

IAEA Safety Standards

for protecting people and the environment

The Management System for the Processing, Handling and Storage of Radioactive Waste

Safety Guide

No. GS-G-3.3



IAEA

International Atomic Energy Agency

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THE MANAGEMENT SYSTEM FOR THE PROCESSING, HANDLING AND STORAGE OF RADIOACTIVE WASTE

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THE MANAGEMENT SYSTEM FOR THE PROCESSING, HANDLING AND STORAGE OF RADIOACTIVE WASTE

SAFETY GUIDE

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2008

FOREWORD

by Mohamed ElBaradei
Director General

The IAEA's Statute authorizes the Agency to establish safety standards to protect health and minimize danger to life and property — standards which the IAEA must use in its own operations, and which a State can apply by means of its regulatory provisions for nuclear and radiation safety. A comprehensive body of safety standards under regular review, together with the IAEA's assistance in their application, has become a key element in a global safety regime.

In the mid-1990s, a major overhaul of the IAEA's safety standards programme was initiated, with a revised oversight committee structure and a systematic approach to updating the entire corpus of standards. The new standards that have resulted are of a high calibre and reflect best practices in Member States. With the assistance of the Commission on Safety Standards, the IAEA is working to promote the global acceptance and use of its safety standards.

Safety standards are only effective, however, if they are properly applied in practice. The IAEA's safety services — which range in scope from engineering safety, operational safety, and radiation, transport and waste safety to regulatory matters and safety culture in organizations — assist Member States in applying the standards and appraise their effectiveness. These safety services enable valuable insights to be shared and I continue to urge all Member States to make use of them.

Regulating nuclear and radiation safety is a national responsibility, and many Member States have decided to adopt the IAEA's safety standards for use in their national regulations. For the Contracting 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 designers, manufacturers and operators around the world to enhance nuclear and radiation safety in power generation, medicine, industry, agriculture, research and education.

The IAEA takes seriously the enduring challenge for users and regulators everywhere: that of ensuring a high level of safety in the use of nuclear materials and radiation sources around the world. Their continuing utilization for the benefit of humankind must be managed in a safe manner, and the IAEA safety standards are designed to facilitate the achievement of that goal.

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1. INTRODUCTION

BACKGROUND

1.1. Radioactive waste (referred to in this Safety Guide as waste) must be managed in such a way as to avoid imposing an undue burden on future generations; that is, the generations that produce the waste have to seek and apply safe, practicable and environmentally acceptable solutions for its long term management (Ref. [1], para. 3.29). Management systems play an important role in applying such solutions, and should be implemented for all stages of waste management, from waste generation to waste disposal. Management systems for managing and controlling radioactive waste are subject to the requirements established in Ref. [2]. Recommendations on meeting these requirements are presented in this Safety Guide and in Ref. [3].

1.2. This Safety Guide uses the term ‘management system’ instead of ‘quality assurance’. The term management system reflects and includes the evolution in the approach from the initial concept of ‘quality control’ (controlling the quality of products) through ‘quality assurance’ (the system to ensure the quality of products) to ‘quality management’ (the system to manage quality). The management system is the set of interrelated or interacting elements that establishes policies and objectives and that enables those objectives to be achieved in a safe, efficient and effective way. The requirements for the management system established in Ref. [2] and the recommendations in the accompanying Safety Guide, Application of the Management System for Facilities and Activities [3], supersede the earlier code on quality assurance¹.

1.3. A management system should be used to ensure that adequate measures are in place to address technical issues relating to safety, protection of health, protection of the environment, security, quality and economics. Solutions to technical problems are provided by means of such processes as design and research and development, which are controlled by the management system. The management, in the management system:

¹ INTERNATIONAL ATOMIC ENERGY AGENCY, Quality Assurance for Safety in Nuclear Power Plants and other Nuclear Installations, Code and Safety Guides Q1–Q14, Safety Series No. 50-C/SG-Q, IAEA, Vienna (1996).

- (a) Should recognize the need to specify when activities in such processes are required to be conducted;
- (b) Should require the scope of the activities to be carefully defined;
- (c) Should require the activities to be carried out carefully;
- (d) Should require the results to be evaluated and taken into account appropriately.

Technical issues may also have to be addressed so that managerial functions such as independent verification and checking may be carried out.

1.4. Managing radioactive waste involves a variety of technical and managerial activities and may extend over a very long period of time. These characteristics present a series of challenges to the development and implementation of effective management systems for a waste management programme, and give rise to the need for an integrated management system to deal with all matters that might affect the management of radioactive waste, including the financial provisions to carry it out. The following aspects warrant particular consideration in developing a management system for programmes for waste management facilities and activities:

- (a) By definition, waste is material for which no further use is foreseen. The provision of funds and the organizational arrangements to manage waste could be given inadequate attention if they were to become decoupled from the benefits drawn from the activity that generates the waste. The organization and funding of the necessary waste management activities could be much more difficult to put into place later.
- (b) Waste can be managed safely on an interim basis, in many cases for extended periods. As a consequence, the selection and implementation of definitive solutions may be postponed by a series of short term deferrals for additional assessment of the options.
- (c) If definite end points for waste have not been selected, it may be difficult to define the preferable form of the waste material to be produced and held during storage, and the acceptable form for final disposition. In such a situation, the selection of methods to treat and package waste should balance two concerns. First, the foreclosure of future disposal options (e.g. by choosing to produce an interim waste form that is both unsuitable for disposal and difficult to convert to a form that is suitable for disposal) should be avoided. Second, uncertainty about the end point should not be used as a rationale for not taking steps to ensure that the waste is managed in a safe and environmentally acceptable manner pending disposal.

- (d) Under the 'polluter pays' principle, the organization that generates the waste is responsible for ensuring that the waste is managed properly. In some jurisdictions, ownership (and hence ultimate responsibility) for waste is transferred when the waste changes hands. In other jurisdictions, waste always remains the responsibility of the original generator. Care should be taken to keep the responsibility clear and fulfilled at all times.
- (e) Responsibility for waste for which the generator can no longer reasonably be held responsible commonly reverts to governmental authorities. The transfer and delineation of the limits of this responsibility, with its attendant costs, can become blurred if care is not exercised.
- (f) Public and political sensitivities to decisions about the production and management of radioactive waste can impose constraints on the management arrangements, timings and technical decisions that are feasible.
- (g) Waste may be managed by a series of organizations that carry out the sequence of required processing steps. For example, waste generated by one organization may be transferred to another for pretreatment, treatment and conditioning, to another for storage, and to yet another for disposal. Each of these organizations may have its own management system, so that the waste may be controlled under a series of different management arrangements. This could present challenges to maintaining continuous active oversight of the waste, which may be exacerbated by the potentially long term nature of some phases of waste management activities.
- (h) Management systems for all waste management activities should encourage the adoption of unified approaches and solutions and international best practices because of the need to ensure continuity between successive human generations, and the uncertainty in the long term of organizational, national and international structures.
- (i) The organizations involved in waste management may be publicly or privately owned, or a combination of both. The respective interests, driving factors and responsibilities of different types of organization may present challenges in harmonizing them into a coherent overall management system for a waste management programme. Whatever the arrangements are, safety and environmental protection should always be paramount.
- (j) The long term nature of waste management operations means that particular attention should be paid to:
 - (i) Maintaining public confidence that management supervision will be continuous;

- (ii) Establishing confidence that the performance of the waste management facilities and activities will meet the requirements;
- (iii) Estimating costs and establishing the funding arrangements that will be necessary to manage the waste in the long term.

1.5. This Safety Guide is issued as one of several IAEA safety standards that deal with management systems for the safety of facilities and activities. It provides recommendations on how to meet the requirements in Ref. [2] for waste management activities, from waste generation to storage, and is supplementary to the general recommendations provided in Ref. [3]. This Safety Guide has a companion standard [4] that provides recommendations on the development of management systems for the disposal of radioactive waste. Application of these requirements and recommendations relating to the management system will contribute to a high level of confidence that activities for waste management will be conducted in a coherent and controlled manner, that waste products will be of high and consistent quality, and that the characteristics of the products are well enough known that it will be possible to make subsequent decisions on whether they meet the waste acceptance criteria for future disposal facilities. Furthermore, if required, it should be possible to make decisions (e.g. on required remediation or on retrieval for further processing and recovery of valuable materials) with confidence about the waste products that have been disposed of. However, it should be recognized that the prime responsibility for properly executing a particular task (e.g. in waste segregation, characterization and clearance activities, or in the design, construction or operation of a conditioning plant for radioactive waste) rests with those who are assigned the task.

1.6. The management systems applied to meet requirements for the pretreatment, treatment, conditioning and storage of all forms of radioactive waste all contribute to applying the fundamental safety principles established in Ref. [1]. Requirements for legal and governmental infrastructure are established in Ref. [5]. Other technical requirements and recommendations relating to the management of radioactive waste are established in other IAEA safety related publications [6–8]. The basic requirements for radiation protection are established in Ref. [9] and the requirements for emergency preparedness and response in Ref. [10].

1.7. The development and maintenance of a safety culture in an organization is central to the management systems described in this Safety Guide. A management system should help rather than impede a waste management organization in achieving its objectives, fostering positive attitudes towards the

management system and the safety culture it supports. The importance of a strong safety culture has been recognized by IAEA Member States.

1.8. The precepts of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [11] should be considered in developing management systems for waste management activities, to give due recognition to the international aspects of waste management activities.

1.9. The management systems discussed in this Safety Guide are intended to apply to the long periods of storage of waste that may occur prior to disposal. Understanding and knowledge will continue to grow and should be managed continuously in the organization, the industry and the regulatory body, and in and among States. This Safety Guide will be revised in the light of knowledge and experience gained on new processes, technological developments, and changes in the skills and tasks of personnel, as well as other, unforeseen, changes.

OBJECTIVE

1.10. The objective of this Safety Guide is to provide recommendations on developing and implementing management systems for the pretreatment, treatment, conditioning and storage of radioactive waste.

SCOPE

1.11. This Safety Guide covers the management systems for the pretreatment (collection, segregation, chemical adjustment and decontamination), treatment (volume reduction, removal of radioactive material and change of composition), conditioning (immobilization, packaging and overpacking) and storage of radioactive waste.

1.12. This Safety Guide also covers management systems for related processes and activities in waste management, such as:

- (a) Waste generation;
- (b) Waste characterization;
- (c) Use of controlled discharges;
- (d) Clearance;

- (e) Packaging strategies;
- (f) Design and manufacture of containers;
- (g) Handling of waste packages;
- (h) Safety assessment;
- (i) Regulatory authorization (e.g. licensing).

1.13. This Safety Guide covers management systems for managing all types of waste including operational waste. It covers waste from nuclear fuel cycle activities, including:

- (a) Mining, milling and extraction;
- (b) Uranium conversion;
- (c) Uranium enrichment;
- (d) Fuel fabrication;
- (e) Reactor operation;
- (f) Fuel reprocessing;
- (g) Management of non-reprocessed spent fuel;
- (h) Waste management;
- (i) Decommissioning.

It also covers waste from non-nuclear-fuel-cycle activities, such as:

- (a) Mining, milling, extraction and processing of non-uranium minerals and resources (i.e. waste containing naturally occurring radionuclides, such as in fertilizers, oil and gas);
- (b) Activities in hospitals;
- (c) Activities in laboratories;
- (d) Activities in research facilities;
- (e) Activities in industry;
- (f) Decommissioning or cleanup of facilities used for activities no longer practised (e.g. workshops used for painting dials with radium).

1.14. This Safety Guide is intended to be used by organizations that are directly involved in, or that regulate, the facilities and activities described here in paras 1.11–1.13, and by the suppliers of nuclear safety related products that are required to meet some or all of the requirements established in Ref. [2]. It will also be useful to legislators and to members of the public and other parties interested in the nuclear industry.

STRUCTURE

1.15. This Safety Guide follows the structure of Ref. [2]. The key points for establishing a management system, including general considerations, safety culture, graded application of requirements and documentation of the management system, are discussed in Section 2. The roles and responsibilities of the management of an organization for the development and implementation of an effective management system are discussed in Section 3. Resource management, including the provision of financial resources, human resources and an infrastructure and working environment, is discussed in Section 4. Planning and control of the processes used for the specific activities of the organization, the control of documents and control of records, and the management of organizational change are discussed in Section 5. Section 6 addresses the measurement, assessment and improvement of the management system itself.

1.16. To aid the user, the corresponding requirements of Ref. [2] are quoted at the beginning of each section.

1.17. Appendix I gives an example of the overall management system for a programme of activities for waste management, incorporating the individual management systems of a series of operators that carry out successive steps in the processing, handling, storage and disposal of waste. Appendix II gives an example of the application of a graded approach to implementing management system procedures. Important safety related characteristics of waste products are detailed in Appendix III.

2. THE MANAGEMENT SYSTEM

GENERAL RECOMMENDATIONS

2.1. Reference [2] requires in paras 2.1–2.4 that:

“2.1. A management system shall be established, implemented, assessed and continually improved. It shall be aligned with the goals of the organization and shall contribute to their achievement. The main aim of the management system shall be to achieve and enhance safety by:

- Bringing together in a coherent manner all the requirements for managing the organization;
- Describing the planned and systematic actions necessary to provide adequate confidence that all these requirements are satisfied;
- Ensuring that health, environmental, security, quality and economic requirements are not considered separately from safety requirements, to help preclude their possible negative impact on safety.

“2.2. Safety shall be paramount within the management system, overriding all other demands.

“2.3. The management system shall identify and integrate with the requirements contained within this publication:

- The statutory and regulatory requirements of the Member State;
- Any requirements formally agreed with interested parties (also known as ‘stakeholders’⁷);
- All other relevant IAEA Safety Requirements publications, such as those on emergency preparedness and response [10] and safety assessment [12];
- Requirements from other relevant codes and standards adopted for use by the organization.

⁷ Stakeholder: interested party; concerned party. ‘Stakeholder’ means an interested party — whether a person or a company, etc. — with an interest or concern in ensuring the success of an organization, business, system, etc. To ‘have a stake in’ something figuratively means to have something to gain or lose by, or to have an interest in, the turn of events. The term stakeholder is used in a broad sense to mean a person or group having an interest in the performance of an organization. Those who can influence events may effectively become interested parties — whether their ‘interest’ is regarded as ‘genuine’ or not — in the sense that their views need to be considered. Interested parties have typically included the following: customers, owners, operators, employees, suppliers, partners, trade unions, the regulated industry or professionals; scientific bodies; governmental agencies or regulators (local, regional and national) whose responsibilities may cover nuclear energy; the media; the public (individuals, community groups and interest groups); and other States, especially neighbouring States that have entered into agreements providing for an exchange of information concerning possible transboundary impacts, or States involved in the export or import of certain technologies or materials.”

“2.4. The organization shall be able to demonstrate the effective fulfilment of its management system requirements.”

2.2. This Safety Guide provides specific recommendations for meeting the requirements of Ref. [2] on establishing management systems suitable for organizations that manage radioactive waste of all types. The development of the management system for an organization will also be influenced by:

- (a) Internationally recognized standards such as ISO 9001:2000 [13] for quality management systems and ISO 14001:2004 [14] for environmental management systems;
- (b) Guidance associated with the defined regulatory and statutory requirements of States;
- (c) Standard practices of the nuclear industry;
- (d) The organization's own standard practices.

2.3. Whichever codes, standards and requirements are used in developing the management system, the design of the management system should incorporate systems and processes both to comply with all requirements and to demonstrate the compliance. Assessments of the management system (see Section 6) should demonstrate that the management system is under control, and that the procedures for executing the processes that are controlled under the management system are producing the specified results to satisfy the requirements, thus establishing that the processes are executed correctly.

2.4. The management system should be developed to cover all activities to be carried out for the purposes of waste management, irrespective of whether they are individual or composite activities.

2.5. The management system should provide assurance that the activity (e.g. clearance) or the product (e.g. the waste package) will comply with all applicable requirements, respecting the principle of carrying out the work correctly the first time. The management system should include measures to be taken in the event that non-conforming waste packages are produced.

2.6. Processes should be developed and controlled to ensure that conditions, limitations or specifications relating to the waste or the activity are continuously met for as long as necessary. It may cost more to develop processes that will achieve this effectively, owing to the additional design and development work required. It may also be more onerous to operate such processes. However, product quality will be more consistent, and overall costs

and radiation doses may be lower because of the reduced need for remedial action (e.g. intrusive testing and reworking, and the associated handling) to deal with products that do not meet specifications.

2.7. The management system should include plans and arrangements for the management system itself to continue for as long as is required to maintain continuous control over the overall waste management programme, and to cover all stages of waste management from the generation of waste to its disposal. Emergency response drills, exercises and planned reviews of the adequacy of measures for emergency preparedness and response should be continued during periods of extended storage, when preparedness may decline in the seemingly static situation. The management system should also be designed to accommodate future technological advances that could have implications for the waste management programme.

2.8. Appendix I provides an example of a series of activities in radioactive waste management, illustrating the possible need for one or more management systems to cover all the stages of waste management from waste generation through the delivery of the waste package to the disposal facility.

SAFETY CULTURE

2.9. Reference [2] requires in para. 2.5 that:

“The management system shall be used to promote and support a strong safety culture by:

- Ensuring a common understanding of the key aspects of safety culture within the organization;
- Providing the means by which the organization supports individuals and teams in carrying out their tasks safely and successfully, taking into account the interaction between individuals, technology and the organization;
- Reinforcing a learning and questioning attitude at all levels of the organization;
- Providing the means by which the organization continually seeks to develop and improve its safety culture.”

2.10. The management system should support the development, implementation and continued enhancement of a pragmatic and strong safety culture

[15–17] and should promote the adoption of best practices, regardless of the type, scale, complexity, duration and evolution of the activities for waste management. The management system for activities for radioactive waste management should support the safety culture and environmental protection culture throughout all levels of the organizations involved. The management system should establish an environment in which staff can raise safety issues without fear of harassment, intimidation, retaliation or discrimination.

GRADING THE APPLICATION OF MANAGEMENT SYSTEM REQUIREMENTS

2.11. Reference [2] requires in paras 2.6 and 2.7 that:

“2.6. The application of management system requirements shall be graded so as to deploy appropriate resources, on the basis of the consideration of:

- The significance and complexity of each product or activity;
- The hazards and the magnitude of the potential impact (risks) associated with the safety, health, environmental, security, quality and economic elements of each product or activity;
- The possible consequences if a product fails or an activity is carried out incorrectly.

“2.7. Grading of the application of management system requirements shall be applied to the products and activities of each process.”

2.12. Organizations involved in waste management should identify the relative importance of the various activities, facilities, equipment and waste products in meeting the overall safety, health, environmental, security, quality and economic requirements, with safety and environmental protection being of primary importance. Resources should then be selectively allocated and processes selectively designed to control the activities, facilities, equipment and waste products effectively and efficiently. Controls will vary for different facilities and activities.

2.13. Effective and efficient management involves the selective application of controls to activities on the basis of fundamental factors important to meeting the safety, health, environmental, security, quality and economic requirements, such as:

- (a) The quantities and potential hazards (radiological and non-radiological, for example chemical) of the waste, and the necessary degree of isolation;
- (b) The dispersibility and mobility of the waste forms involved and the necessary degree of containment;
- (c) The interval before disposal;
- (d) Experience with, and maturity of, the technology and the potential for future advances;
- (e) The reliability of equipment and its function in relation to safety and environmental protection;
- (f) The complexity and degree of standardization of the activities;
- (g) The novelty and maturity of the activities;
- (h) The size of the organization, the number and complexity of interfaces and the safety culture;
- (i) Uncertainty about future public perception of radiation hazards and radioactive waste;
- (j) Uncertainty about future government policy on the nuclear industry and radioactive waste management.

2.14. A graded approach may be adopted (e.g. on the basis of the findings of a hazard and operability studies (HAZOPS) assessment) in applying management system requirements to such aspects of waste management activities as the:

- (a) Level of detail of work instructions and supporting documentation;
- (b) Level of qualification and training of workers;
- (c) Quantity, detail and retention times of records;
- (d) Need for, and level of detail in, formal logbooks;
- (e) Level of detail and frequency of testing, surveillance and inspection;
- (f) Equipment to be included in status control for the facility;
- (g) Key performance indicators to be measured;
- (h) Equipment calibration requirements;
- (i) Need to monitor the condition of equipment, stored waste and facility integrity;
- (j) Traceability of items, including waste packages;
- (k) Availability and conditions of storage of spare parts and the control of the associated records;
- (l) Level of reporting and authority to act on non-conformances and to implement corrective actions;
- (m) Scope, frequency and detail of assessments;
- (n) Scope, frequency and detail of facility audits to monitor operational processes and levels of safety and environmental protection;

(o) Need for, and detail of, environmental monitoring.

2.15. Grading is intended to guide the degree of control applied to an item in relation to the importance of its required function. Grading should not be used as a justification for not applying all of the necessary management system elements or required quality controls, or for performing less than adequate technical assessments of items that are less evidently important to meeting the safety, health, environmental, security, quality and economic requirements. Grading should not be used to sanction less than adequate practices. Grading does not mean excluding determination of the adequacy of any activity affecting quality or safety. Grading means making the stringency of the controls by which the adequacy of such activities is evaluated commensurate with the importance of the activities.

2.16. Appendix II presents examples of the graded application of management system requirements, by illustrating possible differences in the level of controls used to manage radioactive waste produced in a mining operation versus those used to manage spent ion exchange resins generated in a nuclear power plant.

DOCUMENTATION OF THE MANAGEMENT SYSTEM

2.17. Reference [2] requires in paras 2.8–2.10 that:

“2.8. The documentation of the management system shall include the following:

- The policy statements of the organization;
- A description of the management system;
- A description of the structure of the organization;
- A description of the functional responsibilities, accountabilities, levels of authority and interactions of those managing, performing and assessing work;
- A description of the processes and supporting information that explain how work is to be prepared, reviewed, carried out, recorded, assessed and improved.

“2.9. The documentation of the management system shall be developed to be understandable to those who use it. Documents shall be readable, readily identifiable and available at the point of use.

“2.10. The documentation of the management system shall reflect:

- The characteristics of the organization and its activities;
- The complexities of processes and their interactions.”

2.18. Waste management activities may vary greatly in size and complexity, may involve a number of organizations and may continue over extended periods (e.g. a long standing industrial operation that generates waste, the operating and decommissioning periods in the lifetime of a nuclear power plant, the storage of waste awaiting disposal). Particular attention should be paid to ensuring that documents used to control work processes remain relevant, current, understandable and available to the diverse organizations and in the situations in which they are and will be used.

3. MANAGEMENT RESPONSIBILITY

GENERAL

3.1. The processes for fulfilling the responsibilities of senior management in relation to the management and control of radioactive waste are subject to the requirements established in Ref. [2], and the recommendations presented in this Safety Guide and provided in Ref. [3] should be considered.

MANAGEMENT COMMITMENT

3.2. Reference [2] requires in paras 3.1–3.5 that:

“3.1. Management at all levels shall demonstrate its commitment to the establishment, implementation, assessment and continual improvement of the management system and shall allocate adequate resources to carry out these activities.

“3.2. Senior management shall develop individual values, institutional values and behavioural expectations for the organization to support the implementation of the management system and shall act as role models in the promulgation of these values and expectations.

“3.3. Management at all levels shall communicate to individuals the need to adopt these individual values, institutional values and behavioural expectations as well as to comply with the requirements of the management system.

“3.4. Management at all levels shall foster the involvement of all individuals in the implementation and continual improvement of the management system.

“3.5. Senior management shall ensure that it is clear when, how and by whom decisions are to be made within the management system.”

3.3. The management responsible should recognize that a radioactive waste management programme may be affected by many factors. National and international policies and principles for waste management and industry norms and industry standards that currently constitute an accepted management system will evolve over the extended period of time for which waste management activities may continue. Policy decisions (e.g. regarding fuel reprocessing) and technological innovations and advances (e.g. in partitioning and transmutation) may lead to fundamental changes in the overall waste management strategy. However, management will retain its responsibility for all activities at all times, and continuous commitment by management will remain a prerequisite to ensuring safety and the protection of human health and the environment.

SATISFACTION OF THE EXPECTATIONS OF INTERESTED PARTIES

3.4. Reference [2] requires in para. 3.6 that:

“The expectations of interested parties shall be considered by senior management in the activities and interactions in the processes of the management system, with the aim of enhancing the satisfaction of interested parties while at the same time ensuring that safety is not compromised.”

3.5. Several broad considerations relating to satisfying the expectations of the many interested parties involved (e.g. the operator, national and local governments, the regulatory body, the public, the nuclear industry) should be taken into account in developing an overall waste management programme or the management system of an organization. The requirements of some