’s decommissioning activities and plans

• ensure that a programme to implement and monitor compliance with regulatory requirements has been established, in case of remaining restrictions after decommissioning

• evaluate the completion of the end state of the facility after decommissioning activities in compliance with the release criteria

• Ensures long-term records for released sites
Safety Requirements

• Decommissioning shall not start without a satisfactory
decommissioning plan

• Regularly reviewed (about 10 y) by operator to reflect
changes in:
  • operation
  • regulatory requirements, etc

Safety Requirements

• The operator shall be responsible for all aspects of safety and
environmental protection during the decommissioning
activities, i.e.:
  • Provide adequate level of safety workers, public and
    environment
  • Prepare a decommissioning plan
  • Maintain decommissioning plans throughout the life of the
    nuclear facility
  • Develop the decommissioning plans commensurate with
    the type and status of the facility and the hazards
    associated with the decommissioning of the facility
Safety Requirements

• The operator shall:
  • Perform safety assessment shall before start of decommissioning activities:
    • that appropriate measures are taken to prevent such incidents and accidents
    • consequences shall be mitigated if such occur
    • demonstrated that the facilities and operation is adequately safe
    • compliance with relevant requirements and criteria

  • The extent and detail of safety assessment shall be commensurate with the complexity and the hazard associated with the facility or decommissioning operations

Safety Requirements

• Operator shall:
  • Prepare and implement appropriate safety procedures
    • Decommissioning
    • Transfer of the responsibility for the continuity of safety of the facility and for the control of radioactive material
    • Emergency planning arrangements commensurate with the associated hazards are established and maintained
    • Incidents significant to safety are reported to the regulatory body in a timely manner
    • Proper management for all waste streams arising from decommissioning activities
    • Safe storage of the waste is available until final disposal is completed.
Safety Requirements

• Operator shall ensure that:
  • Facilitate decommissioning during design, construction and operation
  • Apply good engineering practice
  • Ensure that staff are properly trained, qualified and competent
  • Establish and maintain records to support decommissioning
  • Adequate financial resources are in place to cover the costs associated with safe decommissioning, including that the management of the resulting waste, are available when needed
  • Financial assurance for decommissioning is obtained prior to the initial operation of the facility

Safety Requirements

• Before site release the operator shall:
  • Survey the site to demonstrate compliance
  • Document the demonstration that the facility meets the end state conditions in a final decommissioning report that is submitted to the regulatory body for review.
  • Management programme shall be conducted to provide necessary confidence
  • Decommissioning tasks shall be controlled through the use of written procedures
  • The operator shall ensure appropriate records generated during decommissioning that are relevant to decommissioning:
    • History of facility use
    • Events and incidents
    • Waste retrievals, conditioning, packaging or disposal, etc.
Safety Requirements

- Management system for decommissioning shall also ensure:
  - A management organization and the personnel resources are in place to ensure that the decommissioning can be completed safely
  - Individuals responsible for decommissioning activities are trained to appropriate levels of health, safety and environmental awareness and have the necessary skills, expertise and training to complete the decommissioning safely
  - Provisions are made to maintain the key staff and institutional knowledge about the facility
  - Safety culture shall be fostered and maintained

Decommissioning Regulation

- Approaches
  - Phase approach (Bulgaria, Ukraine, etc.)
  - Overall decommissioning process (e.g. UK, France)

- Graded regulatory approach
  - Focus on key and most important safety related issues
  - Verification of compliance with endpoints

- Development and periodic review and update of the decommissioning plan
  - Use of independent review
Regulatory Approval Process

• The operator needs to make an application for an operating license amendment or issuance of a new license for decommissioning

• Certain conditions may be contained in the new or modified license directing how facility is now to be operated

• Some decommissioning documents may require approval by the regulatory body before the activities can be implemented (i.e., decommissioning plan)

• The organization responsible for decommissioning (operator or other organisation) typically submits these documents to the regulatory body

Regulatory Approval Process (cont’d.)

• Upon review the regulatory body may request further information to clarify points

• Upon resolution of points commented upon, the regulatory body will formally transmit its approval to the operator

• Once the regulatory body approves the various documents, there may or may not be a set of license conditions

• Agreement should be established by the regulatory body and the operator on fulfilment of these conditions prior to starting decommissioning
Regulatory Approval Process (cont’d.)

- The regulatory body may require a formal request to terminate the operating license upon completion of decommissioning.

- This request may lead to an independent assessment that the decommissioning has been successfully completed upon which the regulatory body will formally respond that the license is terminated.

Standards Supporting Documents

- Safety Reports, Technical Report Series, TECDOCs
- Standard Format and Content for Safety Related Decommissioning Documents (SR 45)
- Safe Enclosure of Nuclear Facilities during Deferred Dismantling (SS 26) 2003
- A Report on the Worldwide Status of Decommissioning
- Safety Considerations in the Transition from Operations to Decommissioning of Nuclear Facilities (SR 36)
- Safe Enclosure of Nuclear Facilities During Deferred Dismantling (SRS 26)
- The Transition from Operation to Decommissioning of Nuclear Installations (TRS420)
- State-of-the-Art Technology for Decontamination and Dismantling of Nuclear Facilities (TRS395)
- Record Keeping for the Decommissioning of Nuclear Facilities: Guidelines and Experience (TRS411)
Standards Supporting Documents

- Organization and Management for Decommissioning of Large Nuclear Facilities (TRS399)
- Decommissioning of Small Medical, Industrial and Research Facilities (TRS 414)
- Safety Considerations for Research Reactors in Extended Shutdown (TECDOC 1387)
- Planning, Organizational and Management Aspects of Decommissioning: Lessons Learned (TECDOC 1394)
- Decommissioning Techniques for Research Reactors- Final report of a Coordinated Research Project 1997-2001 (TECDOC 1273)
- Methods for the Minimization of Radioactive Waste from Decontamination and Decommissioning of Nuclear facilities (TRS 401)

Current Focus

- Finalisation and implementation of safety requirements
- Revision of safety guides, and new guide on safety assessment for decommissioning
- Development of supporting documents
- Technical assistance on development legal and regulatory framework in MSs
  - Serbia and Montenegro, Phillipines, etc.
  - Georgia - planned
- International Conference on Decommissioning – Lessons Learned – 11-15 December 2005, Athens, Greece
- Coordination with international organisations – e.g. NEA, ICRP
Summary

- Legal and regulatory framework to cover all aspects related to decommissioning
- Different regulatory approaches
- Importance of
  - Clear requirements and criteria
  - Allocation of responsibilities
  - Adequate and effective mechanisms for regulatory control of compliance with safety requirements and criteria
- IAEA assistance
  - Standards development
  - Technical support to Member States on applying these standards in national regulations and implementation in practice