

IAEA Safety Standards

for protecting people and the environment

Decommissioning of Medical, Industrial and Research Facilities

Specific Safety Guide

No. SSG-49



IAEA

International Atomic Energy Agency



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IAEA SAFETY STANDARDS

Under the terms of Article III of its Statute, the IAEA is authorized to establish or adopt standards of safety for protection of health and minimization of danger to life and property, and to provide for the application of these standards.

The publications by means of which the IAEA establishes standards are issued in the **IAEA Safety Standards Series**. This series covers nuclear safety, radiation safety, transport safety and waste safety. The publication categories in the series are **Safety Fundamentals**, **Safety Requirements** and **Safety Guides**.

Information on the IAEA's safety standards programme is available on the IAEA Internet site

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The site provides the texts in English of published and draft safety standards. The texts of safety standards issued in Arabic, Chinese, French, Russian and Spanish, the IAEA Safety Glossary and a status report for safety standards under development are also available. For further information, please contact the IAEA at: Vienna International Centre, PO Box 100, 1400 Vienna, Austria.

All users of IAEA safety standards are invited to inform the IAEA of experience in their use (e.g. as a basis for national regulations, for safety reviews and for training courses) for the purpose of ensuring that they continue to meet users' needs. Information may be provided via the IAEA Internet site or by post, as above, or by email to Official.Mail@iaea.org.

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The Agency's Statute was approved on 23 October 1956 by the Conference on the Statute of the IAEA held at United Nations Headquarters, New York; it entered into force on 29 July 1957. The Headquarters of the Agency are situated in Vienna. Its principal objective is "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world".

IAEA SAFETY STANDARDS SERIES No. SSG-49

DECOMMISSIONING OF MEDICAL, INDUSTRIAL AND RESEARCH FACILITIES

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2019

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Marketing and Sales Unit, Publishing Section
International Atomic Energy Agency
Vienna International Centre
PO Box 100
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fax: +43 1 26007 22529
tel.: +43 1 2600 22417
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FOREWORD

by Yukiya Amano
Director General

The IAEA's Statute authorizes the Agency to “establish or adopt... standards of safety for protection of health and minimization of danger to life and property” — standards that the IAEA must use in its own operations, and which States can apply by means of their regulatory provisions for nuclear and radiation safety. The IAEA does this in consultation with the competent organs of the United Nations and with the specialized agencies concerned. A comprehensive set of high quality standards under regular review is a key element of a stable and sustainable global safety regime, as is the IAEA's assistance in their application.

The IAEA commenced its safety standards programme in 1958. The emphasis placed on quality, fitness for purpose and continuous improvement has led to the widespread use of the IAEA standards throughout the world. The Safety Standards Series now includes unified Fundamental Safety Principles, which represent an international consensus on what must constitute a high level of protection and safety. With the strong support of the Commission on Safety Standards, the IAEA is working to promote the global acceptance and use of its standards.

Standards are only effective if they are properly applied in practice. The IAEA's safety services encompass design, siting and engineering safety, operational safety, radiation safety, safe transport of radioactive material and safe management of radioactive waste, as well as governmental organization, regulatory matters and safety culture in organizations. These safety services assist Member States in the application of the standards and enable valuable experience and insights to be shared.

Regulating safety is a national responsibility, and many States have decided to adopt the IAEA's standards for use in their national regulations. For parties to the various international safety conventions, IAEA standards provide a consistent, reliable means of ensuring the effective fulfilment of obligations under the conventions. The standards are also applied by regulatory bodies and operators around the world to enhance safety in nuclear power generation and in nuclear applications in medicine, industry, agriculture and research.

Safety is not an end in itself but a prerequisite for the purpose of the protection of people in all States and of the environment — now and in the future. The risks associated with ionizing radiation must be assessed and controlled without unduly limiting the contribution of nuclear energy to equitable and sustainable development. Governments, regulatory bodies and operators everywhere must ensure that nuclear material and radiation sources are used beneficially, safely and ethically. The IAEA safety standards are designed to facilitate this, and I encourage all Member States to make use of them.

THE IAEA SAFETY STANDARDS

BACKGROUND

Radioactivity is a natural phenomenon and natural sources of radiation are features of the environment. Radiation and radioactive substances have many beneficial applications, ranging from power generation to uses in medicine, industry and agriculture. The radiation risks to workers and the public and to the environment that may arise from these applications have to be assessed and, if necessary, controlled.

Activities such as the medical uses of radiation, the operation of nuclear installations, the production, transport and use of radioactive material, and the management of radioactive waste must therefore be subject to standards of safety.

Regulating safety is a national responsibility. However, radiation risks may transcend national borders, and international cooperation serves to promote and enhance safety globally by exchanging experience and by improving capabilities to control hazards, to prevent accidents, to respond to emergencies and to mitigate any harmful consequences.

States have an obligation of diligence and duty of care, and are expected to fulfil their national and international undertakings and obligations.

International safety standards provide support for States in meeting their obligations under general principles of international law, such as those relating to environmental protection. International safety standards also promote and assure confidence in safety and facilitate international commerce and trade.

A global nuclear safety regime is in place and is being continuously improved. IAEA safety standards, which support the implementation of binding international instruments and national safety infrastructures, are a cornerstone of this global regime. The IAEA safety standards constitute a useful tool for contracting parties to assess their performance under these international conventions.

THE IAEA SAFETY STANDARDS

The status of the IAEA safety standards derives from the IAEA's Statute, which authorizes the IAEA to establish or adopt, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, standards of safety for protection of health and minimization of danger to life and property, and to provide for their application.

With a view to ensuring the protection of people and the environment from harmful effects of ionizing radiation, the IAEA safety standards establish fundamental safety principles, requirements and measures to control the radiation exposure of people and the release of radioactive material to the environment, to restrict the likelihood of events that might lead to a loss of control over a nuclear reactor core, nuclear chain reaction, radioactive source or any other source of radiation, and to mitigate the consequences of such events if they were to occur. The standards apply to facilities and activities that give rise to radiation risks, including nuclear installations, the use of radiation and radioactive sources, the transport of radioactive material and the management of radioactive waste.

Safety measures and security measures¹ have in common the aim of protecting human life and health and the environment. Safety measures and security measures must be designed and implemented in an integrated manner so that security measures do not compromise safety and safety measures do not compromise security.

The IAEA safety standards reflect an international consensus on what constitutes a high level of safety for protecting people and the environment from harmful effects of ionizing radiation. They are issued in the IAEA Safety Standards Series, which has three categories (see Fig. 1).

Safety Fundamentals

Safety Fundamentals present the fundamental safety objective and principles of protection and safety, and provide the basis for the safety requirements.

Safety Requirements

An integrated and consistent set of Safety Requirements establishes the requirements that must be met to ensure the protection of people and the environment, both now and in the future. The requirements are governed by the objective and principles of the Safety Fundamentals. If the requirements are not met, measures must be taken to reach or restore the required level of safety. The format and style of the requirements facilitate their use for the establishment, in a harmonized manner, of a national regulatory framework. Requirements, including numbered ‘overarching’ requirements, are expressed as ‘shall’ statements. Many requirements are not addressed to a specific party, the implication being that the appropriate parties are responsible for fulfilling them.

¹ See also publications issued in the IAEA Nuclear Security Series.

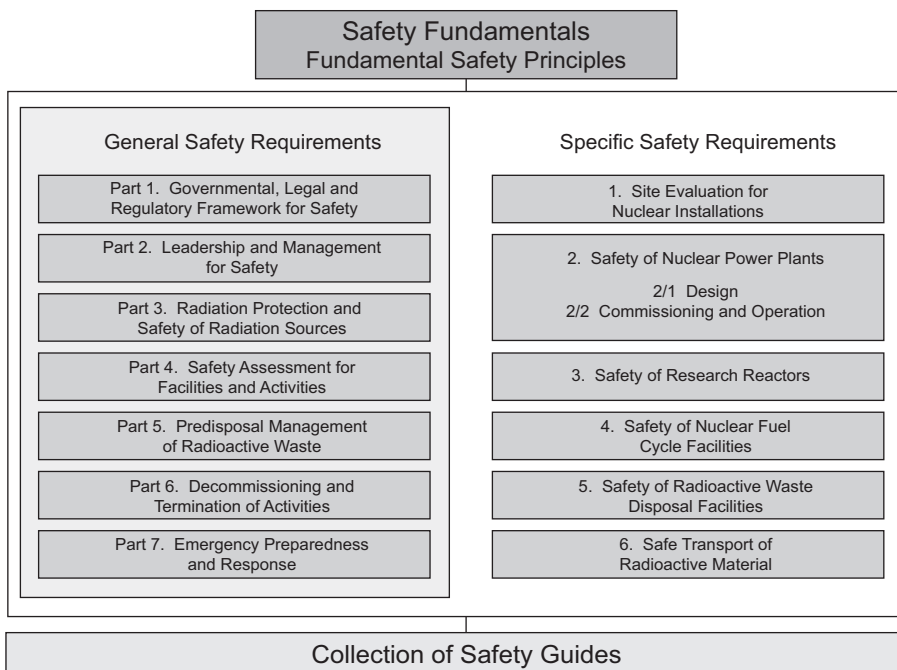


FIG. 1. The long term structure of the IAEA Safety Standards Series.

Safety Guides

Safety Guides provide recommendations and guidance on how to comply with the safety requirements, indicating an international consensus that it is necessary to take the measures recommended (or equivalent alternative measures). The Safety Guides present international good practices, and increasingly they reflect best practices, to help users striving to achieve high levels of safety. The recommendations provided in Safety Guides are expressed as ‘should’ statements.

APPLICATION OF THE IAEA SAFETY STANDARDS

The principal users of safety standards in IAEA Member States are regulatory bodies and other relevant national authorities. The IAEA safety standards are also used by co-sponsoring organizations and by many organizations that design, construct and operate nuclear facilities, as well as organizations involved in the use of radiation and radioactive sources.

The IAEA safety standards are applicable, as relevant, throughout the entire lifetime of all facilities and activities — existing and new — utilized for peaceful purposes and to protective actions to reduce existing radiation risks. They can be used by States as a reference for their national regulations in respect of facilities and activities.

The IAEA's Statute makes the safety standards binding on the IAEA in relation to its own operations and also on States in relation to IAEA assisted operations.

The IAEA safety standards also form the basis for the IAEA's safety review services, and they are used by the IAEA in support of competence building, including the development of educational curricula and training courses.

International conventions contain requirements similar to those in the IAEA safety standards and make them binding on contracting parties. The IAEA safety standards, supplemented by international conventions, industry standards and detailed national requirements, establish a consistent basis for protecting people and the environment. There will also be some special aspects of safety that need to be assessed at the national level. For example, many of the IAEA safety standards, in particular those addressing aspects of safety in planning or design, are intended to apply primarily to new facilities and activities. The requirements established in the IAEA safety standards might not be fully met at some existing facilities that were built to earlier standards. The way in which IAEA safety standards are to be applied to such facilities is a decision for individual States.

The scientific considerations underlying the IAEA safety standards provide an objective basis for decisions concerning safety; however, decision makers must also make informed judgements and must determine how best to balance the benefits of an action or an activity against the associated radiation risks and any other detrimental impacts to which it gives rise.

DEVELOPMENT PROCESS FOR THE IAEA SAFETY STANDARDS

The preparation and review of the safety standards involves the IAEA Secretariat and five safety standards committees, for emergency preparedness and response (EPReSC) (as of 2016), nuclear safety (NUSSC), radiation safety (RASSC), the safety of radioactive waste (WASSC) and the safe transport of radioactive material (TRANSSC), and a Commission on Safety Standards (CSS) which oversees the IAEA safety standards programme (see Fig. 2).

All IAEA Member States may nominate experts for the safety standards committees and may provide comments on draft standards. The membership of

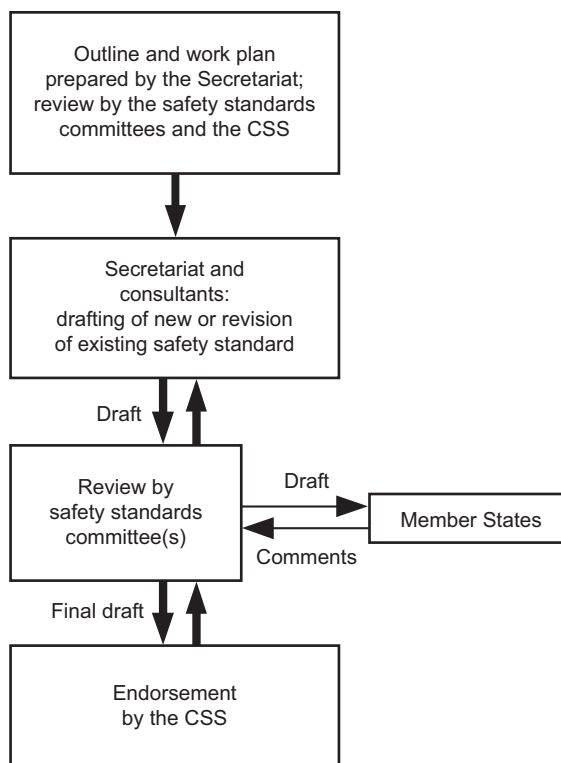


FIG. 2. The process for developing a new safety standard or revising an existing standard.

the Commission on Safety Standards is appointed by the Director General and includes senior governmental officials having responsibility for establishing national standards.

A management system has been established for the processes of planning, developing, reviewing, revising and establishing the IAEA safety standards. It articulates the mandate of the IAEA, the vision for the future application of the safety standards, policies and strategies, and corresponding functions and responsibilities.

INTERACTION WITH OTHER INTERNATIONAL ORGANIZATIONS

The findings of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the recommendations of international

expert bodies, notably the International Commission on Radiological Protection (ICRP), are taken into account in developing the IAEA safety standards. Some safety standards are developed in cooperation with other bodies in the United Nations system or other specialized agencies, including the Food and Agriculture Organization of the United Nations, the United Nations Environment Programme, the International Labour Organization, the OECD Nuclear Energy Agency, the Pan American Health Organization and the World Health Organization.

INTERPRETATION OF THE TEXT

Safety related terms are to be understood as defined in the IAEA Safety Glossary (see <http://www-ns.iaea.org/standards/safety-glossary.htm>). Otherwise, words are used with the spellings and meanings assigned to them in the latest edition of The Concise Oxford Dictionary. For Safety Guides, the English version of the text is the authoritative version.

The background and context of each standard in the IAEA Safety Standards Series and its objective, scope and structure are explained in Section 1, Introduction, of each publication.

Material for which there is no appropriate place in the body text (e.g. material that is subsidiary to or separate from the body text, is included in support of statements in the body text, or describes methods of calculation, procedures or limits and conditions) may be presented in appendices or annexes.

An appendix, if included, is considered to form an integral part of the safety standard. Material in an appendix has the same status as the body text, and the IAEA assumes authorship of it. Annexes and footnotes to the main text, if included, are used to provide practical examples or additional information or explanation. Annexes and footnotes are not integral parts of the main text. Annex material published by the IAEA is not necessarily issued under its authorship; material under other authorship may be presented in annexes to the safety standards. Extraneous material presented in annexes is excerpted and adapted as necessary to be generally useful.

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1. INTRODUCTION

BACKGROUND

1.1. For many decades, radioactive material has been in use in medical, industrial and research facilities¹. Facilities using radioactive material and radioactive sources in a variety of applications were constructed and commissioned in many States over the past decades. Many of these facilities are reaching the end of their operational lifetimes and will be facing permanent shutdown². Other facilities might be facing early permanent shutdown owing to bankruptcy or other unanticipated reasons. These facilities will all need to be decommissioned. This Safety Guide recommends a consistent approach to planning and implementing the decommissioning of both new and existing facilities, incorporating experience and lesson learned from previous decommissioning projects.

1.2. As defined in the IAEA Safety Standards Series No. GSR Part 6, Decommissioning of Facilities [1], “the term ‘decommissioning’ refers to the administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a facility”. While decommissioning is the last stage in the lifetime of a facility, aspects of decommissioning, such as designing for the minimization of radioactive waste, planning for decommissioning and record keeping, should be considered throughout the lifetime of the facility, beginning with the initial planning and design of the facility.

1.3. Decommissioning actions involve decontamination, dismantling and removal of structures, systems and components (SSCs), including the management of the resulting radioactive waste and radiation protection of workers who are carrying out the decommissioning, as well as radiological surveys to support decommissioning. These actions are carried out to achieve a progressive and systematic reduction of radiological hazards during decommissioning, and are taken on the basis of planning and assessment to ensure safety, to ensure protection of workers and the public and protection of the environment, and to demonstrate that the facility achieves the planned end state.

¹ The term ‘facility’ means buildings and their associated land and equipment, including the surface and subsurface soil, and any surface or subsurface water or aquifers. In this Safety Guide, the term ‘facility’ is used with a limited scope to refer to medical, industrial and research facilities.

² The term ‘permanent shutdown’, as used in this Safety Guide, means that the facility has ceased operations and operation will not be recommenced.

1.4. Decontamination, dismantling and other decommissioning actions may be carried out immediately following permanent shutdown or may be deferred until after a safe enclosure³ period (e.g. to allow for radioactive decay). As a consequence, the time period for the conduct of decommissioning actions typically ranges from a few weeks for simple and small facilities, to years for larger and more complex facilities, especially if there is a safe enclosure period. Decommissioning may include a phased release of parts of the facility from regulatory control during conduct of decommissioning actions. On completion of all planned decommissioning actions and on reaching the planned end state, the authorization for decommissioning can be terminated. The site and remaining structures of the facility, if any, will be available for unrestricted or restricted reuse for other purposes.

1.5. Depending on the national regulatory system, decommissioning of a facility might be subject to the granting of a licence for decommissioning or an authorization to perform decommissioning actions in the framework of a licence granted for the whole lifetime of the facility. In this Safety Guide, the term ‘authorization for decommissioning’ is used to mean whichever of these regulatory concepts is relevant.

1.6. For some small and simple facilities with a very low level of hazard, decommissioning actions may consist of removal and return of all the sources to the supplier, followed by a survey to verify that there are no areas with residual contamination above the approved end state criteria. This may be done in the bounds of the operating licence⁴, if so allowed by national regulations. In such cases, no specific authorization for decommissioning is granted before the conduct of decommissioning actions. After performing decommissioning actions, a final report is produced by the licensee to request termination of the operating licence for the facility (see Section 9 of this Safety Guide).

1.7. The decommissioning of a medical, industrial or research facility is usually conducted as a project. A decommissioning project is a collaborative initiative, involving supporting analyses and studies, which is carefully planned to ensure the safety of the planned actions, and to achieve partial or complete removal of

³ The term ‘safe enclosure’ means the period during the implementation of the deferred dismantling strategy in which the facility is placed and maintained in a safe, long term storage condition until decontamination and dismantling actions are performed.

⁴ In certain States, the term ‘operating licence’ may encompass the licence to conduct decommissioning; in some cases, the operating licence may need only to be amended to cover all regulatory aspects pertaining to decommissioning.

regulatory controls from a facility. A decommissioning project is temporary and is conducted by teams within or across organizations. A decommissioning project usually starts when preparation of the final decommissioning plan is initiated or, in some cases, when an authorization for decommissioning is granted.

1.8. In order to simplify approaches to the decommissioning processes and to provide more illustrative guidance, this Safety Guide categorizes the facilities to be decommissioned into three different types, based on their radiation risk: simple facilities, intermediate facilities and complex facilities. This categorization relates to the application of a graded approach in the decommissioning of different types of medical, industrial and research facility. This Safety Guide addresses implications of this categorization scheme in the regulatory review of decommissioning regarding the type of information and documents to be submitted to the regulatory body (e.g. the decommissioning plan and the safety assessment). Typical examples of the three different categories of facility are provided in Annex I.

1.9. This Safety Guide supersedes Decommissioning of Medical, Industrial and Research Facilities, issued in 1999.⁵ Guidance on the decommissioning of nuclear power plants, research reactors and other fuel cycle facilities can be found in IAEA Safety Standards Series No. SSG-47, Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities [2].

1.10. Requirements and guidance on the radiation protection, regulatory control of discharges of radioactive effluents to the environment and associated management of radioactive waste are provided in IAEA Safety Standards Series No. GSR Part 3, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards [3] and IAEA Safety Standards Series No. GSG-9, Regulatory Control of Radioactive Discharges to the Environment [4].

1.11. Requirements and guidance on radiological criteria for the release of materials, equipment and sites from regulatory control are provided in GSR Part 3 [3]; IAEA Safety Standards Series No. RS-G-1.7, Application of the Concepts of Exclusion, Exemption and Clearance [5]; and IAEA Safety Standards Series No. WS-G-5.1, Release of Sites from Regulatory Control on Termination of Practices [6].

⁵ INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Medical, Industrial and Research Facilities, IAEA Safety Standards Series No. WS-G-2.2, IAEA, Vienna (1999).

1.12. Requirements and guidance on transport of radioactive material and the associated safety and environmental aspects are provided in IAEA Safety Standards Series No. SSR-6 (Rev. 1), Regulations for the Safe Transport of Radioactive Material, 2018 Edition [7] and IAEA Safety Standards Series No. SSG-26, Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition) [8].

OBJECTIVE

1.13. The objective of this Safety Guide is to provide guidance for regulatory bodies, licensees, owners, technical support organizations and other interested parties on meeting the requirements on planning for decommissioning, conducting decommissioning actions including characterization surveys, demonstrating completion of decommissioning and terminating the authorization for decommissioning of medical, industrial and research facilities. It aims to assist States in ensuring that decommissioning of these facilities is conducted in a safe and environmentally acceptable manner, in accordance with good international practice.

SCOPE

1.14. This Safety Guide addresses decommissioning considerations and actions for safe decommissioning of medical, industrial and non-reactor research facilities in which radioactive materials and sources are produced, used or stored. This Safety Guide does not address decommissioning of nuclear fuel cycle facilities (uranium conversion plants, uranium enrichment plants, nuclear fuel fabrication plants, research reactors including subcritical and critical assemblies, nuclear power plants, facilities for storage of spent fuel, reprocessing facilities and facilities for predisposal management of radioactive waste) and decommissioning of the surface processing facilities for mining and processing of uranium and thorium ores and other facilities used for industrial activities involving naturally occurring radioactive material. The decommissioning of these types of facility is addressed in SSG-47 [2] and IAEA Safety Standards Series No. WS-G-1.2, Management of Radioactive Waste from the Mining and Milling of Ores [9].

1.15. The scope of this Safety Guide includes the decommissioning of nuclear fuel cycle research and development facilities that conduct laboratory scale experiments and fundamental research studies on specific nuclear materials such as prototype nuclear fuels (before and after irradiation in a reactor) or investigations of nuclear

material or waste arising from new processes. The decommissioning of nuclear fuel cycle research and development facilities conducting activities on processes and equipment envisaged for use on an industrial scale (e.g. pilot plants or demonstration plants) is outside the scope of this Safety Guide. Recommendations and guidance on decommissioning of such facilities are provided in SSG-47 [2].

1.16. Compliance with decommissioning requirements can be achieved through the application of a graded approach, depending on the type and complexity of the facility, its radioactive inventory and the potential hazards associated with decommissioning. For example, the graded approach can be applied to the process of selecting the decommissioning strategy, planning for decommissioning, the conduct of decommissioning actions, and the envisioned end state.

1.17. In cases where only a part of a facility is being decommissioned, this Safety Guide applies only to decommissioning actions associated with the part of the facility being decommissioned. However, the potential safety implications for any continuing operations of the facility need to be addressed.

1.18. This Safety Guide applies to planned, authorized activities. Although some reference is made to remediation in the context of decommissioning of facilities, this Safety Guide does not apply to remediation situations, which are addressed in other IAEA safety standards [3, 10].

1.19. This Safety Guide addresses the radiation risks resulting from actions associated with decommissioning of medical, industrial and research facilities, and from the management of waste and material arising from the decommissioning actions. It is intended primarily for facilities with a normal operational history, followed by a planned permanent shutdown. However, many of the considerations are also applicable to decommissioning after an early, unintended permanent shutdown or an accident that has resulted in damage to the facility or contamination of the facility's premises. In such cases, this Safety Guide may be used as a basis for developing special decommissioning provisions to address the post-accident situation.

1.20. The hazards associated with medical, industrial and research facilities often involve chemical, biological and industrial hazards in addition to the radiological hazards, and consideration should be given to addressing all hazards in an integrated manner, to ensure a high level of safety in relation to both radiological and non-radiological hazards. For example, non-radiological hazards, such as those due to the release of asbestos or polychlorinated biphenyl, might be encountered during decommissioning actions. This Safety Guide does not explicitly address

non-radiological hazards, but these hazards need to be considered in all aspects of decommissioning, including planning for decommissioning, management of decommissioning, financing of decommissioning, conduct of decommissioning actions and completion of decommissioning.

1.21. Normally, the decommissioning of most medical, industrial and research facilities does not involve major security concerns, but for some facilities, security aspects during decommissioning may have to be considered. This Safety Guide does not provide guidance on the security aspects of decommissioning. The IAEA issues Fundamentals and Recommendations on nuclear security in the IAEA Nuclear Security Series [11–13]. Requirements pertaining to interfaces of safety with nuclear security are established in IAEA Safety Standards Series No. GSR Part 1 (Rev. 1), Governmental, Legal and Regulatory Framework for Safety [14]. Aspects relating to accounting for and control of nuclear material might continue to exist during decommissioning of some types of facility, but are outside the scope of this Safety Guide.

STRUCTURE

1.22. Section 2 addresses the issues relating to protection of people and protection of the environment, including the application of a graded approach for the whole decommissioning process and optimization of protection and safety. It also addresses the assessment of safety for decommissioning. Section 3 describes the responsibilities of the major parties involved in decommissioning. Guidance on the management of decommissioning is provided in Section 4, while Section 5 describes the selection of a decommissioning strategy. Section 6 addresses financing of decommissioning. Planning for decommissioning during all stages of the facility's lifetime is addressed in Section 7. Section 7 describes various types of decommissioning plan, which are developed and maintained throughout the facility's lifetime. Section 8 describes the conduct of decommissioning actions, including the management of decommissioning waste, radiation protection and emergency response. Section 9 addresses the completion of decommissioning, including surveys and reporting to support the termination of the authorization for decommissioning.

1.23. Appendix I addresses the development of a safety assessment in support of the decommissioning plan for medical, industrial and research facilities. Appendix II elaborates on the factors to be considered when selecting a decommissioning strategy.

1.24. Annex I defines the three categories of medical, industrial and research facilities and provides examples of facilities in each category. Annex II provides an example of an outline of a final decommissioning plan for medical, industrial and research facilities. Annex III provides an example of the content of the final decommissioning report. Annex IV provides an example of the content of the final radiological survey report. Annex V provides a list of typical supporting documents for the final decommissioning plan. Annex VI provides a list of reference publications that contain additional information on specific organizational, technical, financial and safety issues relating to decommissioning, including considerations for facilities other than medical, industrial and research facilities.

2. PROTECTION OF PEOPLE AND PROTECTION OF THE ENVIRONMENT

Requirement 1 of GSR Part 6 [1]: Optimization of protection and safety in decommissioning

“Exposure during decommissioning shall be considered to be a planned exposure situation and the relevant requirements of the Basic Safety Standards shall be applied accordingly during decommissioning.”

2.1. The principles of radiation protection and safety for radiation sources are provided in GSR Part 3 [3] and IAEA Safety Standards Series No. GSG-7, Occupational Radiation Protection [15].

2.2. Arrangements for radiation protection during decommissioning should be addressed in the decommissioning plan and should be based on the national requirements for radiation protection. In addition to compliance with dose limits, optimization of protection is required to be implemented (para. 2.1 of GSR Part 6 [1]), with account taken of the specifics of the decommissioning project and with due regard to the relevant dose constraints.

2.3. Although the principles and aims of radiation protection during operation and during decommissioning are fundamentally the same, the methods and procedures for implementing radiation protection might differ owing to differences in the actions to be performed, the physical conditions of the facility, the need for access to highly activated materials or contaminated equipment or areas, and the removal of SSCs. Special situations might need to be considered, which might require the

use of remote technology or specialized equipment and the implementation of temporary measures or use of certain non-routine procedures.

2.4. Proper consideration is required to be given to the protection of workers and the public and protection of the environment against consequences of incidents that might occur during decommissioning (para. 2.2 of GSR Part 6 [1]). A system for protection and safety that is commensurate with the likelihood and the magnitude of potential exposures should be maintained. Where appropriate, this can be a system of multiple, sequential, independent provisions for protection and safety.

2.5. An example where protection of workers should be considered is workers having to work in close proximity to activated components (e.g. in accelerators) being dismantled or decontaminated, which could lead to significant exposure or spread of contamination. Special attention should be paid to preventing and reducing the exposure of workers by implementing specific and appropriate controls for protection of personnel. Engineering controls may also be needed and personal protective equipment may need to be tailored to specific work conditions, for example enhancing the puncture resistance of protective gloves to prevent injuries that might result in an intake of radionuclides.

2.6. Incidents or accidents that might occur during decommissioning could lead to radiological impacts outside the boundaries of the facility undergoing decommissioning. For example, to protect on-site personnel, the public and the environment from exposure due to the spread of radioactive substances, active safety systems such as ventilation systems and fire protection systems might need to be retained for some period during decommissioning. In the case of on-site or off-site contamination, actions might be necessary to remediate the contaminated areas or to confine releases of radioactive substances, such as contaminated water, by applying emergency response actions. Such issues are not addressed in this Safety Guide. Remediation of off-site areas is addressed in IAEA safety standards [3, 10], while emergency preparedness and response is addressed in IAEA Safety Standards Series No. GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency [16].

2.7. Remedial actions for the area immediately surrounding a facility might be part of the decommissioning project when the facility has been permanently shut down after an accident. Decommissioning usually does not include remedial actions for large areas outside the facility boundaries defined in the operating licence.

2.8. Records and data of the nature and extent of the emergency arrangements established during normal operation should be considered during planning for decommissioning.

2.9. In addition to protection of workers and the public, licensees are required to consider and plan for protection of the environment during decommissioning (para. 2.3 of GSR Part 6 [1]). Adequate controls should be defined to ensure mitigation of significant impacts on the environment, both on the site and in the surrounding area. For some facilities, an environmental impact assessment⁶ may need to be developed concurrently with the final decommissioning plan, consistent with national requirements. Protection of the environment should be ensured during decommissioning and after its completion if a site is released with restrictions on its future use. Specific measures should be implemented by the licensee, depending on the end state described in the final decommissioning plan. The stringency of measures relating to protection of the environment should be commensurate with the level of hazard. Some of the measures recommended in this Safety Guide might not be necessary for simple facilities with a low level of hazard (see Annex I).

2.10. The licensee should indicate in the environmental impact assessment for decommissioning, which supports the final decommissioning plan, how compliance with applicable requirements for protection of the environment will be ensured, including responsibilities and measures for monitoring, control and surveillance during decommissioning and after its completion, if necessary.

Requirement 2 of GSR Part 6 [1]: Graded approach in decommissioning

“A graded approach shall be applied in all aspects of decommissioning in determining the scope and level of detail for any particular facility, consistent with the magnitude of the possible radiation risks arising from the decommissioning.”

2.11. The range of decommissioning actions for medical, industrial and research facilities is broad, and the scope, extent and level of detail of planning,

⁶ The term ‘environmental impact assessment’ is included in many international instruments and national legislation and regulations. In the context of IAEA Safety Standards Series No. GSG-10, Prospective Radiological Environmental Impact Assessment for Facilities and Activities [17], an environmental impact assessment refers to a procedure within a governmental decision making process for identifying, describing and assessing prospectively the effects, and the risk of effects, of a particular proposed activity or facility on aspects of environment significance.

assessment and demonstration of safety and preparation, review and update of safety related documentation should be commensurate with the types and magnitude of hazards, and their potential consequences for workers, the public and the environment. Therefore, a graded approach is required to be applied to planning for decommissioning, conducting decommissioning actions, completing the decommissioning and terminating the authorization, releasing the site for unrestricted or restricted use and to the regulatory oversight of the decommissioning process (Requirement 2 of GSR Part 6 [1]). The graded approach should be applied in a manner that does not compromise safety and ensures compliance with all relevant safety requirements and criteria.

2.12. The application of a graded approach should support effective and optimized use of resources. In the context of medical, industrial and research facilities, in a graded approach, the type of information and the level of detail in the decommissioning plans and supporting documents, including the safety assessments and actions necessary to comply with the safety requirements, should be commensurate with the factors listed below:

- The size and type of the facility, including its complexity and its operational history;
- The physical state of the facility, specifically the integrity of the SSCs and, in particular, the extent to which ageing or abandoned buildings or other structures may have been compromised owing to, for example, a long period of poor maintenance;
- The radiological inventory (e.g. the activity of sealed sources and unsealed sources and contamination), the biological inventory and the chemical inventory and the hazards associated with the decommissioning of the facility;
- The stage in the lifetime of the facility (siting, design, construction, commissioning, operation, shutdown or decommissioning), for example the preparation of an initial decommissioning plan at the design stage and preparation of a final decommissioning plan prior to conduct of decommissioning actions;
- The scope of the project (e.g. for a part of a facility, a whole facility, a single facility at a multifacility site or an entire multifacility site); and the extent to which the proposed decommissioning actions could adversely affect ongoing activities elsewhere at the facility or at nearby facilities;
- Uncertainty of the information (e.g. information on the quality and extent of the characterization of the facility) and the reliability and availability of relevant supporting information (e.g. drawings and records of modifications) to be used as input data for planning;

- The complexity and risks associated with the planned decommissioning actions;
- The end state of the decommissioning of the facility (e.g. unrestricted or restricted use, total removal of all structures or reuse of some structures or parts of the facility);
- The extent and level of radiological contamination as well as accessibility to conduct cleanup or remediation.

2.13. Successful decommissioning depends on adequate and organized planning and the systematic conduct of the decommissioning actions in accordance with the authorization issued. The application of a graded approach has an impact throughout the decommissioning project, specifically in the following areas:

- Documentation (the scope of the final decommissioning plan, its content and the level of detail necessary might differ depending on the complexity and hazard potential of the facility and should be consistent with national regulations);
- Identification of the SSCs (SSCs already present in the facility and new SSCs) that are needed for the safe decommissioning of the facility, and specification of the associated control requirements;
- The authorization process;
- Control of decommissioning actions;
- The monitoring programme;
- Management of the decommissioning project (e.g. the organizational structure);
- Staffing and training;
- Regulatory oversight;
- The involvement of interested parties.

2.14. Some decommissioning actions can be limited in scope and the hazard from radioactive material might consequently be small. The actual approach to decommissioning should be determined with account taken of the hazards involved, as inappropriate or unduly restrictive safety measures might be a barrier to the good management of safety and could increase costs to no benefit.

Requirement 3 of GSR Part 6 [1]: Assessment of safety for decommissioning

“Safety shall be assessed for all facilities for which decommissioning is planned and for all facilities undergoing decommissioning.”

2.15. Decommissioning of facilities is associated with numerous radiological and non-radiological hazards. In addition to existing radiological hazards associated with a permanently shutdown facility, decommissioning actions might create new hazards that need to be considered, for example through the use of cutting tools or the generation of airborne contamination and secondary radioactive waste⁷. Therefore, through planning for decommissioning, those hazards should be adequately assessed and managed.

2.16. Decommissioning of facilities often involves the removal, at an early stage, of significant quantities of radioactive material, including radioactive sources and waste from operation. After this step, the remaining total contamination and activation of the facility should be taken into account in the safety assessment.

2.17. A safety assessment is required to be performed (para. 2.6 of GSR Part 6 [1]) to support development of the final decommissioning plan (see Fig. 1 in Section 7) and to support the conduct of associated specific decommissioning actions by demonstrating that the safety and the protection of workers and the public are optimized and that exposures do not exceed the relevant limits and constraints.

2.18. The safety assessment should be conducted to define the protective measures necessary to ensure the protection of workers, the public and the environment. Such protective measures should be determined on the basis of an optimization approach to radiation protection, with due regard to industrial safety, in accordance with the requirements established in IAEA Safety Standards Series No. GSR Part 4 (Rev. 1), Safety Assessment for Facilities and Activities [18] and the guidance provided in IAEA Safety Standards Series No. WS-G-5.2, Safety Assessment for the Decommissioning of Facilities Using Radioactive Material [19]. In the case of medical facilities where there is regular access by the public, the exposure of the public during decommissioning should be assessed, optimized and controlled.

⁷ Secondary radioactive waste is a by-product of the processing of primary radioactive waste.

2.19. The licensee is required to control the work of any subcontractors (para. 4.3 of GSR Part 6 [1]) involved in development of the safety assessment. The results of the safety assessment or part of the safety assessment developed by subcontractors, depending on their relevant knowledge and experience in specific decommissioning techniques, should be reviewed, made subject to approval or acceptance, and implemented by the licensee, in accordance with the integrated management system. The results of the safety assessment should also be reviewed and made subject to approval by the regulatory body to ensure overall safety during decommissioning.

2.20. The results of the safety assessments will determine which safety functions and related SSCs used in the operational stage will no longer be needed after operation has permanently ceased. However, some of the safety functions will continue to be required during decommissioning, and decommissioning can also give rise to the identification of new safety functions and to a need for the commissioning of associated SSCs. The safety assessment should demonstrate consistency among the safety measures during the entire process of decommissioning, and it should be updated when necessary to reflect the ongoing changes in the status of the facility as decommissioning actions progress.

2.21. The safety assessment should enable demonstration of compliance with regulatory safety criteria and demonstration of optimization of protection. The results of the safety assessment should lead to the definition of decommissioning limits and conditions, which consist of a set of rules that establish parameter limits, the functional capability and the performance levels of the equipment and the personnel for the safe decommissioning of a facility. The decommissioning limits and conditions should be reflected in the authorization for decommissioning and in the decommissioning procedures. The results of the safety assessment should also be used to inform the radiation protection programme. The safety assessment should be used to help ensure that interested parties are confident in the safety of decommissioning.

2.22. The safety assessment should demonstrate that interdependences between planned decommissioning actions are taken into account, and that any negative impacts of one action on another, as well as the possible generation of additional hazards, are properly taken into account.

2.23. For the majority of medical, industrial and research facilities, an extensive environmental impact assessment is not required for decommissioning. However, an environmental analysis could be included as part of the decommissioning plan. For complex facilities, a summary and the conclusion of the environmental

impact assessment of the decommissioning actions should be included in the decommissioning plan.

2.24. Appendix I provides additional guidance on preparation of the safety assessment for decommissioning of medical, industrial and research facilities.

3. RESPONSIBILITIES ASSOCIATED WITH DECOMMISSIONING

3.1. The decommissioning process for facilities involves several organizations, the key organizations being the government, the regulatory body and the licensee. This section addresses the responsibilities of the government, the regulatory body and the licensee in the planning, conduct and completion of decommissioning of facilities.

Requirement 4 of GSR Part 6 [1]: Responsibilities of the government for decommissioning

“The government shall establish and maintain a governmental, legal and regulatory framework within which all aspects of decommissioning, including management of the resulting radioactive waste, can be planned and carried out safely. This framework shall include a clear allocation of responsibilities, provision of independent regulatory functions, and requirements in respect of financial assurance for decommissioning.”

3.2. In preparing and implementing the national policy for decommissioning, which may be part of the national policy for management of radioactive waste, the government should establish the overall objectives of decommissioning. The policy should be developed by the government in cooperation with relevant organizations, including licensees, and with an involvement of the public and other interested parties. Where a national policy and strategy for decommissioning of medical, industrial and research facilities has not yet been developed or is at an early stage of development, the regulatory body should advise the government on the requirements for, and the effectiveness of, the national policy for decommissioning and radioactive waste management and should provide assistance in its update and improvement.

3.3. A framework for regulating decommissioning is required to be established in national legislation (Requirement 4 of GSR Part 6 [1]). The enabling legislation should be consistent with the relevant national policies, and should be straightforward, feasible and flexible, so that the need for its subsequent amendment is minimized. This is important because amending legislation is usually a slow and resource intensive process.

3.4. Although it is preferable that regulatory responsibilities for decommissioning are held by a single regulatory body, in some States such responsibilities are divided among several bodies already having specific responsibilities for protection and safety. It should be ensured that the regulation of all aspects of radiation safety, transport safety, waste safety, industrial safety and environmental safety is covered adequately and that the responsibilities of the governmental bodies involved are clearly specified and allocated. The legislation should establish clear lines of authority and responsibility, so as to avoid gaps or overlaps between different regulatory bodies having responsibilities for decommissioning.

3.5. One of the main responsibilities of the government is to ensure that mechanisms for providing adequate financial resources are put in place, so that an appropriate level of funding is available to decommission facilities in a safe and timely manner.

3.6. If decommissioning has to be performed in a situation for which the government has not established a legal and regulatory framework, for example to address safety issues relating to deteriorating structures, the decommissioning should be planned and managed on a case by case basis in consultation with the relevant authority or authorities having responsibility for radiation, transport, waste, industrial and environmental safety. In such cases, the licensee should consult the regulatory body with regard to development and implementation of a decommissioning plan.

Requirement 5 of GSR Part 6 [1]: Responsibilities of the regulatory body for decommissioning

“The regulatory body shall regulate all aspects of decommissioning throughout all stages of the facility’s lifetime, from initial planning for decommissioning during the siting and design of the facility, to the completion of decommissioning actions and the termination of authorization for decommissioning. The regulatory body shall establish the safety requirements for decommissioning, including requirements

for management of the resulting radioactive waste, and shall adopt associated regulations and guides. The regulatory body shall also take actions to ensure that the regulatory requirements are met.”

3.7. When developing regulations, the regulatory body should identify clearly the facilities and activities to which regulatory requirements are to be applied. The regulatory body is required to establish safety criteria and regulations for all aspects of decommissioning, including for management of the associated radioactive waste (Requirement 5 of GSR Part 6 [1]). The regulatory body is required to oversee the implementation of the requirements (para. 3.3 of GSR Part 6 [1]) and should control compliance by the licensee with the requirements for planning for decommissioning, conduct of decommissioning actions and completion of decommissioning, including termination of the authorization for decommissioning.

3.8. The regulatory body should follow consistent procedures for establishing, revising and revoking regulations and guidance. Interested parties should be involved in the process.

3.9. Experience in implementing the regulations should be examined by the regulatory body and any problems or difficulties that might arise should be duly considered. The status of applicable requirements should also be examined taking into consideration the state of the art of science and technology (e.g. new safety related developments and lessons learned from decommissioning projects in the State and in other States).

3.10. In order to facilitate the regulatory review process, the regulatory body should provide guidance for the licensee on the typical content of decommissioning plans and supporting documentation, as well as the necessary analysis that would support the process of assessing safety and regulatory compliance. Details of the guidance should consider the graded approach concept (e.g. less detail for simple facilities with low level hazards). In particular, the regulatory review of the safety related documentation for decommissioning should focus on determining whether the selection of decommissioning strategy, the final decommissioning plan, the proposed decommissioning actions, the environmental impact assessment⁸ and the safety assessment for decommissioning comply with the regulatory requirements.

⁸ The review of the environmental impact assessment might be the responsibility of a national authority other than the regulatory body.

3.11. The regulatory body should develop a process for consideration of applications for an authorization for decommissioning, including the process for review of the application. This process should identify milestones and decision points and should specify the period of time for the regulatory review. The process might include performing an acceptance review of the application for decommissioning prior to performing the review of the final decommissioning plan and its supporting documents in accordance with national requirements. Interested parties are required to be given an opportunity to comment on the final decommissioning plan and safety related supporting documents before the authorization is granted, in accordance with national regulations (para. 3.3 of GSR Part 6 [1]).

3.12. The regulatory body should require notification by the licensee of any significant changes to the planned actions described in the final decommissioning plan that might have implications for the safety of decommissioning or for the end state of the facility. Such changes should be subject to an assessment by the licensee, with account taken of the nature and potential magnitude of the associated risks. The regulatory body should review this assessment and should consider amending or renewing the authorization for decommissioning, as appropriate.

3.13. The regulatory body is required to establish a regulatory provision for the termination of an authorization (para. 3.3 of GSR Part 6 [1]), which would support a decision for release of a site (entire site or parts of the site) for unrestricted or restricted use. For cases for which unrestricted use of a site is unachievable, the regulatory body is required to consider whether the site conditions and any proposed institutional controls, as well as proposed provisions for on-site and off-site radiological and environmental monitoring, are acceptable (para. 9.3 of the GSR Part 6).

3.14. In order for decommissioning to be performed in a safe and efficient manner, the regulatory body is required to establish requirements for a mechanism to ensure that adequate resources will be available when necessary for safe decommissioning⁹ (para. 3.3 of GSR Part 6 [1]). The amount of funds necessary and the timeline for the expenditure of the funds should be consistent with the cost estimate for decommissioning of the facility.

⁹ The definition of the funding mechanism might be the responsibility of other governmental organizations.

3.15. On-site inspection is one of the elements of the regulatory regime and the regulatory body should allocate adequate resources to this task. The regulatory body should develop an inspection programme, based on a graded approach, which should include the following key elements: a system of prioritizing inspections; on-site visits of inspectors; review of safety assessments made by the licensee; investigation and follow-up of events; and submission of information on compliance with safety criteria by the licensee. The inspection programme should include industrial safety elements as well, if this is not regulated separately.

3.16. The regulatory body is required to perform inspections during decommissioning (para. 3.3 of GSR Part 6 [1]) using established inspection procedures. The regulatory body should inspect key decommissioning actions, such as decontamination, dismantling, management of decommissioning waste; application of radiation protection measures; and monitoring performed to confirm compliance with the authorization. Inspections should verify compliance with the safety objectives and criteria defined in the final decommissioning plan, compliance with the results and conclusions of the safety assessment, and compliance with the limits and conditions of the authorization for decommissioning.

3.17. The regulatory body is required to take enforcement actions (para. 3.3 of GSR Part 6 [1]) in case of non-compliance with the national legal and regulatory framework, or with the authorization or licence conditions and safety requirements. The regulatory body should ensure that the existing enforcement policy, addressing radiation protection and safety and protection of the environment, covers aspects of decommissioning. The regulatory body should develop and use procedures for determining and exercising enforcement actions.

3.18. The regulatory body should maintain communication with the licensee to determine the future decommissioning timelines and schedules, as well as changes in schedules. Knowledge of the timelines of the licensee and changes to schedules will allow the regulatory body to plan its activities and to ensure it has appropriate staffing levels and experience to avoid regulatory related delays in decommissioning.

3.19. The regulatory body should inform the public and interested parties about the key decisions with regard to decommissioning of facilities for the purpose of transparency and in order to address public concerns relating to the safety of decommissioning. Information should be provided to interested parties as soon as such information becomes available [20]. In addition, the regulatory body is required to give interested parties an opportunity to provide input into

the decommissioning process (para. 3.3 of GSR Part 6 [1], see IAEA Safety Standards Series No. GSG-6, Communication and Consultation with Interested Parties by the Regulatory Body [21]).

3.20. As stated in para. 3.3. of GSR Part 6 [1], the regulatory body is required to establish requirements for ensuring that records important for the planning and implementation of decommissioning actions are collected and retained by the licensee throughout all stages of the facility's lifetime. Certain records developed during the decommissioning project will be important for legal purposes after the authorization for decommissioning has been terminated. Such records should be identified and preserved, and the responsibility for their retention should be assigned clearly.

3.21. A strong safety culture is an important part of a decommissioning project since actions that might not be routine are being performed and specialist personnel might be used to perform some of these actions. One of the purposes of the regulatory body's management system is to foster and support a strong safety culture in the regulatory body through the development and reinforcement of leadership, as well as good attitudes and behaviour in relation to safety on the part of individuals and teams [14, 22]. The regulatory body should cooperate with the licensee in order to maintain a strong safety culture throughout the decommissioning project [1]. Requirements on safety culture are established in IAEA Safety Standards Series No. GSR Part 2, Leadership and Management for Safety [23].

Requirement 6 of GSR Part 6 [1]: Responsibilities of the licensee for decommissioning

“The licensee shall plan for decommissioning and shall conduct the decommissioning actions in compliance with the authorization for decommissioning and with requirements derived from the national legal and regulatory framework. The licensee shall be responsible for all aspects of safety, radiation protection and protection of the environment during decommissioning.”

3.22. Prior to permanent shutdown of a facility, the licensee should discuss with the regulatory body and should reach agreement on the timing of decommissioning, the proposed decommissioning actions, applicable regulations and guidance and other requirements of the regulatory body. During the lifetime of the facility, the licensee is required to select a strategy for decommissioning (para. 3.4 of

GSR Part 6 [1]) that is consistent with national policies, to prepare and submit for regulatory review an initial decommissioning plan and its updates, and to ensure that adequate financial resources will be in place for the decommissioning project. The licensee is required to submit a final decommissioning plan and supporting documents for review and approval by the regulatory body (para. 3.4 of GSR Part 6 [1]), in accordance with national regulations, in its application for an authorization to conduct decommissioning. It has been demonstrated that early dialogue between the regulatory body and the licensee improves the planning and implementation of decommissioning, and can facilitate the process of obtaining regulatory approval.

3.23. In preparing for decommissioning, the licensee might perform activities such as the removal of sealed radioactive sources, waste from operation and historical waste stored on the site during operation. Such activities should be carried out in accordance with the current operating licence of the facility to ensure that the facility is maintained in a safe configuration during the transition from operation to decommissioning, until the final decommissioning plan is approved for implementation and the authorization for decommissioning is granted.

3.24. The licensee is responsible for ensuring that trained and qualified workers are available for safely conducting decommissioning actions, for the overall safety performance, for demonstrating that the end state of decommissioning complies with the end state criteria defined in the final decommissioning plan and for retaining decommissioning records, as required. The availability of qualified experts in radiation protection is essential for ensuring safety in decommissioning.

3.25. The licensee is required to estimate the cost of decommissioning actions and provide financial assurances and resources to cover the costs associated with safe decommissioning (para. 3.4 of GSR Part 6 [1]), including management of the resulting radioactive waste.

3.26. More details on how the licensee should fulfil its responsibilities for decommissioning are provided in Sections 4–9 of this Safety Guide.

4. MANAGEMENT OF DECOMMISSIONING

Requirement 7 of GSR Part 6 [1]: Integrated management system for decommissioning

“The licensee shall ensure that its integrated management system covers all aspects of decommissioning.”

4.1. The licensee should establish, implement, assess and continually improve an integrated management system for decommissioning. The management system is required to cover all aspects of the decommissioning (Requirement 7 of GSR Part 6 [1]) and should be commensurate with the size, complexity and nature of the decommissioning project, in accordance with a graded approach. The licensee should implement an appropriate integrated management system before the commencement of decommissioning actions and the management system should extend to all phases of the decommissioning project.

4.2. The integrated management system provides a single common framework in which decommissioning is undertaken. This framework should include planning for decommissioning, conduct of decommissioning actions and completion of decommissioning, including management of decommissioning records. General requirements and guidance on the management system are provided in other IAEA safety standards [23–25]. A description of or reference to the management system, including a definition of its scope and intent, should be included in the final decommissioning plan.

4.3. The integrated management system should provide for a graded approach to the application of the requirements, considering the magnitude of risk and commensurate with the complexity of the task to be performed (e.g. by specifying the type and level of detail of the required decommissioning documents, the plans and procedures for performing decommissioning tasks, the oversight activities and the training necessary for personnel to ensure that the task will be performed safely).

4.4. The organizational structure that is to be adopted for decommissioning should define the roles, responsibilities, authorities and key personnel of the licensee, including contractors if applicable. The organizational structure to be employed for decommissioning should be described in the decommissioning plan. In the description of the organizational structure, there should be a clear delineation of authorities and responsibilities among the various units. This is particularly

important when subcontractors are used for dedicated decommissioning actions. Mechanisms for controlling subcontractors appropriately should be established in written procedures; however, the prime responsibility for safety remains with the licensee.

4.5. Where appropriate, a ‘work breakdown structure’ should be established for the overall management of the decommissioning project. A high level work breakdown structure, describing decommissioning actions, should be included in the final decommissioning plan. A detailed work breakdown structure should describe the project in terms of work packages and individual tasks, including interdependences between tasks.

4.6. The licensee should develop a safety policy applicable to decommissioning that promotes a strong safety culture and sets out the responsibility of all individuals to identify and to bring any safety concerns to the attention of management of the decommissioning project.

4.7. The licensee should ensure that the safety policy applies to all individuals and includes the authority to stop unsatisfactory work, the responsibility to report safety concerns and the requirements for maintaining a safe working environment. Safety should be the highest priority for everyone involved in the decommissioning process.

4.8. The licensee should foster a safety culture in order to discourage complacency at every level [1]. This is particularly important in decommissioning, where the facility’s configuration is undergoing continuous change. Managers should foster an attitude of willingness to learn in relation to safety matters and should promote an open exchange of information upwards, downwards and horizontally within the organization.

4.9. The licensee should apply appropriate levels of control, supervision and training for individuals in all organizations involved in the decommissioning project in order to ensure a high level of safety performance is maintained, particularly when high hazard tasks are to be performed or when a large number of contractors are engaged. However, the overall responsibility for safety remains with the licensee.

4.10. In accordance with an evaluation of the skills and knowledge necessary to decommission a facility, a team composed of decommissioning specialists and appropriate site personnel should be formed to manage the decommissioning project. Specialized expertise may be necessary in areas such as: