

IAEA Safety Standards

for protecting people and the environment

The Management System for Nuclear Installations

Safety Guide

No. GS-G-3.5



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 at the IAEA Internet site

<http://www-ns.iaea.org/standards/>

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 P.O. Box 100, 1400 Vienna, Austria.

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OTHER SAFETY RELATED PUBLICATIONS

The IAEA provides for the application of the standards and, under the terms of Articles III and VIII.C of its Statute, makes available and fosters the exchange of information relating to peaceful nuclear activities and serves as an intermediary among its Member States for this purpose.

Reports on safety and protection in nuclear activities are issued as **Safety Reports**, which provide practical examples and detailed methods that can be used in support of the safety standards.

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THE MANAGEMENT SYSTEM FOR NUCLEAR INSTALLATIONS

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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. GS-G-3.5

THE MANAGEMENT SYSTEM FOR NUCLEAR INSTALLATIONS

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2009

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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.

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. The safety requirements use 'shall' statements together with statements of

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

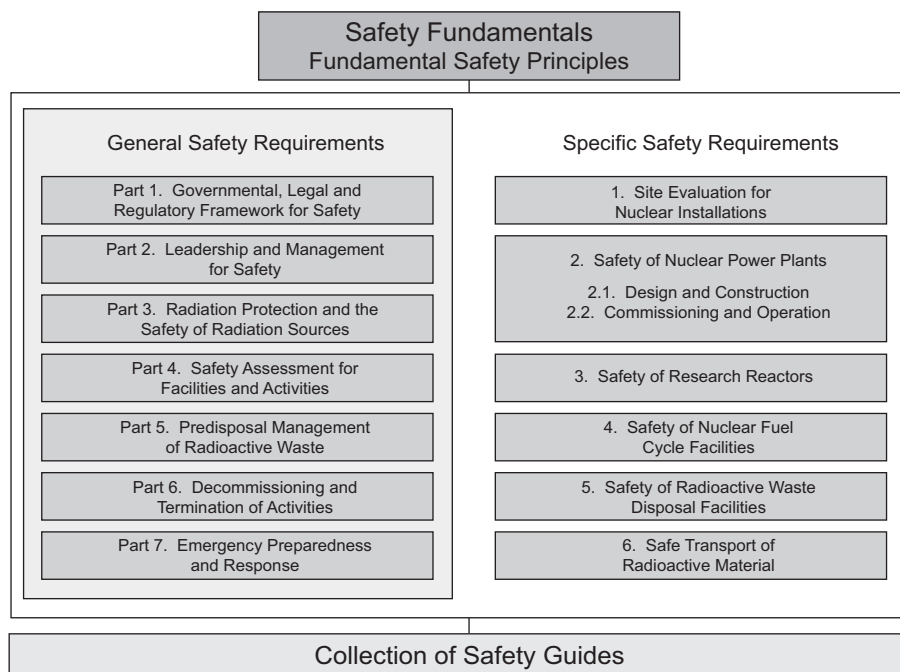


FIG. 1. The long term structure of the IAEA Safety Standards Series.

associated conditions to be met. Many requirements are not addressed to a specific party, the implication being that the appropriate parties are responsible for fulfilling them.

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 four safety standards committees, for nuclear safety (NUSSC), radiation safety (RASSC), the safety of radioactive waste (WASSC) and the safe transport of radioactive material (TRANSSC), and a Commission on

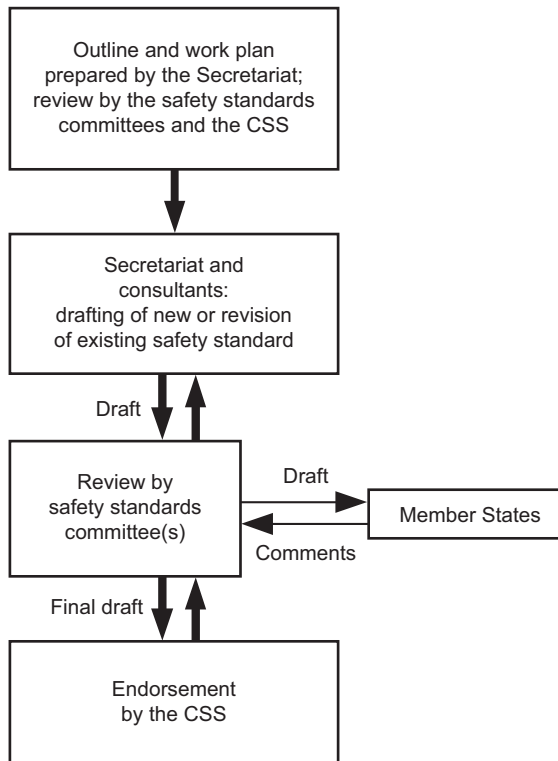


FIG. 2. The process for developing a new safety standard or revising an existing standard.

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 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. This Safety Guide is issued in support of the Safety Requirements publication on The Management System for Facilities and Activities [1]. It provides recommendations in relation to nuclear installations¹ that are supplementary to the general recommendations provided in Ref. [2] on how to comply with the requirements established in Ref. [1].

1.2. This Safety Guide is one of several IAEA Safety Guides that recommend methods of meeting the requirements for management systems that are established in Ref. [1]. It supersedes Safety Guides numbers Q8–Q14 of Safety Series No. 50-C/SG-Q². Application of the requirements for the management system throughout the lifetime of a nuclear installation will contribute to the achievement, maintenance and development of high levels of safety.

1.3. The use of methods and arrangements other than those set out in this Safety Guide for meeting the requirements established in Ref. [1] may be acceptable provided that they achieve at least the same level of safety.

OBJECTIVE

1.4. The objective of this publication is to provide recommendations and guidance supplementary to those provided in Ref. [2] for establishing, implementing, assessing and continually improving a management system that integrates elements of safety, health, environment, security³, quality and

¹ ‘Nuclear installations’ includes nuclear power plants, other reactors (such as research reactors and critical assemblies) and nuclear fuel cycle facilities.

² INTERNATIONAL ATOMIC ENERGY AGENCY, Quality Assurance for Safety in Nuclear Power Plants and other Nuclear Installations, Safety Series No. 50-C/SG-Q, IAEA, Vienna (1996).

³ This Safety Guide covers the security of nuclear installations, nuclear material and sources of radiation only to the extent that security measures for physical protection are essential to safety and the failure of such measures has consequences for safety.

economics⁴. All the topics covered correspond to requirements established in Ref. [1].

SCOPE

1.5. This Safety Guide is applicable throughout the lifetime of a nuclear installation, including any subsequent period of institutional control, until there is no significant residual radiation hazard. For a nuclear installation, the lifetime includes site evaluation, design, construction, commissioning, operation and decommissioning. These stages in the lifetime of a nuclear installation may overlap.

1.6. The recommendations made in this publication should be used in conjunction with the general recommendations provided in Ref. [2]. It is stated in each section whether this Safety Guide provides recommendations supplementary to those in Ref. [2] or whether there are no supplementary recommendations.

1.7. This Safety Guide may be applied to nuclear installations in the following ways:

- (a) To support the development, implementation, assessment and improvement of the management system of those organizations responsible for research⁵, site evaluation, design, construction, commissioning, operation and decommissioning of a nuclear installation;
- (b) As an aid in the assessment by the regulatory body of the adequacy of the management system of a nuclear installation;
- (c) To assist an organization in specifying to a supplier, via contractual documentation, any specific element that should be included within the supplier's management system for the supply of products⁶.

⁴ Economic objectives are included in the list of elements that have to be integrated, as it is recognized that economic decisions and actions may introduce, or may mitigate, potential effects on safety.

⁵ The term 'research' covers research on items, services and processes that may have an effect on safety in the stages of site evaluation, design, construction, commissioning, operation and decommissioning in the lifetime of a nuclear installation, and also the conduct of the research activities for which a nuclear installation (e.g. a research reactor) is built.

⁶ A product is an output from a process. Examples include a piece of equipment maintained and electricity generated.

STRUCTURE

1.8. This Safety Guide follows the structure of the Safety Requirements publication on The Management System for Facilities and Activities [1], whereby:

- (a) Section 2 provides recommendations on implementing the management system, including recommendations relating to safety culture, grading and documentation.
- (b) Section 3 provides recommendations on the responsibilities of senior management⁷ for the development and implementation of an effective management system.
- (c) Section 4 provides recommendations on resource management, including guidance on human resources, infrastructure and the working environment.
- (d) Section 5 provides recommendations on how the processes of the installation can be specified and developed, including recommendations on some generic processes of the management system.
- (e) Section 6 provides recommendations on the measurement, assessment and improvement of the management system of a nuclear installation.
- (f) Appendix I provides some examples of activities that could demonstrate the safety culture attributes. Appendix II provides guidance on implementing the management system requirements for research and development activities. Appendices III–VIII provide guidance on the specific processes to be developed for the various stages in the lifetime of a nuclear installation: site evaluation, design, construction, commissioning, operation and decommissioning. Annex I provides an example from a Member State of a methodology for grading the application of management system requirements.

⁷ ‘Senior management’ means the person who, or group of people which, directs, controls and assesses an organization at the highest level. In nuclear installations, many different terms are used, including, for example: chief executive officer, director general, executive team, plant manager, top manager, site vice-president and managing director.

2. THE MANAGEMENT SYSTEM FOR NUCLEAR INSTALLATIONS

MEETING THE GENERAL REQUIREMENTS OF THE MANAGEMENT SYSTEM

2.1. The Safety Requirements publication [1] states in paras 2.1–2.4 that:

“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.

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

“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’);
- All other relevant IAEA Safety Requirements publications, such as those on emergency preparedness and response [3] and safety assessment [4];
- Requirements from other relevant codes and standards adopted for use by the organization.

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

In this Safety Guide, ‘the organization’ would generally be the operating organization of the nuclear installation.

2.2. The following recommendations have been developed to provide a means of meeting these requirements for nuclear installations. They are

supplementary to, and should be read in conjunction with, the generic recommendations provided in Ref. [2].

2.3. Senior management of the operating organization should be the sole source of operational direction for the installation. The management system should define the responsibilities of those persons responsible for each process (sometimes referred to as ‘process owners’) and of the managers and functions in the organizational structure, so that there are clear lines of authority and accountability. The persons responsible for each process should support the operational direction by assuming responsibility for developing effective processes and ensuring that they remain effective. The managers and functions in the organization should implement the processes within their areas of responsibility. More information regarding the operating organization can be found in Ref. [5].

2.4. Senior management should establish a reporting structure that should permit reporting on safety performance, efficiency in discharge of responsibilities and achievement of safety objectives. This reporting structure should include, but should not be limited to, the processes of the organization. It should be made clear in the management system what the reporting mechanisms are and who assumes specific responsibilities with regard to what, when and how to report and to whom. Care should be taken in designing the structure of the organization as this can affect the speed of decision making.

2.5. Guidance on the processes to be covered in the management system for the different stages in the lifetime of a nuclear installation is provided in Appendices III–VIII of this Safety Guide. Separate organizations may be established for these stages or they may be combined within one organization. Irrespective of the organizational arrangement used, responsibilities and interfaces should be clearly specified and understood. The management system should cover all the activities that are carried out at the relevant stage in the lifetime of the installation. It should be recognized that many activities and outputs from one stage may be necessary to aid work in later stages, and that this may impact the way in which this work is carried out. The management system, when applied in practice, should provide assurance that the nuclear installation will conform to specified requirements.

SAFETY CULTURE

2.6. Reference [1] states 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.”

2.7. The following recommendations have been developed to provide a means of meeting these requirements for nuclear installations. They are supplementary to, and should be read in conjunction with, the generic recommendations provided in Ref. [2].

2.8. Any effort to focus attention on developing or improving the safety culture of an organization should rely on a common understanding of the concept of safety culture. Every organization has its culture. Safety culture is that type of organizational culture where safety is of utmost priority, considered essential for the long term success of the organization. The issue is to make that safety culture strong and sustainable, so that safety becomes a prime responsibility or main focus for all types of activity.

2.9. Safety culture should be based on a set of safety ‘beliefs’ (assumptions) and on a code of conduct that reflects the right attitude to safety which is held in common by all individuals in the organization. Ultimately, the safety culture is manifested in individual and collective behaviour in the organization.

2.10. Senior management should establish and promote a set of principles to be used in decision making and promoting safety conscious behaviour. Examples of such principles used in some organizations are as follows:

- (a) Everyone has an impact on safety.
- (b) Managers and leaders must demonstrate their commitment to safety.

- (c) Trust and open communication permeate the organization.
- (d) Decision making reflects putting safety first.
- (e) Nuclear technology is recognized as having unique safety implications.
- (f) A questioning attitude is fostered.
- (g) Organizational learning is encouraged.
- (h) Training of personnel is encouraged.
- (i) A proactive approach to safety is taken.
- (j) Safety is constantly under review.

2.11. A common understanding by all individuals of the characteristics and attributes of a strong safety culture is a prerequisite, so that everyone can seek and identify strengths and weaknesses and thus enhance the safety culture. The framework identified in Ref. [2] consists of a set of five key characteristics (see Fig. 1), each of which has a number of attributes that have been identified as essential for achieving a strong safety culture. The details of each of the attributes can be found in Ref. [2]. The activities that could demonstrate the attributes of a strong safety culture are provided in Appendix I.

2.12. This framework can be used in two ways:

- (i) To reach a common understanding of what factors should be considered in relation to safety culture;
- (ii) To evaluate the strengths and weaknesses in an organization by means of both self-assessments and external review.

2.13. The following text provides further recommendations relating to each of the five characteristics of a strong safety culture.

Safety is a clearly recognized value

2.14. The ways that decisions are made and communicated are very important aspects of an organization's safety culture because decisions represent 'values in action'. The stated goals, strategies and plans for the organization establish its objectives and priorities in the short and longer terms. Reference [1] in para. 2.2 states "Safety shall be paramount within the management system, overriding all other demands". Managers should consider safety when establishing goals, strategies and plans, and should align the declared priorities and objectives when allocating resources.



FIG. 1. Characteristics of a strong safety culture.

Leadership for safety is clear

2.15. Senior managers should be the leading advocates of safety and should demonstrate in both words and actions their commitment to safety. The ‘message’ on safety should be communicated frequently and consistently. Leaders⁸ develop and influence cultures by their actions (and inactions) and by the values and assumptions that they communicate. A leader is a person who has an influence on the thoughts, attitudes and behaviour of others. Leaders cannot completely control safety culture, but they may influence it. Managers and leaders throughout an organization should set an example for safety, for example, through their direct involvement in training and in oversight in the field of important activities. Individuals in an organization generally seem to emulate the behaviours and values that their leaders personally demonstrate.

⁸ The difference between management and leadership can be stated simply whereby ‘management’ is a function and ‘leadership’ is a relationship. Management ensures that work is completed in accordance with requirements, plans and resources. It is through leadership that individuals may be influenced and motivated, and organizations changed. Managers may also act as leaders.

Standards should therefore be set within the organization for aspects that are important for safety.

Accountability for safety is clear

2.16. Managers should establish the authorities and decision making powers for all positions in the organization. These powers should be exercised and there should be clear lines of authority for safety related matters. Accountability means that all individuals should know their specific assigned tasks (i.e. what they have to accomplish and by when, and how to recognize good results); if individuals are unable to execute their assigned tasks as expected, they should report this to their supervisors. The behaviour of managers towards the regulatory body should be such that strong signals are sent to individuals in the organization about respect for rules and the importance of safety. The organization and the regulatory body should be mutually independent and should have a constructive relationship.

Safety is integrated into all activities

2.17. The culture of an organization will encompass everything it does and so, with a strong safety culture, it should be clearly apparent that safety is integrated into all activities in the organization.

Safety is learning driven

2.18. An organization should continually strive to improve its performance so that it does not become complacent. Complacency is often a precursor to a serious decline in safety culture. Management should establish processes and should show by individual example and direction that it expects individuals to look for ways to learn and improve with regard to safety. Operating experience should be highly valued and the capacity to learn from experience should be well developed. Training, benchmarking and self-assessment are often used to stimulate learning and to improve performance.

2.19. A common understanding of what is meant by safety culture should be established. Training is one of the means by which individuals can achieve this understanding. Such training should not be considered a ‘one-off’ event but should be provided regularly to all individuals, including senior management.

2.20. Some organizations make use of facilitators who are knowledgeable in the area of safety culture, particularly in the initial efforts to raise awareness in the organization of issues relating to safety culture. As safety culture develops in the organization, facilitation skills should be developed for all individuals who will serve in management positions.

2.21. Safety culture should be enhanced by means of regular communication via media such as newsletters and intranets.

Improving safety culture

2.22. In developing a process for continually improving the safety culture in an organization, the following steps should be considered:

- (a) Obtaining the commitment of senior management;
- (b) Building a common understanding of safety culture;
- (c) Describing the desired safety culture;
- (d) Assessing the existing culture;
- (e) Communicating the results of the assessment to all personnel in the organization;
- (f) Identifying gaps, root causes and key initiatives for improvements;
- (g) Communicating the direction of the organization and engaging the commitment of supervisors and personnel;
- (h) Implementing change;
- (i) Ensuring that the guiding principles of safety culture become the accepted way of working;
- (j) Sustaining the change;
- (k) Performing follow-up assessments.

2.23. In considering how to improve the safety culture, it should be borne in mind that the organization will already have a safety culture in some form that will have been influenced by the organizational culture, the organization's history and experience, and other cultural forces (e.g. the national culture). The challenge is to transform the existing safety culture for the organization's future success. Changing the safety culture should not be an end in itself though; it should be a means of contributing to achieving the goals of the organization. It should be recognized that it might take several years to achieve a profound change in the safety culture.

2.24. The best way of changing the safety culture is to understand and focus on what the new way of working should be and to clarify and communicate any

new behaviour and thinking necessary. The characteristics of a strong safety culture (Fig. 1) could help to identify the desired future state of the organization's safety culture. Once the desired future state is well understood, the present state of the safety culture should be assessed. The assessment should yield information on how the existing safety culture may help in achieving the desired new way of working and thinking. It should also identify any safety culture issues that could hinder the achievement of goals or the fulfilment of strategies, plans and objectives. A specific programme of change for the safety culture should then be designed to deal with these issues. The entire safety culture need not be changed: only the elements of it that could hinder the achievement of goals should be changed. As the gaps between the present state and the desired future state of the safety culture are identified, consideration should be given to what kind of change process is necessary. For this stage, there are no standard solutions and an organization should design its own approach. The approach may involve training, the creation of task groups, system changes, team building and coaching of senior managers and other individuals.

2.25. Major initiatives for changes that affect the safety culture should not be launched prematurely. A careful approach should be taken initially to ensure that everyone understands the new way of thinking and working, and to consider how the existing culture could help or hinder the new culture. The desired changes should build on the existing culture. It should be considered how the individuals who are the targets for change could be motivated to want to change, but such individuals should not become so anxious about learning new things as to resist change. Consideration should be given to how the existing culture can help the learning process and make individuals feel secure.

2.26. A major challenge in changing the safety culture is to develop a learning organization that will continually be able to make its own diagnosis, and to self-manage whatever transformations are necessary as the environment changes. An organization of this type is likely to be far more resilient and successful in dynamic, fast changing economic conditions. Ideally, all individuals should be involved in proactively contributing ideas for improvements. More sustainable approaches would involve encouraging individuals to work in teams and continually seek improvements by identifying and prioritizing actions to enhance safety in their own work areas. To facilitate this, individuals should be given the opportunity to compare their way of working with that of others, so that they are aware of what constitutes excellence in their area of work. Further guidance on safety culture is provided in Ref. [6].

Warning signs of a decline in safety culture

2.27. To prevent a significant degradation of safety, a proactive approach to the management of safety and safety culture should be established so that any problem may be detected and acted upon at an early stage. There is often a delay between the development of weaknesses in safety culture and the occurrence of a safety significant event. By being alert to the warning signs, management can take corrective actions in sufficient time to avoid adverse consequences for safety.

2.28. The management system should have in place the mechanisms by which managers are kept up to date with the warning signs that have been shown to precede organizational failures. Paragraph 2.29 provides examples of the stages of decline and their symptoms; these examples have been taken from a root cause analysis of failures in the management of safety and safety culture.

2.29. The following are typical symptoms of a decline in safety culture:

- (a) Lack of a systematic approach to safety — unclear accountabilities, poor decision making processes, poor risk assessment processes, lack of a change management process.
- (b) Procedures not being regularly reviewed and updated.
- (c) Incidents not analysed in depth and lessons not learned — the recurrence of a problem indicating that the fundamental cause (or causes) has (have) not been properly identified.
- (d) No actions taken or implemented in order to eliminate root causes.
- (e) Resource mismatches — excessive project slippage, excessive overtime, lack of qualified and experienced personnel, increased use of contractors to perform key organizational activities for long periods of time.
- (f) Increasing numbers of violations of rules — an increase in conscious deviations from rules, e.g. short cuts.
- (g) An increasing backlog of corrective actions — an increase in the number of corrective actions that have exceeded their target date for implementation and an increase in the length of the delay.
- (h) Lack of proper verification of readiness for operation — plant systems not properly verified before the startup of equipment, systems or plant after shutdowns for maintenance.
- (i) Safety concerns of personnel not dealt with promptly — safety concerns are ignored or have to be raised repeatedly before action is taken, e.g. lack of a process to allow or encourage individuals to raise safety concerns that results in actions being taken.

- (j) Disproportionate focus on technical issues — insufficient attention to issues of human performance, problems being perceived as technical challenges to be solved by engineering means only, without considering that the solution may involve aspects of human performance.
- (k) Lack of self-assessment processes — the organization not recognizing deficiencies in attitudes to safety and behaviour and being unable to adopt a philosophy of continual improvement.
- (l) Poor housekeeping — indicating lack of interest on the part of management and a poorly motivated workforce with little pride in the working environment.
- (m) Failure of corporate memory — a lack of historical data and lack of a knowledge management programme to manage staff turnover. Disproportionate number of experienced individuals leaving the organization, e.g. when reorganizing and/or downsizing.
- (n) Low status of individuals or units conducting assessments — lack of respect for findings of assessments, findings being ignored or not addressed in a timely manner.
- (o) Failure to deal with the findings of independent external safety reviews — reluctance to accept proposals for changes that were not developed internally or lack of a process to monitor progress in implementing the recommendations of external reviews.
- (p) Lack of corporate oversight — lack of awareness of safety issues at the corporate level, with safety issues being ignored in making business decisions.
- (q) Lack of ‘ownership’ of safety — lack of recognition that everyone shares a responsibility for safety.
- (r) Isolationism — safety practices and standards become unrelated to best practices and standards in the industry whereby the organization operates increasingly in a self-referencing mode.
- (s) Lack of learning — unwillingness to share knowledge and experience with others, or to use the experience of others to improve safety at the installation. Organizations become complacent and focus on the successes of the past, and are reluctant to invest in acquiring new knowledge and skills for the future.

More information regarding the stages of decline in safety culture is provided in Ref. [7].

2.30. Reference [1] states in para. 2.5 that:

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

- 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.”

2.31. The following recommendations have been developed to provide a means of meeting these requirements for nuclear installations. They are supplementary to, and should be read in conjunction with, the generic recommendations provided in Ref. [2].

Human factors and the interaction between individuals, technology and the organization⁹

2.32. All safety barriers are designed, constructed, strengthened, breached or eroded by the action or inaction of individuals. Human factors in the organization are critical for safe operation and they should not be separated from technical aspects. Ultimately, safety results from the interaction of individuals with technology and with the organization.

2.33. The concept of safety culture embraces this integration of individuals and technical aspects. However, whereas the culture of an organization influences human behaviour through the values, beliefs and assumptions held by the personnel of the organization, there are also other factors that may have an influence on how humans act in a given situation.

2.34. In a strong safety culture, there should be a knowledge and understanding of human behaviour mechanisms and established human factor principles should be applied to ensure the outcomes for safety of individuals–technology–organization interactions. This could be achieved by including experts on human factors in all relevant activities and teams.

2.35. The interaction between the individual, technology and the organization can be explained as follows. In a given situation, individuals have various types of resource at their disposal to enable them to carry out a task successfully.

⁹ In some States this interaction is referred to as ‘man–technology–organization’.

These resources may be intrinsic to the individual in the form of competence, motivation, cognitive abilities, etc. Resources may also be physical resources (such as instrumentation, procedures or computer aids), or they may reside in the working environment, through teamwork, communication and leadership, in the management system and in the culture. When the content, design and organization of the task correspond to the individual's needs and capabilities, the conditions prevail for the individual to perform in a way that promotes safety. Thus, resources intrinsic and extrinsic to the individual may help in preventing human error by providing barriers to error.

2.36. When analysing events, consideration should be given to the possible influence of all these factors on human behaviour. These factors should also be considered when the purpose is to identify potential weaknesses in the interactions between individuals–technology–organization and to determine how to strengthen barriers or introduce new barriers to prevent human error. Ideally, interdisciplinary teams should carry out predictive and preventive analyses of these types of event. Such teams should include human behaviour competence, so as to analyse the individuals–technology–organization interactions from different perspectives in order to identify suitable barrier functions.

2.37. Individuals should also be trained in how to recognize situations that are likely to give rise to errors, so that they can avoid making mistakes. In addition, there are various activities that could be carried out on an individual basis to prevent error. Among these are:

- (a) Pre-job briefings, asking the questions: What are the critical steps? What situations associated with the work assignment are likely to give rise to errors? What defences are in place to prevent events?
- (b) Self-checks applying the stop–think–act–review (STAR) concept.
- (c) Peer checks — having a second individual check the intended action prior to carrying it out.
- (d) Three-way communication by which a message is communicated from one individual to another. The individual receiving the message repeats the message to confirm a clear understanding and the originator acknowledges that the message has been correctly understood and so closes the communication loop.
- (e) Conservative decision making should be applied when there are no procedures in place or plans made for the activity. Further guidance is provided in Ref. [7].

GRADING THE APPLICATION OF REQUIREMENTS FOR THE MANAGEMENT SYSTEM

2.38. Reference [1] states in paras 2.6 and 2.7 that:

“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.

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

2.39. The following recommendations have been developed to provide a means of meeting these requirements for nuclear installations. They are supplementary to, and should be read in conjunction with, the generic recommendations provided in Ref. [2].

2.40. To establish the necessary grading of an item, service or process, the responsible individual should be guided through a series of questions to enable them to determine the consequences of the inadequate performance or inadequate control of an item, service or process. Annex I provides an example of such a methodology for use in the operation stage and the considerations that need to be taken into account in grading management system requirements. The grading methodology used in other stages of the lifetime of a nuclear installation could reflect a similar methodology to that discussed in Annex I but which will address the factors relevant to the specific stage.

2.41. In general, application of the management system requirements should be most stringent for items, services or processes with the highest grade; for the lowest grade, application of the management system requirements may be the least stringent. The following are examples of areas where grading should be applied:

- (a) Type and content of training;
- (b) Level of detail and degree of review and approval of instructions;
- (c) Need for, and level of, detail of inspection plans;
- (d) Degree of in-process reviews and controls;

- (e) Requirements for traceability of material;
- (f) Type and level of detail in procurement documents;
- (g) Type of assessment;
- (h) Records to be generated and retained.

DOCUMENTATION OF THE MANAGEMENT SYSTEM

2.42. Reference [1] states in paras 2.8–2.10 that:

“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 [e.g. procedures and instructions] that explain how work is to be prepared, reviewed, carried out, recorded, assessed and improved.

“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.

“The documentation of the management system shall reflect:

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

2.43. The following recommendations have been developed to provide a means of meeting these requirements for nuclear installations. They are supplementary to, and should be read in conjunction with, the generic recommendations provided in Ref. [2].

2.44. Detailed working level documents include work instructions, technical instructions and drawings and typically cover the tasks within a process that are carried out within a department or by an individual. Some organizations develop a writers guide to ensure the consistency of the style and appearance of the documents. These documents are level 3 documentation, as described in Ref. [2].

2.45. Detailed working documents are used to describe specific work activities and to convey administrative and technical information to the individuals performing the work. The type and format of these documents may vary considerably, depending on their application.

2.46. The sections contained in detailed working documents are similar to the documents at level 2, although they contain considerably more detail on how the work is to be performed. The sections typically include the following twelve instructions:

- (1) *Purpose*: Give a clear, concise statement explaining the specific purpose of the document and answering the question: What is the document intended for?
- (2) *Scope*: Define the type and the scope of work and the places where the document applies, and delineate the boundaries of the functions, systems and areas treated in the document.
The above two item headings may not be necessary if the title of the document adequately conveys the purpose and scope, e.g. routine maintenance of turbine hall water coolant pump.
- (3) *Responsibilities*: Define the duties of the individuals who are to apply the document. Identify these individuals and specify their responsibilities and when any necessary action should be taken.
- (4) *Definitions*: Define words and terms used in the document that might cause confusion and which thus need clarification.
- (5) *References*: Provide a bibliography of specifications, standards and other documents referenced in the document. If documents are referenced in part, state the relevant pages and paragraph numbers, which may include references to other work instructions. Documents referenced may also include applicable design documents or other source documents such as vendors' literature, engineering drawings or plant specifications.
- (6) *Prerequisites*: State any independent actions that should be performed, and by whom they should be performed, prior to the use of the procedure or instruction. State any spare parts, special tools or instruments that are necessary (e.g. scaffolding or services); state also the necessary state of the plant, if relevant, and any special conditions necessary to simulate normal or abnormal operating conditions.
- (7) *Precautions*: State what precautions are necessary to protect equipment, individuals, the public and the environment or to avoid abnormal conditions or an emergency. Highlight such precautions in this section, or identify them in the relevant steps of the procedure or instructions.

- (8) *Limitations*: Are there any limitations on the parameters being controlled? Identify the corrective measures that may be used to restore such parameters to within the normal limits.
- (9) *Actions*: Include a description of the functions or tasks to be performed in a process. Provide sufficient detail so that a competent individual can perform the functions or tasks without direct supervision. In some cases, it may be appropriate to provide step-by-step instructions.
- (10) *Verification*: Identify any work activity that requires verification, including independent verification. Highlight the verification points at the relevant step in the procedure.
- (11) *Acceptance criteria*: State criteria for the satisfactory completion of the task or function. If tolerances within prescribed limits are permissible, they should be specified together with any requisite actions (e.g. reporting). Specify the method of verification to be used. This can be included as part of the procedure or on a check sheet. Referenced documents may be used as a source of the details of acceptance criteria.
- (12) *Records and check sheets*: Clarify which documents or forms are to be used and retained. Check sheets should be employed when complex procedures or instructions are used. A list should be added which specifies, by title, the records necessary to certify or provide evidence that the tasks required in the document have been accomplished and verified and examples of the documents or forms attached. Identify records as permanent or non-permanent in accordance with specified criteria, and specify the retention times for non-permanent records. Mark attached sample forms with 'specimen'. Record the date and identify the individuals performing the work and, where appropriate, the 'as found' condition, the corrective action performed and the 'as left' condition.

3. RESPONSIBILITY OF MANAGEMENT

COMMITMENT BY MANAGEMENT

3.1. Reference [1] states in paras 3.1–3.5 that:

“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.

“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.

“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.

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

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

3.2. The generic recommendations that were developed to provide a means of meeting these requirements are provided in Ref. [2]; there are no supplementary recommendations.

MEETING THE EXPECTATIONS OF INTERESTED PARTIES

3.3. Reference [1] states 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.”

3.4. The following recommendations have been developed to provide a means of meeting these requirements for nuclear installations. They are supplementary to, and should be read in conjunction with, the generic recommendations provided in Ref. [2].

3.5. To consider and respond to the expectations of interested parties, an organization:

- (a) Should identify its interested parties and address their expectations within the management system;

- (b) Should identify and agree which of the interested parties' expectations are to be satisfied and should ensure that they are communicated throughout the organization;
- (c) Should take an approach such that ensuring safety overrides all other demands, especially in the event of contrary expectations on the part of different interested parties;
- (d) Should translate the expectations identified into requirements on the organization;
- (e) Should communicate the requirements throughout the organization;
- (f) Should focus on improving processes to ensure value for the interested parties identified.

3.6. Formally agreed expectations of interested parties, in relation to a nuclear installation, should be addressed by the organization within the constraints imposed by statutory and mandatory requirements. Expectations of interested parties could be factored into elements such as:

- (a) Safety;
- (b) Availability;
- (c) Reliability;
- (d) Transparency;
- (e) Communication;
- (f) Cost;
- (g) Liability;
- (h) Environmental impact.

3.7. Management should practise ethical, effective and efficient compliance with current and prospective requirements and should communicate throughout the organization:

- (a) The benefits to be gained for interested parties and by the organization by striving for excellence;
- (b) The obligations of the organization with regard to its impact on society.

3.8. The process of assessing how the expectations of interested parties are satisfied should involve several steps:

- (a) Determination of the factors necessary for satisfying the expectations of interested parties;
- (b) Selection of the approach to, and methodology for, the assessment;

- (c) Assessment of the satisfaction of the expectations of interested parties;
- (d) Analysis of the data.

3.9. The results of the assessment of satisfaction of the expectations of interested parties should be used as an input for the process of continual improvement of the management system.

ORGANIZATIONAL POLICIES

3.10. Reference [1] states in para. 3.7 that:

“Senior management shall develop the policies of the organization. The policies shall be appropriate to the activities and facilities of the organization.”

3.11. The following recommendations have been developed to provide a means of meeting these requirements for nuclear installations. They are supplementary to, and should be read in conjunction with, the generic recommendations provided in Ref. [2].

Developing the policies

3.12. The policies of the organization should be stated as succinctly as possible, to enable them to be effectively communicated, understood and consistently implemented. In addition, the following key information should be communicated effectively for each policy:

- (a) The meaning and purpose of the policy;
- (b) The values and beliefs that relate to the policy;
- (c) The commitment of senior managers to its implementation;
- (d) The plans, standards, procedures and systems relating to its implementation and the measurement of performance;
- (e) Additional factual information to promote the involvement and commitment of individuals;
- (f) Performance reports;
- (g) Comments and ideas for improvements;
- (h) How lessons learned will be applied.

3.13. Written policy statements should set the direction for the organization:

- (a) By demonstrating senior managers' commitment;
- (b) By setting each policy in context with other business objectives;
- (c) By making a commitment to continual improvement in performance.

3.14. The key tasks of senior management with regard to policies should include:

- (a) Specifying and devising the policies of the organization;
- (b) Establishing strategies to implement each policy and integrating these strategies into general business activities;
- (c) Specifying a structure for planning, measuring and assessing each policy;
- (d) Specifying a structure for implementing each policy and its supporting plans;
- (e) Agreeing plans for improvements and for reviewing progress, to develop both the management system and the policies;
- (f) Pursuing the policy objectives.

Implementing policies

3.15. The processes for implementing each policy and the structure within which the policy is implemented should be clear. Individuals should know which parts of the processes are relevant to them, so as to understand the major risks in the activities at the installation and how they are controlled.

3.16. In order to understand and implement policies at the installation, managers at all levels should have:

- (a) Leadership skills;
- (b) Communication skills;
- (c) Skills in training, instruction, coaching, knowledge management and problem solving;
- (d) An understanding of the risks within the manager's own area of responsibility;
- (e) Knowledge of relevant legislation and appropriate methods of compliance;
- (f) Knowledge of the planning, measuring and assessment processes at the installation.

3.17. Some managers in key positions may provide specific input to the policies of the organization. This would apply to those managers who devise and develop the management system, who investigate accidents and other incidents, who take part in review and audit activities or who are responsible for implementing emergency procedures.

3.18. To understand and implement the policies of the organization, every individual should have:

- (a) An overview of the principles underlying each policy;
- (b) Detailed knowledge of the arrangements relevant to the individual's own job and safety implications thereof;
- (c) Communication skills and problem solving skills, to allow effective participation.

3.19. The system of performance appraisal should be used to identify any lack of understanding by individuals or any failure to implement the policies of the organization. Such a lack of understanding could arise, for example, because an individual has not absorbed formal on the job training or information provided as part of their induction. Training is necessary in different situations and at various stages. Training should cover:

- (a) The induction of new personnel, including part-time and temporary personnel;
- (b) Improving the performance of individuals;
- (c) Job changes, promotions or delegations of authority allowing someone to deputize;
- (d) The introduction of new equipment, technology or procedures;
- (e) Follow-up actions after the investigation of an incident.

3.20. A single integrated policy or an integrated set of policies should be developed that includes as a minimum the following topics:

- (a) Safety (including nuclear safety and the health and safety of individuals);
- (b) The environment;
- (c) Quality;
- (d) Change management;
- (e) Security.

Safety, health and environmental policy

3.21. Since policies on safety, health and the environment are similar in content and nature, some organizations choose to combine them into one policy. The combined safety, health and environmental policy:

- (a) Should state the importance of protecting the safety, the health and the environment of personnel, contractors and the public.
- (b) Should confirm that excellence in performance in the areas of safety, health and environmental protection is an integral part of the business and is essential to commercial success.
- (c) Should state, as primary goals, that no harm should result from activities carried out by the organization and that the organization should be respected and trusted by the personnel, by the public and by interested parties.
- (d) Should state clear policy objectives and proposed means of:
 - Eliminating injuries and health issues at work and minimizing radiation exposures;
 - Preventing incidents and maintaining effective arrangements for emergency preparedness and response;
 - Reducing pollution as far as practicably feasible, minimizing radioactive discharges, minimizing radioactive waste and other waste and using natural resources in a sustainable way, for the purpose of environmental protection;
 - Ensuring the safe disposal or storage of radioactive waste and other waste;
 - Achieving and maintaining a strong safety culture;
 - Learning lessons from events, implementing corrective actions and seeking out and using good practices;
 - Ensuring that the activities and products of the organization are in compliance with applicable legislation and that its practices meet the relevant requirements and applicable standards of performance.
- (e) Should specify how the safety, health and environmental policy will be developed and improved by, for example:
 - Consulting individuals on matters of common interest;
 - Listening to and responding to interested parties;
 - Openly reporting, at least once a year, on performance in meeting the objectives of the safety, environmental and health policy;
 - Working with interested parties, the nuclear industry and contractors to improve safety, environmental and health activities;

- Informing, instructing, training and developing individuals who work at the installation and ensuring that competent advice on safety, environmental and health matters is available;
 - Auditing the management system and, as a result, adjusting the objectives and targets of the safety, environmental and health policy where necessary;
 - Maintaining a high level of performance of activities, in particular by ensuring that the activities are adequately resourced and are carried out by suitably qualified and experienced individuals, with priority given to safety at all times.
- (f) Should state which specific legal requirements the policy has been developed to meet.
- (g) Should specify the process for reviewing new legislation on safety, environmental and health matters and for ensuring that the organization can comply with it.

Policy for quality

3.22. The policy for quality:

- (a) Should specify the organization's expectations in relation to quality.
- (b) Should set the expectations of the management for organizational performance and for the performance of individual employees.
- (c) Should express the management's support of each individual in carrying out their assigned work.
- (d) Should promote an objective of continual improvement.
- (e) Should create a working environment that promotes quality and continual improvement throughout the installation.
- (f) Should ensure that individuals have the necessary responsibilities and authorities to carry out their work.
- (g) Should state a commitment that products and processes will be of the required quality.
- (h) Should establish the management's responsibility for ensuring that individuals understand and accept their functions and obligations in applying the policy for quality.
- (i) Should specify the key documents that govern levels of performance, such as:
 - Other policy statements;
 - Statutes and regulations;
 - The description of the management system;
 - National and international codes and standards.

Policy for change management

3.23. Organizations should promulgate a policy for promoting and managing change that encompasses their vision and values. This policy for change management:

- (a) Should give priority to safety;
- (b) Should address all types of change;
- (c) Should introduce the process for change management;
- (d) Should state that only approved changes will be implemented;
- (e) Should promote effective communication.

Security policy

3.24. Details of the security policy are not provided here because of the nature of its content. The content of the security policy is governed by the security requirements of the Member State (see footnote 3).

PLANNING

3.25. Reference [1] states in paras 3.8–3.11 that:

“Senior management shall establish goals, strategies, plans and objectives¹⁰ that are consistent with the policies of the organization.

“Senior management shall develop the goals, strategies, plans and objectives of the organization in an integrated manner so that their collective impact on safety is understood and managed.

“Senior management shall ensure that measurable objectives for implementing the goals, strategies and plans are established through appropriate processes at various levels in the organization.

“Senior management shall ensure that the implementation of the plans is regularly reviewed against these objectives and that actions are taken to address deviations from the plans where necessary.”

¹⁰ These goals, strategies, plans and objectives are sometimes collectively referred to as a ‘business plan’.

3.26. The generic recommendations that were developed to provide a means of meeting these requirements are provided in Ref. [2]; there are no supplementary recommendations.

RESPONSIBILITIES AND AUTHORITY FOR THE MANAGEMENT SYSTEM

3.27. Reference [1] states in paras 3.12–3.14 that:

“Senior management shall be ultimately responsible for the management system and shall ensure that it is established, implemented, assessed and continually improved.

“An individual reporting directly to senior management shall have specific responsibility and authority for:

- Coordinating the development and implementation of the management system, and its assessment and continual improvement;
- Reporting on the performance of the management system, including its influence on safety and safety culture, and any need for improvement;
- Resolving any potential conflicts between requirements and within the processes of the management system.

“The organization shall retain overall responsibility for the management system when an external organization is involved in the work of developing all or part of the management system.”

3.28. The following recommendations have been developed to provide a means of meeting these requirements for nuclear installations. They are supplementary to, and should be read in conjunction with, the generic recommendations provided in Ref. [2].

3.29. The individual with specific responsibility for the development and implementation of the management system should be specified. This individual should ensure that those persons responsible for each process (the process owners) provide a periodic report on the status of their processes to enable reports on the performance of the management system to be prepared.

3.30. Techniques such as benchmarking (internal and external) should be used to identify potential improvements in the management system. Also, the individual with specific responsibility for the assessment and for continual improvement of the management system should be aware of, and if possible

should be involved in, developments in national and international standards, and should be aware of practices in other organizations, so as to identify potential improvements.

4. MANAGEMENT OF RESOURCES

PROVISION OF RESOURCES

4.1. Reference [1] states in para. 4.1 that:

“Senior management shall determine the amount of resources necessary and shall provide the resources¹¹ to carry out the activities of the organization and to establish, implement, assess and continually improve the management system.”

4.2. The following recommendations have been developed to provide a means of meeting these requirements for nuclear installations. They are supplementary to, and should be read in conjunction with, the generic recommendations provided in Ref. [2].

Resources provided by suppliers and partners

4.3. Work may be contracted out to external organizations for reasons of economy or because another organization is more competent to perform the work. This should be done on the basis of an established management strategy for suppliers. This strategy should clearly specify whether goods or services are simply acquired from suppliers or whether the organization and the supplier are partners.

¹¹ ‘Resources’ includes individuals, infrastructure, the working environment, information and knowledge, and suppliers, as well as material and financial resources.

4.4. In either case, the organization should know and should have a clear understanding of the products and services with which it is supplied. ‘Intelligent customer capability’¹² should be retained by the organization in order to ensure the organization can exercise control over the work, so as to maintain the ultimate responsibility for its safe and effective execution.

4.5. It may be beneficial to maintain an approved list of suppliers whose performance has been verified by means of selection criteria and/or experience. However, the inclusion of a supplier on an approved list should not diminish the organization’s responsibility to ensure that goods and services are as specified in procurement documentation.

4.6. In the case of a partnership between the organization and the supplier, consideration should be given to the way in which learning could best be achieved to the advantage of both organizations and to maximize the future benefits of continuing the relationship. This may include partners in project initiation phases such as development and review. Partnerships should be managed with account taken of any regulations regarding competition.

4.7. When contracts are awarded for work to be carried out at the installation by individuals from other organizations, the organization should ensure that there is no conflict between the work practices and standards of the supplier and those at the installation.

Managing information and knowledge

4.8. Reference [1] states in para. 4.2 that “The information and knowledge of the organization shall be managed as a resource.”

4.9. The following recommendations have been developed to provide a means of meeting these requirements for nuclear installations. They are supplementary to, and should be read in conjunction with, the generic recommendations provided in Ref. [2].

4.10. Knowledge management is an integrated, systematic approach to identifying, acquiring, transforming, developing, disseminating, using, sharing and preserving knowledge that is relevant to achieving specified objectives.

¹² An ‘intelligent customer capability’ is the capability of the organization to have a clear understanding and knowledge of the product or service being supplied.

Knowledge management consists of three fundamental components: (i) individuals, (ii) processes and (iii) technology. Knowledge management focuses on individuals and organizational culture to stimulate and nurture the sharing and use of knowledge; on processes or methods to find, create, capture and share knowledge; and on technology to store knowledge and make it accessible and to allow individuals to work together without needing to be in the same place. Individuals are the most important of these components, because managing knowledge depends on the willingness of individuals to share and reuse knowledge.

4.11. With regard to information, the full information needs of those carrying out tasks and the ways in which the information is to be provided to the user should be considered in formulating the instructions for each task. The day to day responsibility for ensuring that such information is used effectively lies with the immediate supervisors of the individuals performing tasks. An example of a good practice is the use of pre-job and post-job briefings that include the review of instructions, the review of potential hazards, tool checks, reports on experience of performing the same or similar tasks, and the possible impacts of any other work being undertaken in the vicinity. Information on any unexpected or unusual occurrences while carrying out the work should be preserved and shared.

4.12. Information relating to safety should not be regarded as intellectual property but rather should be shared freely within the nuclear community. Sharing may be achieved through the contribution of information to databases, the sharing of reports, participation in conferences and seminars and benchmarking visits.

4.13. For an organization to be able to provide critical information, it should manage pertinent knowledge so that it is easily accessible to those who may need it for carrying out their tasks. An organization should have an integrated, systematic approach to identifying, capturing, managing and sharing its knowledge and, in so doing, enable groups of individuals to acquire ‘new’ knowledge collectively to help achieve the objectives of the organization. Such a knowledge management system helps an organization to gain insight and understanding from its own experience.

4.14. Knowledge management should be used to capture knowledge (both tacit and explicit) from individuals before they leave the organization, so that it can be retained and transferred to others who need the knowledge for the performance of their jobs or tasks. The organization should assess any risk that

is posed by the loss of critical knowledge and should take mitigatory action if necessary. The organization should have the knowledge base necessary to facilitate the assimilation of new workers and to enhance the skills and knowledge of existing workers.

HUMAN RESOURCES

4.15. Reference [1] states in paras 4.3 and 4.4 that:

“Senior management shall determine the competence requirements for individuals at all levels and shall provide training or take other actions to achieve the required level of competence. An evaluation of the effectiveness of the actions taken shall be conducted. Suitable proficiency shall be achieved and maintained.

“Senior management shall ensure that individuals are competent to perform their assigned work and that they understand the consequences for safety of their activities. Individuals shall have received appropriate education and training, and shall have acquired suitable skills, knowledge and experience to ensure their competence. Training shall ensure that individuals are aware of the relevance and importance of their activities and of how their activities contribute to safety in the achievement of the organization’s objectives.”

4.16. The following recommendations have been developed to provide a means of meeting these requirements for nuclear installations. They are supplementary to, and should be read in conjunction with, the generic recommendations provided in Ref. [2].

4.17. The organization should maintain a human resources plan that deals with both numbers of staff and competence levels. The human resources plan should include a model that covers, for example, the demographics of the organization’s personnel and the projected use of contractors and off-site work. The organization should consider the effects of ageing on its workforce and should establish a detailed plan to ensure that sufficient competent staff remain available. Account should be taken in the plan of the lead time necessary to recruit and train key personnel such as reactor operators.