

IAEA Safety Standards

for protecting people and the environment

The Operating Organization for Nuclear Power Plants

Specific Safety Guide

No. SSG-72



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IAEA SAFETY STANDARDS

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

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

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

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

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

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 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.

Other safety related IAEA publications are issued as **Emergency Preparedness and Response** publications, **Radiological Assessment Reports**, the International Nuclear Safety Group's **INSAG Reports**, **Technical Reports** and **TECDOCs**. The IAEA also issues reports on radiological accidents, training manuals and practical manuals, and other special safety related publications.

Security related publications are issued in the **IAEA Nuclear Security Series**.

The **IAEA Nuclear Energy Series** comprises informational publications to encourage and assist research on, and the development and practical application of, nuclear energy for peaceful purposes. It includes reports and guides on the status of and advances in technology, and on experience, good practices and practical examples in the areas of nuclear power, the nuclear fuel cycle, radioactive waste management and decommissioning.

THE OPERATING
ORGANIZATION FOR
NUCLEAR POWER PLANTS



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

IAEA Safety Standards Series No. SSG-72

THE OPERATING ORGANIZATION FOR NUCLEAR POWER PLANTS

SPECIFIC SAFETY GUIDE

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2022

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FOREWORD

by Rafael Mariano Grossi
Director General

The IAEA's Statute authorizes it to "establish...standards of safety for protection of health and minimization of danger to life and property". These are standards that the IAEA must apply to its own operations, and that States can apply through their national regulations.

The IAEA started its safety standards programme in 1958 and there have been many developments since. As Director General, I am committed to ensuring that the IAEA maintains and improves upon this integrated, comprehensive and consistent set of up to date, user friendly and fit for purpose safety standards of high quality. Their proper application in the use of nuclear science and technology should offer a high level of protection for people and the environment across the world and provide the confidence necessary to allow for the ongoing use of nuclear technology for the benefit of all.

Safety is a national responsibility underpinned by a number of international conventions. The IAEA safety standards form a basis for these legal instruments and serve as a global reference to help parties meet their obligations. While safety standards are not legally binding on Member States, they are widely applied. They have become an indispensable reference point and a common denominator for the vast majority of Member States that have adopted these standards for use in national regulations to enhance safety in nuclear power generation, research reactors and fuel cycle facilities as well as in nuclear applications in medicine, industry, agriculture and research.

The IAEA safety standards are based on the practical experience of its Member States and produced through international consensus. The involvement of the members of the Safety Standards Committees, the Nuclear Security Guidance Committee and the Commission on Safety Standards is particularly important, and I am grateful to all those who contribute their knowledge and expertise to this endeavour.

The IAEA also uses these safety standards when it assists Member States through its review missions and advisory services. This helps Member States in the application of the standards and enables valuable experience and insight to be shared. Feedback from these missions and services, and lessons identified from events and experience in the use and application of the safety standards, are taken into account during their periodic revision.

I believe the IAEA safety standards and their application make an invaluable contribution to ensuring a high level of safety in the use of nuclear technology. I encourage all Member States to promote and apply these standards, and to work with the IAEA to uphold their quality now and in the future.

THE IAEA SAFETY STANDARDS

BACKGROUND

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

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

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

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

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

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

THE IAEA SAFETY STANDARDS

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

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

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

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

Safety Fundamentals

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

Safety Requirements

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

Safety Guides

Safety Guides provide recommendations and guidance on how to comply with the safety requirements, indicating an international consensus that it

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

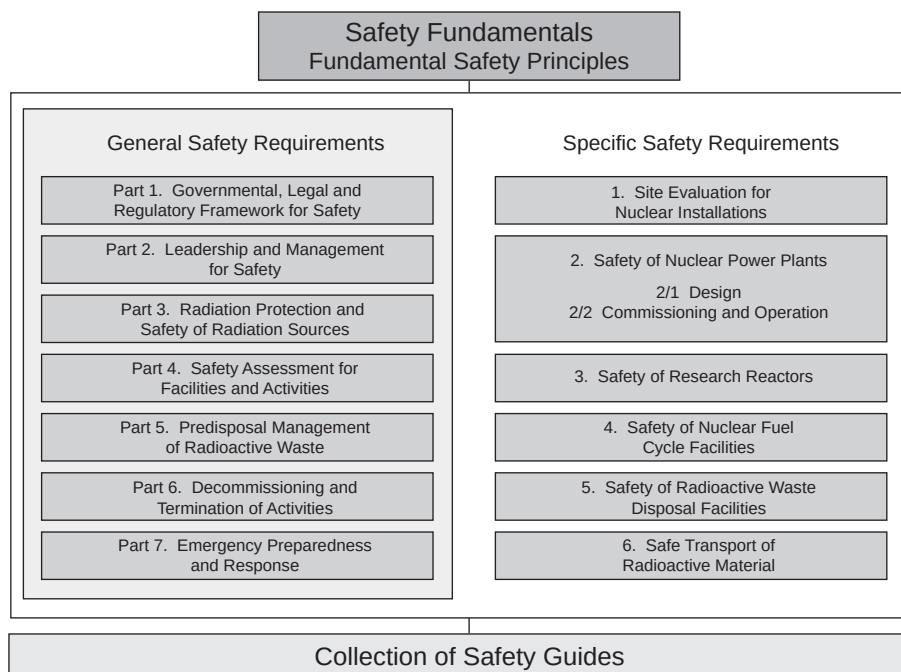


FIG. 1. The long term structure of the IAEA Safety Standards Series.

is necessary to take the measures recommended (or equivalent alternative measures). The Safety Guides present international good practices, and increasingly they reflect best practices, to help users striving to achieve high levels of safety. The recommendations provided in Safety Guides are expressed as ‘should’ statements.

APPLICATION OF THE IAEA SAFETY STANDARDS

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

The IAEA safety standards are applicable, as relevant, throughout the entire lifetime of all facilities and activities — existing and new — utilized for peaceful purposes and to protective actions to reduce existing radiation risks. They can be

used by States as a reference for their national regulations in respect of facilities and activities.

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

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

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

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

DEVELOPMENT PROCESS FOR THE IAEA SAFETY STANDARDS

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

All IAEA Member States may nominate experts for the Safety Standards Committees and may provide comments on draft standards. The membership of 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.

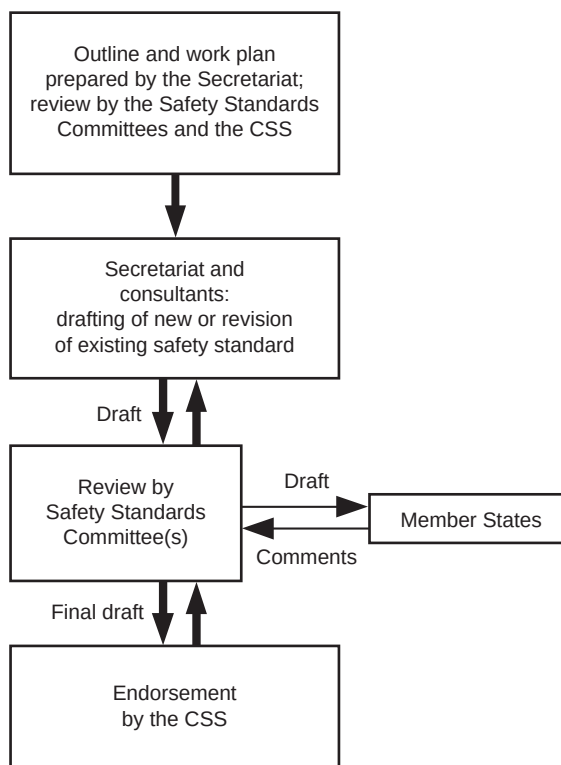


FIG. 2. The process for developing a new safety standard or revising an existing standard.

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 <https://www.iaea.org/resources/safety-standards/safety-glossary>). 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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CONTRIBUTORS TO DRAFTING AND REVIEW 57

1. INTRODUCTION

BACKGROUND

1.1. Requirements for the operation of nuclear power plants are established in IAEA Safety Standards Series No. SSR-2/2 (Rev. 1), Safety of Nuclear Power Plants: Commissioning and Operation [1], while requirements for the design of nuclear power plants are established in IAEA Safety Standards Series No. SSR-2/1 (Rev. 1), Safety of Nuclear Power Plants: Design [2].

1.2. Requirements for establishing, sustaining and continuously improving leadership and management for safety and for an effective management system for all facilities and activities are established in IAEA Safety Standards Series No. GSR Part 2, Leadership and Management for Safety [3].

1.3. This Safety Guide provides specific recommendations on establishing and maintaining the operating organization of nuclear power plants to ensure effective management for safety.

1.4. This Safety Guide was developed in parallel with six other Safety Guides on the operation of nuclear power plants, as follows:

- IAEA Safety Standards Series No. SSG-70, Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants [4];
- IAEA Safety Standards Series No. SSG-71, Modifications to Nuclear Power Plants [5];
- IAEA Safety Standards Series No. SSG-73, Core Management and Fuel Handling for Nuclear Power Plants [6];
- IAEA Safety Standards Series No. SSG-74, Maintenance, Testing, Surveillance and Inspection in Nuclear Power Plants [7];
- IAEA Safety Standards Series No. SSG-75, Recruitment, Qualification and Training of Personnel for Nuclear Power Plants [8];
- IAEA Safety Standards Series No. SSG-76, Conduct of Operations at Nuclear Power Plants [9].

A collective aim of this set of Safety Guides is to support the fostering of a strong safety culture in nuclear power plants.

1.5. The terms used in this Safety Guide are to be understood as defined and explained in the IAEA Safety Glossary [10].

1.6. This Safety Guide supersedes IAEA Safety Standards Series No. NS-G-2.4, The Operating Organization for Nuclear Power Plants¹.

OBJECTIVE

1.7. The purpose of this Safety Guide is to provide recommendations on establishing and maintaining the operating organization of a nuclear power plant to meet the requirements established in SSR-2/2 (Rev. 1) [1] and GSR Part 2 [3].

1.8. The recommendations provided in this Safety Guide are aimed primarily at operating organizations of nuclear power plants and regulatory bodies.

SCOPE

1.9. It is expected that this Safety Guide will be used primarily for land based stationary nuclear power plants with water cooled reactors designed for electricity generation or for other production applications (such as district heating or desalination).

1.10. In most States, the operating organization is the legal entity responsible for safety and for financial and commercial obligations, as well as for other obligations that are connected with the operation of a nuclear power plant. This Safety Guide is solely concerned with those responsibilities and obligations that are necessary to ensure the safe operation of the nuclear power plant(s) under the control of the operating organization.

1.11. This Safety Guide addresses the commissioning, operation and preparation for decommissioning stages of a nuclear power plant. The role of the operating organization in the siting, design, manufacturing and construction of a nuclear power plant is outside the scope of this Safety Guide.

STRUCTURE

1.12. Recommendations on determining the structure of the operating organization and establishing the management system are provided in Section 2. Section 3

¹ INTERNATIONAL ATOMIC ENERGY AGENCY, The Operating Organization for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-2.4, IAEA, Vienna (2001).

provides recommendations on determining the functions, responsibilities, goals and objectives of the operating organization to ensure the safe operation of a nuclear power plant. Recommendations on managing the interfaces between the operating organization and external organizations are provided in Section 4. Section 5 provides recommendations relating to management for safety. Recommendations on internal and external communication and on liaison relevant to implementing an effective management system within the operating organization are provided in Section 6. Section 7 provides recommendations on the establishment of management programmes² by the operating organization. The Annex gives examples of tools that can be used by the operating organization to enable continuous improvement of operations at a nuclear power plant.

2. ORGANIZATIONAL STRUCTURE

THE OPERATING ORGANIZATION OF A NUCLEAR POWER PLANT

2.1. The term ‘operating organization’ is defined as any organization or person applying for authorization or authorized to operate an authorized facility or to conduct an authorized activity and responsible for its safety [10]. For the purposes of this Safety Guide, the term ‘operating organization’ is used to designate a company or utility that is authorized to operate one or more nuclear power plants.

2.2. The operating organization is required to be authorized to operate a nuclear power plant through a licensing system that has been established in accordance with the national regulatory framework. Requirements for such a framework, including the authorization and licensing of operating organizations, are established in IAEA Safety Standards Series No. GSR Part 1 (Rev. 1), Governmental, Legal and Regulatory Framework for Safety [11].

MANAGEMENT SYSTEM FOR A NUCLEAR POWER PLANT

2.3. The operating organization is required to develop, implement, assess and continuously improve a management system, in accordance with the

² For the purposes of this Safety Guide, a ‘management programme’ consists of a systematic application of planning schedules, procedures, reviews and audits supported by appropriate resources to administer a specific management policy.

requirements established in GSR Part 2 [3] and with Requirement 2 of SSR-2/2 (Rev. 1) [1]. Recommendations on the management system for a nuclear power plant are provided in IAEA Safety Standards Series No. GS-G-3.5, The Management System for Nuclear Installations [12].

2.4. As part of the management system, the operating organization is required to define the various functions that are needed for safe operation of a nuclear power plant (see para. 3.2 of SSR-2/2 (Rev. 1) [1]). The operating organization should decide which functions should be performed (i) at the plant site, (ii) off the site but within the operating organization and (iii) outside the operating organization.

2.5. As part of the management system, the operating organization is required to establish policies, lines of responsibility and authority, lines of communication, and review and support activities (see para. 3.2 of SSR-2/2 (Rev. 1) [1]).

2.6. Paragraph 3.11 of SSR-2/2 (Rev. 1) [1] states that “The organization, qualifications and number of operating personnel shall be adequate for the safe and reliable operation of the plant in all operational states and in accident conditions.” The staffing of the plant should be regularly reassessed and, if necessary, updated to reflect developments in safe operation.

2.7. The management system should be established well in advance so that the necessary processes (including the recruitment and training of personnel) are implemented for the commissioning stage, and to ensure that all processes are established before the commencement of operation. The management system should form the basis for the initial recruitment and training programme as well as for all such subsequent programmes.

2.8. Paragraph 6.6 of GSR Part 2 [3] states:

“Senior management shall conduct a review of the management system at planned intervals to confirm its suitability and effectiveness, and its ability to enable the objectives of the organization to be accomplished, with account taken of new requirements and changes in the organization.”

STRUCTURE OF THE OPERATING ORGANIZATION

2.9. Requirement 3 of SSR-2/2 (Rev. 1) [1] states that “**The structure of the operating organization and the functions, roles and responsibilities of its personnel shall be established and documented.**”

2.10. The factors to be considered in determining the structure of the operating organization of a nuclear power plant and its staffing requirements include the following:

- (a) The need to ensure that structures, systems and components important to safety remain in accordance with the design requirements;
- (b) The need for radiation protection arrangements and related provisions for medical surveillance, in accordance with the requirements established in IAEA Safety Standards Series No. GSR Part 3, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards [13];
- (c) The need to ensure the fulfilment of fundamental safety functions in all plant states, as described in Requirement 4 of SSR-2/1 (Rev. 1) [2], that is (i) control of reactivity, (ii) removal of heat from the reactor and from the fuel store, and (iii) confinement of radioactive material, shielding against radiation and control of planned radioactive releases, as well as limitation of accidental radioactive releases;
- (d) The need for design, construction, operation and plant modifications to be thoroughly analysed and reviewed, in accordance with the relevant requirements of SSR-2/1 (Rev. 1) [2] and SSR-2/2 (Rev. 1) [1];
- (e) The need to be prepared for a nuclear or radiological emergency and to coordinate emergency plans with those of the regulatory body, public authorities and other response organizations, in accordance with the requirements established in IAEA Safety Standards Series No. GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency [14];
- (f) The need to minimize and control radioactive releases and waste arisings and provide for environmental surveillance, in accordance with paras 5.11 and 5.17–5.20 of SSR-2/2 (Rev. 1) [1];
- (g) The need to control access to the plant and to certain areas within the site in order to ensure protection and safety, and also for nuclear security purposes (see para. 5.1 of SSR-2/2 (Rev. 1) [1]);
- (h) The need to conduct activities affecting items important to safety in accordance with the management system (see paras 2.3–2.8), including the need to verify whether such activities have been performed as specified;
- (i) The need for training and retraining operating personnel and contractors to achieve and maintain an adequate level of competence, in accordance with Requirement 7 of SSR-2/2 (Rev. 1) [1];
- (j) The need to consider factors that might affect human performance (see para. 4.29 of SSR-2/2 (Rev. 1) [1]), so that work can be carried out safely and satisfactorily without imposing unnecessary physical or psychological demands on operating personnel;

- (k) The need to ensure that attitude towards safety is one of the selection criteria for recruiting staff, appraising staff performance and promoting managers (see para. 5.2 of GSR Part 2 [3]);
- (l) The need to know and understand regulatory requirements, make proposals to meet these requirements, and implement them in a timely manner (see also para. 3.7 of SSR-2/2 (Rev. 1) [1]);
- (m) The need to set up a system of formal communication with the regulatory body (see paras 3.3 and 3.7 of SSR-2/2 (Rev. 1) [1]);
- (n) The need for additional personnel and facilities for activities such as maintenance, fuel management, chemistry control, surveillance, in-service inspection and monitoring, plant modifications and procurement of special items (see Refs [4–9]);
- (o) The need for operating experience feedback and review (in accordance with Requirement 24 of SSR-2/2 (Rev. 1) [1]), so that appropriate actions can be taken;
- (p) The need to ensure an open exchange of information both upward and downward within the organization;
- (q) The need for technical services and expertise (see Requirement 13 of GSR Part 1 (Rev. 1) [11]), including for emergency preparedness and response;
- (r) The need to ensure that personnel involved in the monitoring and review of safety performance have sufficient independence from costs and schedules, in accordance with para. 4.36 of SSR-2/2 (Rev. 1) [1].

2.11. The document describing the organizational structure should indicate the staffing arrangements in terms of direct operating personnel and support personnel. Clear lines of authority are required to be established to deal with matters bearing on plant safety in all plant states (see para. 3.8 of SSR-2/2 (Rev. 1) [1]). The extent to which the support functions are self-sufficient or dependent on services from outside the operating organization should be described by means of organizational charts that include personnel resource allocations and specify the duties and responsibilities of key personnel (see also para. 3.6 of SSR-2/2 (Rev. 1) [1]).

2.12. The descriptions of the structure of the operating organization, the lines of responsibility, authority and communication, as well as the functions to be performed by individual departments (and by individuals in those departments, as appropriate) should be unambiguous and should leave no scope for improvisation in any operational state or in accident conditions. Functions to be performed by external organizations or consultants should also be described, together with the related lines of communication and authority.