IAEA SAFETY STANDARDS

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Safety of Nuclear Power Plants: Commissioning and Operation

DRAFT SAFETY REQUIREMENTS

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Revision of SSR-2/2 (Rev. 1)

CONTENTS

1. INTRODUCTION

BACKGROUND

1.1. The safety of a nuclear power plant is ensured by means of proper site selection, design, construction and commissioning, followed by proper management, operation and maintenance of the plant. Thereafter, a controlled transition to decommissioning is required. The organization and management of plant operations is expected to ensure that a high level of safety is achieved and maintained through the effective management and control of operational activities.

1.2. This publication is governed by IAEA Safety Standards Series No. SF-1, Fundamental Safety Principles [1]. It has been harmonized with IAEA Safety Standards Series Nos: SSR-2/1 (Rev. 1), Safety of Nuclear Power Plants: Design [2]; GSR Part 2, Leadership and Management for Safety [3]; GSR Part 3, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards [4]; GSR Part 5, Predisposal Management of Radioactive Waste [5]; GSR Part 6, Decommissioning of Facilities [6]; and GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency [7].

1.3. Recommendations on the fulfilment of the safety requirements are provided in supporting Safety Guides. The terminology used in this publication is to be understood as it appears in the IAEA Nuclear Safety and Security Glossary [8].

1.4. This Safety Requirements publication supersedes IAEA Safety Standards Series No. SSR-2/2 (Rev. 1), Safety of Nuclear Power Plants: Commissioning and Operation[1].

OBJECTIVE

1.5. The objective of this publication is to establish the requirements to be satisfied to ensure the safe commissioning and operation of nuclear power plants.

1.6. The requirements established in this publication are aimed at nuclear power plant regulatory bodies, operating organizations and technical support organizations.

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR-2/2 (Rev. 1), IAEA, Vienna (2016).

SCOPE

1.7. This publication establishes requirements on the safe commissioning and operation of nuclear power plants. This includes multiple unit plants, evolutionary and innovative designs, and plants with alternative operating models (including autonomous systems and remote monitoring and intervention capabilities), transportable reactors and microreactors.

1.8. The scope of this publication includes commissioning and operation up to the removal of nuclear fuel from the plant, including maintenance and modifications made throughout the lifetime of the plant. It includes the preparation for decommissioning but not the decommissioning stage itself. The scope covers normal operation, anticipated operational occurrences and accident conditions.

STRUCTURE

1.9. This publication follows the relationship between principles and objectives for safety, and safety requirements and criteria. Sections 2–9 establish safety requirements under numbered overarching requirements.

1.10. Section 2 establishes the requirements to be applied for the general management of a nuclear power plant. Section 3 establishes the operational requirements , while Section 4 establishes the requirements for maintenance, testing, surveillance and inspection . Section 5 establishes the requirements for engineering . Section 6 establishes the requirements for radiation protection. Section 7 establishes the requirements for emergency and severe accident management. Section 8 establishes the requirements for preparation for commissioning and Section 9 establishes the requirements for the preparation for decommissioning.

1.11. As the structure of this publication has been changed from the previous version (see footnote 1) to reflect the functional areas of nuclear power plant commissioning and operation, the Annex contains a table showing how the numbering of the requirements in this publication corresponds to that in the previous version.

2. GENERAL MANAGEMENT OF A NUCLEAR POWER PLANT

REQUIREMENT 1: RESPONSIBILITIES OF THE OPERATING ORGANIZATION OF THE NUCLEAR POWER PLANT

The operating organization shall have the prime responsibility for safety at all stages in the operation of a nuclear power plant.

2.1. The prime responsibility for safety shall cover all the activities relating to the operation, both directly and indirectly. It shall include the responsibility for supervising the activities of all other related external support organizations , such as designers, suppliers, manufacturers and constructors, employers and contractors, as well as the responsibility for operation of the nuclear power plant by the operating organization itself. The operating organization shall discharge this responsibility through a management system established in accordance with the requirements of GSR Part 2 [3].

2.2. The senior management at the nuclear power plant shall have the necessary authority (in accordance with their defined accountabilities) to ensure the safe operation of the plant. This includes the provision of any necessary resources, information and support from the operating organization.

REQUIREMENT 2: MANAGEMENT SYSTEM OF THE OPERATING ORGANIZATION

The operating organization of a nuclear power plant shall establish, implement, assess and continually improve an integrated management system.

2.3. The operating organization of the nuclear power plant shall ensure through the management system that the plant is operated in a safe manner and within the limits and conditions that are specified in the safety assessment and established in the authorization. The management system shall be used by all individuals, shall assist in achieving organizational goals and shall support the development of a strong safety culture.

2.4. The management system shall integrate all the elements of management so that processes and activities that might affect safety are established and conducted coherently with other requirements, including requirements in respect of leadership, protection of health, human performance, protection of the environment, security and quality, so that safety is not compromised by other requirements or demands.

2.5. The management system of the operating organization shall provide for arrangements to ensure safety in activities performed by external support organizations. Responsibility for activities performed by external support organizations, and for their overall control and supervision, shall rest with the operating organization. The operating organization shall establish a system for the supervision of work performed by external support organizations. It shall be the responsibility of the operating organization to ensure that the personnel of external support organizations who perform activities on structures, systems or components important to safety, or who undertake activities affecting safety, are qualified to perform their assigned tasks. The contracted activity shall be clearly specified in writing and shall be approved by the operating organization prior to its commencement.

2.6. The operating organization shall ensure long term access to knowledge of the plant design, siting, manufacture, construction and operation throughout the lifetime of the plant including life extensions and decommissioning.

2.7. The operational safety of the nuclear power plant is required to be subject to oversight by a regulatory body independent of the operating organization (see Requirements 3 and 4 of IAEA Safety Standards Series No. GSR Part 1 (Rev. 1), Governmental, Legal and Regulatory Framework for Safety [9]). The operating organization, in accordance with regulatory requirements and its own management system, shall submit or make available to the regulatory body all necessary documents and information. The operating organization shall develop and implement a management process for reporting events to the regulatory body in accordance with established criteria and regulatory requirements. The operating organization shall provide the regulatory body with all necessary assistance to enable it to perform its duties, including the provision of unhindered access to the plant, personnel and documentation.

2.8. The management system for a nuclear power plant, shall include:

(a) Policy making for all areas of safety, including:
    (i) Setting management objectives;
    (ii) Establishing the policy for safety;
    (iii) Developing managers and staff who value learning, have skills in acquiring and transferring knowledge, and can adapt the organization on the basis of new knowledge and insights;
    (iv) Promoting a strong safety culture.

(b) Allocation of responsibilities (with corresponding lines of authority and communication) for:

(i) Allocating resources;

(ii) Providing personnel with the appropriate level of education and training and material resources;

(iii) Retaining the necessary competences;

(iv) Approving the contents of management programmes;

(v) Developing procedures and instructions, and for ensuring adherence to these procedures and instructions;

(vi) Establishing and implementing policies on fitness for duty (see para. 3.22);

(vii) Establishing a programme for making changes to the management system including organizational changes which shall be risk assessed before implementation.

(c) Processes for executive decision making and actions for the operation of the plant in all operational states and accident conditions.

(d) Processes for obtaining (from on-site organizations and off-site organizations, including contractors) technical and administrative services and the use of associated resources considering differences in design and technology. For sites with shared safety related resources (e.g. sites with multiple units or with more than one operating organization), the arrangements for the use of such shared resources shall be clearly defined.

(e) Review processes, including monitoring and assessment of the performance of the operating organization. The purpose of monitoring shall be: to verify compliance with the objectives for safe operation of the plant; to reveal deviations, deficiencies including human and organizational factors and equipment failures; and to provide information for the purpose of taking timely corrective actions and making improvements. This shall also include review of the overall safety performance of the organization to assess the effectiveness of management for safety and to identify opportunities for improvement. In addition, a safety review of the plant shall be performed periodically, including design aspects, to ensure that the plant is operated in conformance with the approved design and safety analysis report, and to identify possible safety improvements.

(f) Processes for maintaining a formally designated design authority (see para. 2.15) that has overall responsibility for the continuing integrity of the plant design throughout its lifetime and for managing the interfaces and lines of communication with the designers

and equipment suppliers contributing to this continuing integrity.

(g) Detail the interrelated elements for establishing policies and objectives and the means to enable the objectives to be achieved which flow from the governance model.

2.9. The operating organization shall establish liaison with the regulatory body and with relevant authorities to ensure a common understanding of, and to ensure compliance with, safety requirements and their interface with other requirements, such as those for security, protection of health or protection of the environment.

REQUIREMENT 3: STRUCTURE, FUNCTIONS AND GOVERNANCE OF THE OPERATING ORGANIZATION

The structure and functions of the operating organization for a nuclear power plant, its governance model and the roles and responsibilities of its personnel shall be established and documented.

2.10. A governance model, shall be established — to monitor, control and direct the operating organization of the nuclear power plant and if appropriate, the corporate organization,. The interrelated elements for establishing policies and objectives and the means to enable the objectives to be achieved which flow from the governance model, shall be detailed within the integrated management system.

2.11. Safety committees, providing a review of performance and activities that relate to the safe operation of the plant, for the operating organization and, where applicable, for the corporate organization, shall be established. The objectives, responsibilities, authority and reporting lines of the safety committee(s) shall be specified and documented. The involvement of experts from outside the operating organization shall also be considered.

2.12. The structure of the operating organization shall include provisions for independent oversight of the operating organization and, where appropriate, for the corporate organization, and shall include objectives, responsibilities, authority and reporting lines. Independent oversight shall provide senior managers with an independent comprehensive view of performance and identified issues for increased management attention as well as regular assessment of the independent oversight processes and their effectiveness.

2.13. Documentation of the plant’s organizational structure and of the arrangements for

discharging responsibilities shall be made available to the plant staff and, in accordance with regulatory requirements, to the regulatory body. The structure of the operating organization shall be specified so that all roles that are important for safe operation are specified and described. Proposed organizational changes to the structure and associated arrangements that might be important to safety shall be analysed in advance by the operating organization. Proposals for such organizational changes shall be submitted to the regulatory body for approval, in accordance with regulatory requirements.

2.14. The operating organization shall have overall responsibility for the maintenance of the design integrity of the plant. A designated 'design authority' shall be established to ensure that the overall integrity of the nuclear power plant design is maintained at all stages of the plant lifetime. The objectives, roles, responsibilities and lines of communication of the design authority shall be established, implemented and documented for the following:

(a) Changes to structures, systems and components;
(b) Organizational changes;
(c) Changes in operating modes;
(d) Interfaces with responsible designers, suppliers and contractors;
(e) Knowledge management;
(f) Ageing management;
(g) Transition from commissioning to operations and to decommissioning.

2.15. The management system of the operating organization shall contain specific provisions for the procurement, supervision, use maintenance of items products or services that may influence safety including the qualification of any commercial grade items , and any first of a kind components and services that could affect the safety of the nuclear power plant.

2.16. The operating organization shall ensure that strategies, policies, objectives and processes for procurement and supply chain management are developed and implemented. These shall include:

(a) A process for the qualification and selection of suppliers, including specific arrangements for the supply of new items (including commercial grade components) and services that have not previously been used at the nuclear power plant and which might affect safety at the plant, to ensure that they are capable of performing their intended function when

necessary;

(b) Activities for the monitoring, evaluation, auditing, verification and, if applicable, reporting of suppliers' performance.

2.17. Where a project management organization is used to manage major projects within the operating organization, the project management organization shall:

(a) Give plant safety the highest priority, overriding the demands of production and project schedules;
(b) Be established in a manner that is consistent with the operating organization's management system;
(c) Support and achieve the operating organization's policies, goals, strategies, plans and objectives;
(d) Establish the long term human resource requirements for the project.

REQUIREMENT 4: STAFFING OF THE OPERATING ORGANIZATION

The operating organization shall be staffed with competent managers and sufficient qualified personnel for the safe operation of the nuclear power plant.

2.18. The operating organization shall be responsible for ensuring that the necessary knowledge, skills, attitudes and safety expertise exist and are sustained within the operating organization , for all plant stages (commissioning, operations and transition to decommissioning) and that there are adequate provisions for ensuring long term human resources.

2.19. 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. Succession planning for operating personnel shall be an established practice. The recruitment and selection policy of the operating organization shall be directed at retaining competent personnel to cover all aspects of safe operation. Roles, responsibilities, accountabilities and performance standards for safety at all levels shall be clear and avoid conflict with other business roles, responsibilities, accountabilities and objectives. A long term staffing plan aligned to the long term objectives of the operating organization shall be developed in anticipation of the future needs of the operating organization for personnel and skills. The long term staffing plan shall include provisions to ensure sufficient operational and design knowledge for the transition from operation to decommissioning.

2.20. Shift teams shall be staffed to ensure that sufficient authorized operating personnel are present to operate the plant in accordance with the operational limits and conditions (see Requirement 9) and to ensure the safety of the plant in anticipated operational occurrences and accident conditions. Where the design involves multiple units or sites operated by one main control room with remote monitoring and intervention capabilities, an assessment of the staffing needs shall be made to ensure that all units can be operated under all conditions in accordance with the operational limits and conditions. The shift staffing patterns, shift cycles and controls on working hours shall provide sufficient time for the training of shift personnel.

2.21. A staff health policy shall be, established, developed, monitored and regularly updated by the operating organization to ensure the medical and psychological fitness for duty of personnel. Attention shall be paid to minimizing conditions causing harmful stress, to setting restrictions on overtime, and to ensuring adequate rest breaks. The health policy shall cover the prohibition of alcohol consumption and drug abuse.

2.22. A knowledge management process shall be established to identify, acquire, maintain and share knowledge, skills and information as a fundamental means of achieving the objectives and goals of the operating organization and organizational and individual competences. This process shall:

(a) Identify the competences needed for the performance of safe plant operations;
(b) Include a programme for initial, continual and refresher training of staff as appropriate;
(c) Ensure adequate knowledge of the design and of the overall basis for safety;
(d) Take into account the loss of personnel and their knowledge due to planned and unplanned attrition and other reasons;
(e) Include the knowledge and skills necessary to supervise and evaluate the work of staff and contractors;
(f) Consider necessary skills and knowledge to understand conditions that might lead to human errors and thereby avoid such errors;
(g) Ensure the preservation and transfer of critical knowledge.

2.23. A process for the qualification, selection and evaluation of contractors shall be implemented by the operating organization, be documented in the management system and be communicated to relevant parties. The process shall include:

(a) Specified acceptance criteria to be met;

(b) Monitoring and performance evaluation of contractors by the operating organization;

(c) Communication of the results of the performance evaluation to the contractor and the further monitoring of the effectiveness of any agreed contractor actions.

REQUIREMENT 5: SAFETY POLICY

The operating organization of the nuclear power plant shall establish and implement operational policies that give safety the highest priority, overriding the demands of production and project schedules.

2.24. The operating organization shall establish a safety policy that promotes a strong safety culture, including a questioning attitude and a commitment to excellent performance in all activities important to safety.

2.25. The safety policy shall clearly stipulate the leadership role in the establishment of the highest level of safety management matters at the nuclear power plant. Senior managers shall communicate the provisions of the safety policy throughout the organization. Safety performance standards shall be developed for all operational activities and shall be applied by all plant personnel. All personnel in the organization shall be made aware of the safety policy and of their responsibilities for ensuring safety. The safety performance standards and the expectations of managers with regard to safety performance shall be clearly communicated to all personnel, and it shall be ensured that they are understood by all those involved in their implementation.

2.26. The key aspects of the safety policy shall be communicated to external support organizations, including contractors, to ensure that the operating organization's requirements and expectations for the safety related activities of these organizations are understood and met.

2.27. The safety policy of the operating organization shall include a commitment to perform periodic safety reviews of the nuclear power plant throughout its operating lifetime in compliance with regulatory requirements (see Requirement 24). Operating experience and significant new safety related information from relevant sources, including information on agreed corrective actions and on necessary improvements that have been implemented, shall be taken into account (see Requirement 7).

2.28. The safety policy of the operating organization shall include a commitment to continuous improvement in operational safety. The strategy of the operating organization for enhancing

safety shall focus on finding more effective ways of applying and, where feasible, improving safety in a timely manner, which shall be continuously monitored and supported by means of a clearly specified programme with clear objectives and goals and involvement of plant staff.

2.29. The safety policy of the operating organization shall include high level expectations for leadership for safety (see Requirement 2 of GSR Part 2 [3]). These expectations shall be communicated, implemented, assessed and continuously improved by the operation organization to enable managers at all levels to support and foster leadership for safety and safety culture. These expectations shall include:

(a) Setting of goals consistent with strategies and policies for safety;
(b) Establishing organizational and individual values;
(c) Coaching, observation and supervision of operating personnel;
(d) Demonstration of leadership skills;
(e) Consistent approaches to decision making.

2.30. The safety policy shall include the establishment of behavioural expectations and the fostering of a strong safety culture and consider the importance of the interaction between technological, human and organizational strategies, resource utilization and performance of safety related activities (see Requirement 12 of GSR Part 2 [3]).).

REQUIREMENT 6: CONSIDERATION OF NUCLEAR SECURITY OBJECTIVES IN SAFETY PROGRAMMES

The operating organization of the nuclear power plant shall ensure that the implementation of safety requirements and security requirements satisfies both safety objectives and security objectives.

2.31. The operating organization shall be responsible for managing the implementation of safety requirements and security requirements by ensuring close cooperation between safety managers and security managers, with the objective of minimizing risks.[2] Safety and security shall be viewed as complementary, as many of the measures designed to ensure one will also serve to ensure the other. Safety and security measures shall be designed and implemented in such a manner that they do not compromise each other. The operating organization shall

[2] Guidance on nuclear security measures is provided in the IAEA Nuclear Security Series.

establish mechanisms to resolve potential conflicts and to manage safety–security interfaces.

REQUIREMENT 7: FEEDBACK OF OPERATING EXPERIENCE

The operating organization of the nuclear power plant shall establish an operating experience programme to learn from events at the plant and events in the nuclear industry and other industries worldwide.

2.32. The operating experience programme shall be used to identify, report, collect, screen, analyse , trend, document and communicate operating experience at the plant in a systematic way. As part of this programme, the operating organization shall obtain and evaluate relevant operating experience from other nuclear installations to incorporate lessons for its own operations, including its emergency arrangements. The operating organization shall encourage the exchange of experience within national and international systems for the feedback of operating experience. Relevant experience from other industries shall also be taken into consideration, as necessary.

2.33. The operating organization shall apply a level of investigation and analysis technique commensurate to the actual or potential safety significance of the event. The analysis technique shall consider the actual or potential consequences of the event. The analysis shall be performed by suitably qualified and trained personnel who are competent in the subject matter under review. Events with safety implications shall be investigated in accordance with their actual or potential significance, to identify their direct and root causes, including causes relating to equipment design, operations, maintenance, human performance and organizational factors. Events with significant implications for safety shall be analysed by persons with sufficient independence from the line management to identify and address organizational issues objectively. The results of such analyses shall be used by the operating organization to implement corrective measures to prevent event reoccurrence. The outcomes of the analyses shall be included, as appropriate, in the relevant plant programmes (training, equipment, operations, maintenance, human performance and organizational programmes) and associated documentation (procedures, instructions, guidelines). Plant event reports and reports of non-radiation-related accident shall be used by the operating organization to identify tasks for which training might be inadequate.

2.34. Information on operating experience shall be reviewed by a competent, multidisciplinary team for its significance based on the actual and potential impact on safety and on the

implementation of any urgent safety actions.

2.35. Information on operating experience including for low-level events and near misses shall be analysed for any precursors to, or trends in, adverse conditions for safety, so that any necessary corrective actions can be taken before serious conditions arise.

2.36. The operating organization shall ensure that analyses of events produce recommendations for corrective actions which address and are directly linked to the identified root and contributing causes. These recommendations shall be validated by senior management and developed for the responsible managers, who shall take the corrective actions in a timely manner to avoid any reoccurrence of the events. Corrective actions, including temporary corrective actions, shall be prioritized and reviewed periodically for their implementation status. Once the actions are complete, their effectiveness shall be reviewed. Relevant parties shall be briefed on events of importance and shall take the necessary corrective actions to make their recurrence less likely.

2.37. The operating organization shall be responsible for instilling a culture among plant personnel that encourages the reporting of all events, including low level events and near misses, potential problems relating to equipment failures, shortcomings in human performance, procedural deficiencies or inconsistencies in documentation that are relevant to safety.

2.38. The operating organization shall liaise, as appropriate, with organizations (e.g. manufacturers, research organizations, designers) involved in the design, construction, commissioning and operation of the plant in order to provide these organization with operating experience feedback and to obtain advice, if necessary, in the event of equipment failure or other events.

2.39. The operating experience programme shall be periodically reviewed by the operating organization to determine its effectiveness and to identify any necessary improvements.

3. NUCLEAR POWER PLANT OPERATIONS

REQUIREMENT 8: QUALIFICATION AND TRAINING OF PERSONNEL

The operating organization shall establish a training programme to ensure that all activities that might affect safety at the nuclear power plant are performed by suitably trained, qualified and competent persons.

3.1. The operating organization shall clearly define the requirements for qualifications and competence to ensure that plant personnel and contractors conducting safety related activities are capable of safely performing their duties. Certain operating positions at the nuclear power plant may require formal authorization or a licence. Personnel who perform tasks while unqualified but progressing through the training programme, shall be supervised and shall have all outputs reviewed and verified by a competent and trained individual prior to those outputs resulting in any safety action or decision.

3.2. The training policy for the nuclear power plant shall be aligned with the human resources, safety and operating policies to ensure the safe and reliable operation of the plant. Suitably qualified personnel shall be recruited and shall be given the necessary training and instruction to enable them to correctly perform their duties in different operational states and in accident conditions, in accordance with the appropriate procedures.

3.3. Training programmes for leadership development shall be established, focusing on the development and assimilation of competences for effective leadership and management for safety, including training to promote a strong safety culture.

3.4. Managers in the operating organization shall participate in determining the needs for training and in ensuring that operating experience is taken into account in the training. Managers shall conduct periodic evaluations of personnel knowledge and skills and this information shall be used to enhance individual's and team's training needs. Managers shall be trained in fostering a strong safety culture and shall ensure that production needs do not unduly interfere with the conduct of the training programme.

3.5. A suitable training programme shall be established and maintained for the training of personnel before they are assigned to safety related duties. The training programme shall include provisions for periodic confirmation of the competence of personnel and for regular refresher training. The refresher training shall also include retraining provisions for personnel who have had extended absences from their duties. The training shall emphasize the importance of safety in all aspects of plant operation and shall promote safety culture.

3.6. Training programmes shall be developed and implemented for each position including, if necessary, external support organizations and contractors. The content of each programme shall be based on a systematic approach and shall include the technical, administrative and operational requirements necessary to undertake the role safely. These training programmes

shall promote attitudes that help to ensure that safety issues receive the attention that they warrant. The results from Probabilistic Safety Assessments (PSAs) shall be used to improve training programmes for operations and maintenance personnel.

3.7. The training programmes shall be assessed and improved by means of periodic reviews in accordance with a systematic approach to training. In addition, improvements shall be made by the timely update of the training programmes, facilities, computer models, simulators and materials to ensure that they adequately reflect current plant configuration and operating policy, and that any differences are justified.

3.8. Operating experience at the plant, as well as relevant experience from other plants, shall be appropriately assessed and incorporated into the training programme. In addition, specific personnel shall receive training on conducting root cause and direct cause analysis of an event and on the determination and implementation of corrective actions.

3.9. Qualification requirements for training instructors shall be established. All training instructor positions shall be held by adequately qualified and experienced persons, who have the requisite technical knowledge and skills and have credibility with the trainees. Training instructors shall have the necessary instructional skills and shall also be familiar with the current routines and work practices through regular visits to the workplace.

3.10. Training programmes shall be appropriate for specific reactor types and designs, including those involving remote operations, and sites where multiple units are operated from the same main control room, and where technical staff are shared. Training programmes where technical staff are shared shall include the training to respond to the situation where all of facilities in a site are impacted by an event simultaneously.

3.11. Adequate training facilities, including representative simulators, appropriate training materials, and facilities for computer-based training, technical training and maintenance training, shall be made available for the training of operating personnel. Simulator training shall incorporate training for all operational states and for accident conditions and shall simulate realistic responses of plant systems and components. In the case of multiple unit plants, the simulator shall allow several units to respond simultaneously, if they are controlled within one control room.

REQUIREMENT 9: OPERATIONAL LIMITS AND CONDITIONS

The operating organization shall ensure that the nuclear power plant is operated in accordance with a set of operational limits and conditions.

3.12. Operational limits and conditions shall form an important part of the basis for the authorization of the operating organization to operate the plant. The plant shall be operated within the operational limits and conditions to so that if situations arise that could lead to anticipated operational occurrences or accident conditions, measures are taken to mitigate the consequences of such events if they do occur. The operational limits and conditions shall be developed for ensuring that the plant is being operated in accordance with the final safety analysis report and the design basis , as well as in accordance with its licensing conditions.

3.13. The operational limits and conditions shall reflect the provisions made in the final design as described in the safety analysis report. The operational limits and conditions shall be submitted to the regulatory body for assessment and approval before the commencement of operation, if so, required by the regulatory body. All operational limits and conditions and the basis for their derivation shall be defined, documented through a controlled process and made available for the reference of all users requiring an understanding of the basis for safe plant operation.

3.14. The operational limits and conditions shall be reviewed and revised as necessary following a robust management of change process that keeps the operational limits and conditions up to date with respect to changes in plant design, operating experience, safety analysis , developments in technology and approaches to safety, and licence requirements.

3.15. The operational limits and conditions shall be established taking into account appropriate margins commensurate with the risks and uncertainties associated with novel or innovative technologies and with equipment for which limited operating experience exists. For first of a kind systems, a conservative approach shall be used and then shall be reviewed and, as necessary, adjusted after operating experience has been accumulated.

3.16. The operational limits and conditions shall be defined for a set of plant operating states based on the approved design of the plant including requirements for all modes of normal operation, (including shutdown and outage stages), and shall cover actions to be taken and limitations to be observed by the operating personnel.

3.17. The operational limits and conditions shall include:

(a) Safety limits;
(b) Limiting settings for safety systems;
(c) Limits and conditions for normal operation;
(d) Surveillance and testing requirements;
(e) Action statements and timeliness to correct deviations from normal operation. Timeliness shall be commensurate with the safety significance of the deviation.
(f) Organisational requirements such as minimum manning levels

3.18. Operating personnel who are directly responsible for the conduct of operations shall be trained on and knowledgeable of the operational limits and conditions in order to comply with the provisions contained therein.

3.19. The operating organization shall establish surveillance programmes for ensuring compliance with the established operational limits and conditions and for detecting and correcting any abnormal condition. The operating organization shall ensure that the results of the surveillance programme are evaluated, recorded and retained.

3.20. The operating organization shall establish a process to ensure that deviations from operational limits and conditions are reported, recorded and retained in an appropriate manner and that appropriate actions are taken in response. Responsibilities and lines of communication for responding to such deviations shall be clearly specified in writing. The plant shall be returned to a safe state when an event occurs in which parameters deviate from the limits and conditions for normal operation. Appropriate corrective actions shall be taken to ensure subcriticality and that fundamental safety functions can be maintained. The operating organization shall undertake an investigation into the event and shall notify the regulatory body in accordance with the established event reporting system.

3.21. The operating organization shall not intentionally exceed the operational limits and conditions. Where circumstances necessitate plant operation outside the operational limits and conditions, clear formal instructions for such operations shall be developed, on the basis of a safety analysis. The instructions shall be approved by the licensed duty Shift Supervisor and shall be reported to the regulatory authority within an appropriate timeframe. These instructions shall include steps and timeliness for returning the plant to normal operation within the

operational limits and conditions. The instructions shall also include specification of the arrangements for approval by the operating organization and the regulatory body, as appropriate, of the changed operational limits and conditions, prior to operation under these changed operational limits and conditions.

REQUIREMENT 10: PERFORMANCE OF SAFETY RELATED ACTIVITIES

The operating organization shall ensure that safety related activities at the nuclear power plant are adequately assessed and controlled to ensure that protection and safety are optimized.

3.22. All routine and non-routine operational safety related activities shall be assessed for potential risks. The level of risk assessment undertaken shall depend on the safety significance of the task. Risk assessments which use a graded approach to determine the controls and measures to be applied shall ensure that any grading that is performed ensures that safety functions are preserved, that the operational limits and conditions are not challenged and there are no negative effects on the safety of the workforce, the public or the environment. The graded approach shall be documented and approved by a competent person.

3.23. The assessment and control of safety related activities shall take into account potential risks associated with interactions between multiple units, shared systems and other plant systems.

3.24. The assessment and control of safety related activities shall ensure preservation of the safety provisions that prevent mechanisms or combination of mechanisms from occurring that might challenge the performance of the safety functions and compromise defence in depth.

3.25. The operating organization shall ensure that the competence requirements for staff and contractors who perform safety related activities are identified, documented and communicated and taken into account in training programmes.

3.26. All safety related activities shall be performed in accordance with written procedures to ensure that the plant is operated within the established operational limits and conditions. Acceptable margins shall be ensured between normal operating values and the established safety system settings to avoid undesirably frequent actuation of safety systems.

3.27. No experiments shall be conducted without adequate justification. If there is a need to

conduct a non-routine operation or test that is not covered by existing operating procedures, a specific safety review shall be performed, and a special procedure shall be developed and submitted for approval in accordance with regulatory requirements.

3.28. The assessment and control of safety related activities shall take into account human performance, the use of error reduction practices and other appropriate measures such as a strong safety culture.

3.29. In the performance of safety related activities, written communication shall be preferred. If spoken communication is used, attention shall be given to ensuring that spoken instructions are clearly understood and error reduction practices shall be used.

3.30. Aspects of the working environment at the nuclear power plant that influence human performance (e.g. ergonomics, workload, distractions) and the effectiveness and fitness of personnel for duty shall be identified and controlled. Tools for enhancing human performance shall be used as appropriate to support operating personnel and a defence in depth approach shall be applied to safety related activities in plant operations.

3.31. Distractions to control room operators shall be minimized. To avoid overburdening control room operators and to allow them to focus on their responsibilities for safety, work shall be scheduled to reduce simultaneous activities as far as possible.

3.32. The operating organization shall encourage plant personnel to have a questioning attitude when undertaking safety related activities and to make appropriate and conservative decisions, so as to optimize protection and safety and to maintain the plant in a safe condition.

3.33. In the event that unexpected or uncertain occurrences are encountered that could impact safety at the nuclear power plant, a conservative decision making process based on risk assessment shall be undertaken. This process shall be documented and reviewed to ensure that the final plant configuration meets the provisions of the safety analysis report, operational limits and conditions and ensures that the plant remains in a safe state.

3.34. The responsibilities and authority for restarting a reactor after an event leading to an unplanned shutdown, scram or major transient, or to an extended period of maintenance, shall be clearly established in writing. An investigation shall be performed to determine the cause of the event (by means of root cause analysis where necessary) and corrective actions shall be

taken to make its recurrence less likely. Prior to the restart or the resumption, the operating organization shall perform the necessary corrective actions, including inspection, testing and repair of damaged structures, systems and components, and shall revalidate the safety functions that might have been affected. Restart conditions and criteria shall be established and followed after the timely implementation of the necessary corrective actions.

3.35. The operating organization shall implement a structured, transparent and well communicated decision making approach to ensure that safety is an overriding priority in the performance of safety related activities. If a probabilistic safety assessment is to be used for decision making purposes, the operating organization shall ensure that this assessment is of appropriate quality and scope for decision making purposes. The safety assessment shall be performed by appropriately qualified persons and shall be used in a manner that complements the deterministic approach to decision making, in compliance with applicable regulatory requirements and plant licence conditions.

REQUIREMENT 11: MONITORING AND REVIEW OF SAFETY PERFORMANCE

The operating organization shall establish a system for continuous monitoring and periodic review of the safety of the nuclear power plant and of the performance of the operating organization.

3.36. An adequate programme of audits and reviews shall be established by the operating organization to ensure that the safety policy of the operating organization is being implemented and applied effectively. The findings from these audits and reviews, as well as internal and external operating experience, shall be used by the operating organization to improve safety performance.

3.37. Self-assessment by the operating organization shall be an integral part of the monitoring and review system. The operating organization shall perform systematic self-assessments to identify areas of strong safety performance and to address any degradation in safety performance. Where practicable, suitable objective performance indicators or other performance measures shall be developed and used to enable managers at all levels to detect and to react to shortcomings and deterioration in the management of safety.

3.38. Monitoring of safety performance shall include but not limited to, the monitoring of: personnel performance; attitudes to safety; response to infringements of safety; and violations

of operational limits and conditions, operating procedures, regulatory requirements and licence conditions. The monitoring of plant conditions, activities and attitudes of personnel shall be supported by systematic coaching and observation of personnel and walkdowns of the plant by managers at all levels.

3.39. The persons and organizations performing assessments, reviews and oversight functions shall have sufficient authority and organizational independence to identify weaknesses, strengths, risks and improvement opportunities, and to recommend and verify the implementation of solutions for the enhancement of safety performance. These persons and organizations shall report to a level of management that has the necessary authority and organizational independence to ensure that findings from the assessments are reviewed and implemented to ensure that plant safety matters are given the highest priority, overriding the demands of production and project schedules.

3.40. The independent oversight functions shall ensure that issues that are not addressed within the specified time frames are escalated to the senior managers in the organization for resolution. Senior leaders shall take action to ensure that issues are addressed and that appropriate oversight is provided.

3.41. The operating organization shall determine and implement appropriate corrective actions as a result of the monitoring and review of safety performance. Progress in taking the corrective actions shall be monitored to ensure that actions are completed within appropriate time frames. Any delayed actions shall be reassessed with regard to their impact on safety and the activity concerned, and compensatory measures shall be applied, as appropriate. Completed corrective actions shall be reviewed at planned intervals to assess whether they have adequately addressed the identified safety issues.

3.42. The effectiveness of the self-identification of issues by the operating organization through safety performance monitoring shall be periodically evaluated and corrective actions shall be taken by the operating organization, as appropriate.

REQUIREMENT 12: OPERATING PROCEDURES

Operating procedures for the nuclear power plant shall be developed for normal operation, anticipated operational occurrences and accident conditions.

3.43. The level of detail for a particular operating procedure shall be appropriate for the

purpose of that procedure. The guidance provided in the procedures shall be clear and concise and, to the extent possible, it shall be verified and validated. The procedures and associated reference material shall be clearly labelled and shall be readily accessible in the control room and in other operating locations as necessary. Strict adherence to written operating procedures shall be an essential element of safety policy at the plant.

3.44. Guidelines shall be developed for the management of severe accidents. For operating procedures for anticipated operational occurrences and accident conditions, both event based approaches and symptom based approaches shall be used, as appropriate. In addition, the related analysis and justifications shall be documented.

3.45. Operating procedures and supporting documentation shall be issued under controlled conditions and shall be subject to approval by suitably qualified persons and periodically reviewed and revised as necessary to ensure their adequacy and effectiveness. Procedures shall be updated in a timely manner in the light of operating experience and the actual plant configuration and any changes effectively communicated to the affected staff with supporting training if necessary. Operating procedures shall be categorized on the basis of the safety significance of the operations they govern.

3.46. The operating organization shall establish and implement an operator aids programme. This programme shall prevent the use of non-authorized operator aids and of any other non-authorized materials such as instructional information or unapproved equipment labels. The operator aids programme shall ensure that operator aids contain correct information and that they are periodically reviewed, updated and approved. A clear operating policy shall be maintained to minimize the use of, and reliance on, temporary operator aids. Where appropriate, temporary operator aids shall be made into permanent plant features or shall be incorporated into plant procedures.

REQUIREMENT 13: CONTROL ROOMS AND CONTROL EQUIPMENT

The operating organization of the nuclear power plant shall ensure that the control rooms and control equipment are maintained in a suitable condition.

3.47. The habitability, good condition and accessibility of control rooms (in-plant or remote) shall be maintained. Where the design of the plant foresees additional or local control rooms that are dedicated to the control of processes that could affect plant conditions, clear coordination and prioritization of verbal and written information shall be established for

ensuring effective transfer of information between these control rooms and the main control room.

3.48. Where the design involves multiple units or sites operated by a combination of main control rooms, local control rooms and semi-autonomous operations, a control hierarchy of expected operational responses shall be established.

3.49. The remote shutdown panels and all other operational panels containing items important to safety outside the main control room shall be kept operable and free from obstructions, as well as from non-essential material that prevent their immediate operation. The operating organization shall periodically confirm that the remote shutdown panels and all other operational panels containing items important to safety are in a state of operational readiness, including proper documentation, communications, alarm systems and habitability.

3.50. The alarms in the main control room shall be managed as an important feature for the safe operation of the plant. The plant information system shall be such that abnormal conditions are easily recognizable by the operating personnel. Control room alarms shall be clearly prioritized. The number of alarms, including alarm messages from process computers, shall be minimized for any analysed operational state, outage or accident condition of the plant. The operating organization shall establish procedures for operating personnel to manage the response to alarms. Appropriate operator action shall be taken to address the cause of any alarm.

REQUIREMENT 14: CHEMISTRY PROGRAMME

The operating organization shall establish and implement a chemistry programme to provide the necessary support for chemistry and radiochemistry at the nuclear power plant.

3.51. The chemistry programme shall be developed prior to normal operation and shall be in place during the commissioning programme. The chemistry programme shall contribute to ensuring safe operation, long term integrity of structures, systems and components, fuel integrity, and minimization of the buildup of radioactive material, and to ensuring that discharges to the environment are as low as reasonably achievable.

3.52. Chemistry control shall be implemented to ensure that plant systems within the scope of the chemistry programme are operated in accordance with the appropriate chemistry regimes.

3.53. Chemistry and radiochemistry assessment shall be conducted at the plant to verify the effectiveness of chemistry controls in the plant systems and to verify that structures, systems and components important to safety are operated within the specified chemical limit values. Additional attention on the potential long-term degradation shall be paid to the chemistry and radiochemistry surveillance for novel materials used in structures, systems and components.

3.54. Laboratory analysis and on-line monitoring equipment shall be used to provide accurate measuring and recording of chemistry and radiochemistry data and shall provide alarms for chemistry parameters that are vital for ensuring plant safety. Records shall be kept available and shall be easily retrievable.

3.55. The use of chemicals in the plant, including chemicals brought in by contractors, shall be monitored closely. The appropriate control measures shall be implemented to ensure that only authorized chemicals are used in the plant and the use of these chemicals does not adversely affect equipment or lead to its degradation.

REQUIREMENT 15: MATERIAL CONDITIONS AND HOUSEKEEPING

The operating organization shall develop and implement programmes to maintain a high standard of material conditions, housekeeping and cleanliness in all working areas of the nuclear power plant.

3.56. Administrative controls shall be established to ensure that operational premises and equipment are maintained, well-lit and accessible, and that temporary storage is controlled and limited.

3.57. Equipment that is degraded (e.g. owing to leaks, corrosion spots, loose parts or damaged thermal insulation) shall be identified and reported and deficiencies shall be assessed and corrected in a timely manner using a documented risk-based approach that prioritizes plant safety.

3.58. An exclusion programme for foreign objects shall be implemented and monitored, and suitable arrangements shall be made for locking, tagging or otherwise securing isolation points for systems or components to ensure safety.

3.59. The operating organization shall be responsible for ensuring that the identification and labelling of plant equipment (items important to safety and items not important to safety)

rooms, piping and instruments are accurate, legible, well maintained, and not degraded.

REQUIREMENT 16: FIRE SAFETY PROGRAMME

The operating organization shall make arrangements for ensuring fire safety at the nuclear power plant.

3.60. A fire safety programme shall be established by the operating organization which covers: adequate management for fire safety; fire prevention; fire detection and extinguishing; prevention of the spread of fires; and fire protection for structures, systems and components important to safety. The fire safety programme shall include:

(a) Application of the principle of defence in depth;
(b) Control of combustible materials and ignition sources, including during outages;
(c) Inspection, maintenance and testing of fire protection measures;
(d) Establishment of a manual firefighting capability;
(e) Assignment of responsibilities;
(f) Training and exercises for plant personnel;
(g) Assessment of required actions to be taken on the fire safety measures as a result of any plant modifications (permanent or temporary) to any plant system including the fire safety system itself.

3.61. A comprehensive fire hazard analysis shall be developed for the plant and shall be periodically reviewed and updated. The fire hazard analysis shall reflect the type of fire extinguishing agent , combustible materials and possibility of interaction among multiple unit plants as applicable.

3.62. In the arrangements for firefighting, special attention shall be paid to events for which there is a risk of release of radioactive material in a fire. Appropriate measures shall be established for the radiation protection of firefighting personnel based on the relevant requirements for occupational exposure provided in GSR Part 3 and the management of radioactive releases to the environment.

3.63. The operating organization shall ensure that there are appropriate procedures, equipment and personnel for the effective coordination and cooperation of all on-site and off-site organizations involved in the fire safety programme. Periodic joint fire drills and exercises shall be conducted to assess the effectiveness of the fire response capability.

3.64. Fire protection systems and firefighting systems shall be designed to ensure that damage to, or inadvertent operation of, these systems does not significantly impair the capabilities of the structures, systems and components necessary for safe shutdown.

3.65. At multiple unit sites on which systems are shared, special attention shall be paid to ensuring that the impact of fires and firefighting actions on the safety of all affected or potentially affected units and systems is fully understood.

REQUIREMENT 17: NON-RADIATION-RELATED SAFETY PROGRAMME

The operating organization shall establish and implement a programme to ensure that safety related risks associated with non-radiation-related hazards at the nuclear power plant are kept as low as reasonably achievable.

3.66. The non-radiation-related safety programme shall include arrangements for the planning, implementation, monitoring and review of the relevant preventive and protective measures, and it shall be integrated with the nuclear safety programmes and radiation protection programme. All personnel, suppliers, contractors and (where appropriate) visitors shall be trained and shall possess the necessary knowledge of the non-radiation-related safety programme and its interface with other programmes and shall comply with its safety rules and practices. The operating organization shall provide support, guidance and assistance for plant personnel in the area of non-radiation-related hazards.

3.67. The continued safe operation of the nuclear power plant shall consider the effects of unexpected events such as epidemics, pandemics and natural disasters and their potential to impact safety. As appropriate, the operating organization shall implement measures to protect site personnel and to ensure the necessary supplies for safe operation of the plant.

REQUIREMENT 18: RECORDS AND REPORTS

The operating organization of the nuclear power plant shall establish and maintain a system for the control of records and reports.

3.68. The operating organization shall identify the types of record and report, as specified by the regulatory body, that are relevant for the safe operation of the plant. Records of site evaluation, design, commissioning and operation, including maintenance and surveillance activities, shall be kept available for each plant system important to safety, including relevant off-site tests. The records of permanent and temporary modifications shall be retained,

including basic and detailed design documentation and records of design verification, installation and testing. The records and reports shall be categorized and retained in a secure and safe environment for the periods required by the regulatory body. All records shall be readable, complete, identifiable and easily retrievable. Retention times for records and reports shall be commensurate with their level of importance for the purposes of plant licensing, operation and decommissioning.

4. MAINTENANCE, TESTING, SURVEILLANCE AND INSPECTION AT A NUCLEAR POWER PLANT

REQUIREMENT 19: MAINTENANCE, TESTING, SURVEILLANCE AND INSPECTION PROGRAMMES

The operating organization shall ensure that effective programmes for maintenance, testing, surveillance and inspection are established and implemented at the nuclear power plant.

4.1. The maintenance, testing, surveillance and inspection programmes shall include preventive (including predictive) and corrective maintenance activities, which shall be undertaken in accordance with a graded approach, based on the safety significance of the activities. Preventive maintenance activities shall be conducted to maintain the availability of structures, systems and components during their service life by controlling degradation and preventing failures. In the event that failures do occur, corrective maintenance activities shall be conducted to restore the capability of failed structures, systems and components to function such that the plant continues to operate within the safe operating envelope as prescribed in the safety analysis.

4.2. Particular attention shall be paid to maintenance, testing, surveillance and inspection programmes for novel design multiple unit nuclear power plants, and for plants with alternative operating models (such as multiple control rooms and shared services) and passive safety systems.

4.3.

4.4. The operating organization shall develop procedures for all maintenance, testing, surveillance and inspection tasks. The maintenance, testing, surveillance and inspection of structures, systems and components expected to operate in conditions for which no operating experience is available shall be determined to prevent unplanned failures and ensure that the

safety functions of the structures, systems and components continue to be fulfilled. These procedures shall be prepared, reviewed, modified when necessary, validated, approved and distributed in accordance with procedures established under the management system of the operating organization.

4.5. Data on maintenance, testing, surveillance and inspection shall be recorded, stored and analysed for the purpose of confirming that the operating performance is in accordance with the design intent and with requirements for the reliability and availability of equipment.

4.6. The frequency of maintenance, testing, surveillance and inspection of individual structures, systems and components shall be determined on the basis of:

(a) The importance to safety of the structure, system or component, with insights from probabilistic safety assessment taken into account;

(b) The reliability of the structure, system or component during operation, and its availability for operation;

(c) The assessed potential of the structure, system or component for degradation during operation and its ageing characteristics;

(d) Operating experience;

(e) Recommendations of vendors.

(f) Changes to the frequency of maintenance, testing, surveillance and inspection initially defined and approved shall be controlled, reviewed and dispositioned by competent technical personnel and founded on an appropriate technical basis whose conclusions shall not be overridden on the basis of commercial pressures.

(g) Design requirements and operating conditions.

(h) Ageing management requirements.

(i) The requirements of applicable industry codes and standards.

4.7. A comprehensive and structured approach to identifying failure scenarios shall be taken to ensure the proper management of maintenance activities, using methods of probabilistic safety assessment as appropriate.

4.8. New approaches that could result in significant changes to current strategies for maintenance, testing, surveillance and inspection shall be taken only after review and assessment by competent technical personnel of the implications for safety and, where required, after appropriate authorization by the regulatory body.

4.9. A comprehensive work planning and control process shall be implemented by the operating organization to ensure that maintenance, testing, surveillance and inspection activities are properly authorized, planned and performed safely and that safety functions are maintained, and structures, systems, and components are protected. All such activities shall be documented in accordance with the management system of the operating organization. The operating organization shall establish procedures to ensure that relevant information is transferred at shift turnovers and at pre-job and post-job briefings on maintenance, testing, surveillance and inspection activities.

4.10. The work planning and control process shall ensure that plant equipment is released from service for maintenance, testing, surveillance or inspection only with the approval of designated operating personnel and in compliance with the operational limits and conditions. The work planning and control process shall also be designed to ensure that permission to return equipment to service following maintenance, testing, surveillance or inspection is given by designated operating personnel. Such permission shall be given only after the completion of a documented check that the new plant configuration is within the established operational limits and conditions and, where appropriate, after functional tests have been performed.

4.11. Coordination shall be maintained between different maintenance groups (e.g. maintenance groups for mechanical, electrical, instrumentation and control, and civil equipment). Coordination shall also be maintained between maintenance groups, and operations groups and support groups (e.g. groups for fire protection, radiation protection, nuclear security and non-radiation-related safety). The operating organization shall make arrangements with the external grid operator to ensure that appropriate procedures are applied in maintaining the connections between the plant and the external grid.

4.12. A system for managing and correcting deficiencies in structures, systems and components shall be established and shall be used to ensure that operating personnel are not overly burdened. This system shall also ensure that safety at the plant is not compromised by the cumulative effects of these deficiencies.

4.13. The operating organization shall ensure that maintenance work during power operation is performed with adequate defence in depth. Probabilistic safety assessment shall be used, as appropriate, to demonstrate that risks are not significantly increased.

4.14. Corrective maintenance of structures, systems and components shall be performed as promptly as practicable and in compliance with operational limits and conditions. Priorities

shall be established, with account taken of the relative importance to safety of the defective structures, systems and components.

4.15. The operating organization shall establish maintenance programmes for non-permanent equipment (including all types of passive equipment) , in order to maintain high reliability of this equipment.

4.16. The operating organization shall establish suitable arrangements to:
(a) procure, receive, control, store and issue materials (including supplies), spare parts and components.
(b) ensure that the characteristics of the materials, spare parts and components are consistent with applicable safety standards and with the plant design.
(c) ensure that storage conditions are adequate and that the materials, spare parts and components are available and are in proper condition for use.

REQUIREMENT 20: OUTAGE MANAGEMENT

The operating organization of the nuclear power plant shall establish and implement arrangements to ensure the effective performance, planning and control of work activities during outages.

4.17. Outage planning shall be an ongoing, continually improving process that takes account of past, present, scheduled and future outages. Reference points shall be determined and shall be used to track pre-outage work.

4.18. In the processes for planning and performing outage activities, priority shall be given to safety related considerations. Special attention shall be given to maintaining the plant configuration in accordance with the operational limits and conditions and to any remotely performed or off-site outage work.

4.19. The operating organization shall establish programmes and procedures for outage management and for the provision of adequate resources for ensuring safety during shutdown operations.

4.20. The tasks, authority and responsibilities of the groups and persons involved in preparing, assessing or executing outage schedules and activities shall be formally assigned and shall be followed by all operating personnel and contractors who are involved.

4.21. The interfaces between the group responsible for outages and other groups, including groups on the site and off the site, shall be clearly defined. Operating personnel shall be kept

informed of current activities for maintenance, modification and testing.

4.22. Optimization of radiation protection, non-radiation-related safety, waste reduction and control of chemical hazards shall be essential elements of outage programmes and planning, which shall be clearly communicated to relevant operating personnel and contractors.

4.23. A comprehensive review shall be performed after each outage to identify lessons to be learned.

5. NUCLEAR POWER PLANT ENGINEERING ASPECTS

REQUIREMENT 21: PLANT CONFIGURATION MANAGEMENT

The operating organization of the nuclear power plant shall establish and implement a system for plant configuration management to ensure consistency between design requirements, physical configuration, operational configuration and plant documentation.

5.1. The plant configuration management system shall ensure that changes to the plant and to items important to safety are properly identified, screened, designed, evaluated, implemented and recorded. Proper controls shall be implemented to address changes in plant configuration items that result from, for example:

(a) Changes to design basis, design requirements, margins and operational limits and conditions;

(b) Changes in external event analysis;

(c) Operating experience, technical developments and research;

(d) Maintenance work, testing results, repair, plant refurbishment and modifications due to ageing of components or obsolescence.

5.2. If there are changes in plant configuration, the plant documentation shall be formally revised and issued at the same time the changes are made. If this is not possible, compensatory measures shall be taken, and a deadline shall be set for the revision and update of the plant documentation, commensurate with the safety significance of the structure, system or component.

5.3. Particular attention shall be paid to the configuration of instrumentation and control equipment to ensure that the documentation detailing the plant parameters is consistent with

the configuration of the plant parameters actually present in the equipment.

5.4. Particular attention shall be paid to the configuration management of multiple unit nuclear power plants located in shared structures, or which utilize shared systems, to ensure any necessary changes are applied to the correct systems.

REQUIREMENT 22: MANAGEMENT OF MODIFICATIONS

The operating organization shall establish and implement a programme to manage modifications to the nuclear power plant.

5.5. A modification programme shall be established and implemented to ensure that all modifications to the nuclear power plant are properly identified, specified, designed, evaluated, authorized by the operating organization for implementation, implemented and recorded. The modification programme shall cover: structures, systems and components; operational limits and conditions; procedures; management system arrangements, documents; resources, and the structure of the operating organization. The modification programme shall include the requirements of the plant configuration management system to ensure modifications to plant configuration are appropriately tracked, managed and documented.

5.6. Modifications shall be categorized on the basis of their safety significance and evaluated by persons with suitable expertise before implementation. The full impact of any modification on the safety of the nuclear power plant shall be evaluated and, where so required, submitted to the regulatory body for approval before being implemented.

5.7. Modification control, in compliance with the requirements established in SSR-2/1 [2], shall ensure the proper design, safety assessment, review, control, implementation and testing of all permanent and temporary modifications.

5.8. Modifications shall be properly assessed and justified to ensure that the effect of modifications will not have adverse consequences for the safe operation of the plant. The design and safety assessment of a modification shall consider the plant configuration at the time of the modification to ensure that the cumulative effect of temporary and permanent modifications on the safe operation of the plant is considered.

5.9. The consequences of modifications for human tasks and performance shall be systematically analysed. For all plant modifications, human and organizational factors shall be adequately considered.

5.10. Temporary modifications shall be limited in time and number to minimize the cumulative safety significance. Temporary modifications shall be clearly identified at their location and at any relevant control position. The operating organization shall establish a formal system for informing relevant personnel in a timely manner of temporary modifications and of their consequences for the operation and safety of the plant.

5.11. When a temporary modification needs to be implemented immediately in the interest of safety, it shall be independently reviewed by the operating and design authorities prior to implementation and subsequently reviewed in accordance with the normal process for temporary modifications at the earliest opportunity.

5.12. When a modification is changed it shall undergo the same review process as a new modification to ensure that any other ongoing modifications are not affected by the change.

5.13. The plant management shall establish a system for modification control to ensure that plans, documents and computer programs are revised in accordance with modifications. The safety analysis report shall also be updated in a timely manner to reflect plant modifications that have an impact on safety.

5.14. Where simultaneous modifications are being conducted, the operating organization shall undertake work planning to ensure that these do not affect the safe operation of the plant, especially in the case of multiple unit plants.

5.15. If the implementation of a modification involves deviations from operational limits and conditions, or from other safety relevant documentation, the effect of such deviations on safety shall be assessed by the operating organization and, as applicable, submitted to the regulatory body for approval.

5.16. Before commissioning a modified system, structure or component or putting the system, structure or component back into operation after modifications, personnel shall be trained, as appropriate, with regard to the significance of the modification, and all relevant documents necessary for plant operation shall be updated. The training and update of documents shall be timely and consistent with the safety significance of each document and modification.

REQUIREMENT 23: CORE MANAGEMENT AND FUEL HANDLING

The operating organization shall be responsible and shall make arrangements for all activities associated with core management and fuel handling at the nuclear power plant.

5.17. Provision shall be made to ensure that only fuel that has been appropriately

manufactured is loaded into the core. In addition, the fuel design criteria including fuel enrichment shall be in accordance with design specifications and shall be subject to approval by the regulatory body as required. The same requirements shall be applied before the introduction of fuel of a new or modified design into the core.

5.18. When fuel of a new or modified design is to be introduced, it shall be demonstrated that the plant and fuel behaviour will be within the established criteria for normal operation, anticipated operational events, design basis accidents. The scope of this demonstration shall be defined based on the technology of the plant and the extent of the changes compared with previously licensed fuel designs. If required by the waste management plan, the scope of the demonstration shall encompass short and long term storage, eventual processing and final disposal of the spent fuel.

5.19. The possible modifications to the design specifications, existing design criteria, and plant documentation as a result of a new or modified fuel design shall be based on the technical characteristics of the new or modified fuel and subject to approval by the regulatory body in accordance with regulatory requirements.

5.20. Events with low probability but high consequences that could cause core damage or spent fuel accidents shall be analysed. Conditions and activities that give rise to an elevated risk of such events shall be properly identified, understood and assessed on a continual basis in order to prioritize mitigating actions to ensure an acceptable level of residual risk.

5.21. If the criticality safety of fuel in the spent fuel storage or fresh fuel storage is ensured with fixed absorbers, it shall be ensured that their ability to absorb neutrons is not damaged by the radiation or other conditions in the fuel storage and that potential degradation of the neutron absorbing properties is considered in the ageing management of the absorbers.

5.22. Provision shall be made to ensure that residual heat from irradiated fuel is removed at a rate sufficient to prevent unacceptable degradation of the fuel assembly and of the storage and support systems. It shall be ensured that all parameters related to the cooling of the core and the cooling of spent fuel are kept within acceptable limits, as defined in the design requirements. A means of monitoring the status of core cooling and spent fuel pool pools in all operational states shall be provided.

5.23. The operating organization shall develop specifications and procedures for the procurement, verification, receipt, accounting and control, loading, utilization, relocation, unloading and testing of fuel and core components. A fuelling programme shall be established

in accordance with the design assumptions, and details of the programme shall be submitted to the regulatory body if required. It shall be confirmed by means of calculations and measurements that the performance of the core meets the safety criteria. A suitably qualified person shall also confirm that all core alterations comply with approved configurations.

5.24. The operating organization shall establish a safe reactivity management programme that is part of the integrated management system. Decisions on, and the planning, evaluation, conduct and control of, all operations or modifications involving the fuel that are liable to affect reactivity control shall be undertaken using approved procedures and in accordance with predefined operational limits for the core.

5.25. A comprehensive core monitoring programme shall be established to ensure that core parameters are monitored, analysed for trends and evaluated to detect abnormal behaviour; actual core performance is consistent with core design requirements; and the values of key operating parameters are recorded and retained in a logical, consistent and retrievable manner. Core parameters shall be monitored in all operational and design basis fault conditions and appropriate recovery actions taken in the event of adverse conditions being detected.

5.26. Reactivity manipulations and changes in the core cooling shall be made in a deliberate and carefully controlled manner to ensure that the reactor is maintained within prescribed operational limits and conditions and that the desired response is achieved.

5.27. The operating procedures for reactor startup, power operation, shutdown and refuelling shall include the precautions and limitations necessary to maintain fuel integrity and to comply with the operational limits and conditions throughout the lifetime of the fuel. In addition, appropriate emergency operating procedures and severe accident management guidelines shall be established to manage events and accidents during the handling and storage of fresh and irradiated fuel.

5.28. Radiochemistry data that are indicative of fuel integrity shall be systematically monitored and analysed for trends so that fuel integrity is ensured under all operating conditions.

5.29. Appropriate methods shall be established to identify any anomalous changes in the activity of coolant and to perform data analysis for fuel defects to determine their nature and severity, their location, their probable root causes and the necessary corrective actions.

5.30. For fuel and core components, handling procedures shall be developed to ensure the

controlled movement of unirradiated and irradiated fuel, proper storage on the site and preparation for transport from the site. The plans for storage of unirradiated and irradiated fuel shall be submitted to the regulatory body for approval, if required.

5.31. The transport, including packaging, and carriage of unirradiated and irradiated fuel shall be carried out in accordance with appropriate national regulations for domestic transport and in the event of international transport, performed in accordance with IAEA Safety Standards Series No. SSR-6 (Rev. 1), Regulations for the Safe Transport of Radioactive Material, 2018 Edition [10].

5.32. Before any fuel handling takes place, the operating organization shall ensure that an authorized, trained and qualified person is present, who shall be responsible for control and handling of the fuel on the site in accordance with written procedures. The risks involved in the fuel handling and associated lifting operations, including risks for abnormal fuel configuration with heightened reactivity, shall be considered in the work planning. Access to fuel storage areas shall be limited to authorized personnel.

5.33. Detailed auditable accounts shall be maintained for the storage, irradiation and movement of all fissile material, including unirradiated and irradiated fuel, in accordance with regulatory requirements.

REQUIREMENT 24: PERIODIC SAFETY REVIEW

Systematic safety assessments of the nuclear power plant, in accordance with regulatory requirements, shall be performed by the operating organization throughout the plant's operating lifetime, with due account taken of operating experience and significant new safety related information from all relevant sources.

5.34. Safety reviews such as periodic safety reviews or safety assessments under alternative arrangements shall be performed throughout the lifetime of the plant, at regular intervals and as frequently as necessary (typically no less than once in ten years). If a new reactor module is added, the periodicity of periodic safety review of the nuclear power plant shall be consistent with the date at which the first module was installed.

5.35. Safety reviews shall address, in an appropriate manner: changes in regulatory requirements and international safety standards, operating practices and technology; the potential for the cumulative effects of plant modifications to adversely affect safety; identification of significant ageing effects or trends; accumulation of relevant operating

experience; changes in how the plant is, or will be, operated; changes in the environment in the vicinity of the plant (including changes in the hazard management process); changes in staffing levels or in the experience of staff; and changes in the management structure and procedures of the plant's operating organization. Safety reviews shall be aimed at ensuring a high level of safety throughout the lifetime of the plant.

5.36. The operating organization shall report to the regulatory body as required, in a timely manner, the findings of the safety review that have implications for safety.

5.37. The scope of the safety review shall include all safety related aspects of an operating plant. Where appropriate, the findings of probabilistic safety assessment shall be used to supplement deterministic safety assessment to provide additional insights into the contributions to safety from different safety related aspects of the plant.

5.38. The safety review shall include a systematic review of all relevant plant documents and records, verification of plant processes, walkdowns, and evaluation of the existing safety analysis. The safety review shall determine the adequacy and effectiveness of the arrangements and the structures, systems and components that are in place to ensure plant safety; the extent to which the plant conforms to regulatory requirements and international safety standards and operating practices; safety improvements and time frames for their implementation; and the extent to which the safety documentation, including the licensing basis, remains valid. The review shall:

(a) Identify any features that might limit the lifetime of the plant in order to plan future modifications;

(b) Provide a conclusion on the safe continued operation of the nuclear power plant;

(c) Identify reasonably practicable safety improvements on the basis of a balanced assessment of the review findings.

5.39. The plant management shall establish a system to ensure that plant documentation and design documentation is updated to incorporate outcomes from periodic safety reviews.

5.40. On the basis of the results of the safety review, the operating organization shall implement any reasonably practicable safety improvements and reasonably practicable modifications in a timely manner, for compliance with applicable standards. The safety improvements shall be designed to enhance the safety of the plant by further reducing the likelihood and the potential consequences of incidents and accidents.

REQUIREMENT 25: EQUIPMENT QUALIFICATION PROGRAMME

The operating organization of the nuclear power plant shall ensure that an equipment qualification programme is implemented to provide reliable confirmation that structures, systems and components important to safety are capable of the required performance for all operational states and for accident conditions.

5.41. The purpose, scope and process of equipment qualification shall be established, and effective and practicable methods shall be used to review upgrade and preserve equipment qualification. A programme to establish, confirm and maintain equipment qualification shall be initiated from the initial design, supply and installation phases and shall include the post-operational phase, if the equipment is needed during decommissioning. The effectiveness of the equipment qualification programme shall be periodically reviewed by the operating organization. The equipment qualification programme shall be integrated with other plant safety programmes and processes such as the ageing management programme (see Requirement 26).

5.42. The scope and details of the equipment qualification programme shall be documented by the operating organization and submitted to the regulatory body for review and approval, if required. Relevant national and international experience shall be taken into account in accordance with regulatory requirements. Additional equipment qualification criteria shall be established for the qualification of equipment that utilizes new materials in structures, systems and components where they are expected to operate in conditions for which there is a lack of operating experience on the potential for long term degradation.

5.43. Spare parts shall be stored and transported in a controlled manner to ensure their capability to function as intended during their design lifetime is not compromised . The means of confirming the storage and transport conditions for a spare part shall be commensurate with the safety significance of the part and its vulnerability to damage. See also para. 4.16.

5.44. The operating organization shall ensure that written arrangements are prepared to address non-conformance of equipment with qualification criteria. These arrangements shall provide for qualified personnel to assess the safety significance of the non-conformance and to determine the actions that are necessary to ensure the safety of the plant.

REQUIREMENT 26: AGEING MANAGEMENT PROGRAMME

The operating organization shall ensure that effective ageing management is implemented to ensure that the safety functions of structures, systems and components are fulfilled over the entire operating lifetime of the nuclear power plant.

5.45. The scope of the ageing management programme shall be defined and shall take into account the safety significance of structures, systems and components. The programme shall include a consideration of environmental stressors (e.g. temperature, pressure, radiation, humidity) and potential degradation mechanisms (e.g. fatigue, corrosion, thermal and radiation ageing). The associated ageing effects shall be systematically identified and the activities necessary to maintain the safety functions of structures, systems and components shall be determined. The ageing management programme shall also consider the potential ageing effects associated with: new operating conditions; cooling media; structures, systems and components made from novel materials; and first of a kind designs for which no operating experience is available. An ageing management review process shall be established to evaluate if all ageing effects are duly managed. The ageing management programme shall be coordinated with, and consistent with, other relevant programmes, including the programme for periodic safety review.

5.46. Ageing management activities, including the management of technological obsolescence (see para. 5.49), shall be coordinated at the plant level and be consistent with other plant programmes, including configuration management, modification management, maintenance, equipment qualification and chemistry.

5.47. Time limited ageing analyses shall be identified and their validity for the intended period of operation shall be evaluated.

5.48. A systematic approach shall be taken for the development, implementation and continuous improvement of the ageing management programme, including periodic reviews of its effectiveness.

5.49. Technological obsolescence of items important to safety shall be evaluated. A programme shall be established to identify and prioritize technological obsolescence issues for items important to safety and to implement effective, timely solutions. The effectiveness of the technological obsolescence programme shall be periodically reviewed by the operating organization.

5.50. The operating organization shall establish a data collection and record-keeping system for ageing management at the early stages of the plant's life and maintain it throughout the lifetime of the plant.

REQUIREMENT 27: PROGRAMME FOR LONG TERM OPERATION

Where applicable, the operating organization shall establish and implement a comprehensive programme for ensuring the safe long term operation of the nuclear power plant beyond the time frame established in the licence conditions, original plant design, relevant standards and/or regulatory requirements.

5.51. The justification for long term operation shall be prepared on the basis of the results of a safety assessment, with due consideration of the ageing of structures, systems and components, to ensure the safety of the plant throughout its extended operating lifetime. The justification for long term operation shall be submitted to the regulatory body, for approval.

5.52. A comprehensive programme for the preparation for and implementation of long term operation shall be established, the aims of which shall include:

(a) To review and improve plant documentation and programmes relevant to ageing management and long term operation, including a review of the results of periodic safety reviews;
(b) To identify and categorize structures, systems and components subject to ageing management;
(c) To identify and revalidate time limited ageing analyses;
(d) To review the ageing management of structures, systems and components;
(e) To review and update ageing management programmes and related operational safety programmes to ensure that new information on new operating conditions, new cooling media, and chemistry properties for new materials and innovative designs are included;
(f) To prepare the documentation to support long term operation.

REQUIREMENT 28: HAZARD MANAGEMENT

The operating organization shall establish and implement a hazard management programme to ensure that the plant is protected against internal hazards and external hazards as identified by the safety assessments.

5.53. The hazard management programme shall include the purpose, scope and the following:

(a) Arrangements for prevention, monitoring, and mitigation of the impacts of internal and external hazards such as toxic or explosive gases, fires and other hazards identified by the safety assessment , including credible combinations of hazards;
(b) A consideration of the impact of changes in hazards and site characteristics over time;
(c) Harmonization with the accident management programme and the arrangements for emergency preparedness and response;
(d) Communication arrangements with appropriate regional and national organizations regarding the forecast and coordinated mitigation of external hazards;
(e) Control of materials and housekeeping (see Requirement 15);
(f) Inspection, maintenance, testing and review of preventive and mitigatory measures for internal hazards and external hazards;
(g) Assignment of responsibilities and training and exercising on hazard management for plant personnel, and provisions to ensure the protection of those personnel responsible for implementing hazard management measures;
(h) Strategies for coping with the impact(s) of internal hazards and external hazards;
(i) Assessment of the impact of plant modifications on hazard management measures;
(j) Assessment of potential chemical and fire hazards for any new materials that might affect the safety of the nuclear power plant.
(k) Assessment of new insights gained by national and international operational experience on hazard management measures.

6. RADIATION PROTECTION PROGRAMME AT A NUCLEAR POWER PLANT

REQUIREMENT 29: RADIATION PROTECTION

The operating organization of the nuclear power plant shall establish and implement a radiation protection programme.

6.1. The operating organization shall ensure that the radiation protection programme complies with Requirement 24 of GSR Part 3 [4]. The operating organization shall verify, by means of surveillance, inspections and audits, that the radiation protection programme is being properly implemented and that its objectives are being met. The radiation protection programme shall also consider, as applicable, operational experience on radiological conditions arising from novel designs, coolants and materials, as well as new arrangements in relation to

activities such as fuel management and maintenance. The radiation protection programme shall be reviewed on a regular basis and shall be updated if necessary.

6.2. The operating organization shall ensure that for all operational states, doses due to exposure to ionizing radiation at the nuclear power plant or doses due to any planned radioactive releases (discharges) from the plant are kept below authorized limits and are as low as reasonably achievable.

6.3. The operating organization shall ensure that the radiation protection programme has independence and resources to be able to enforce and to advise on radiation protection regulations, standards and procedures, and on safe working practices.

6.4. The operating organization shall implement measures to ensure that all site personnel understand and acknowledge their individual responsibility for implementing measures to control exposure in accordance with the radiation protection programme. Particular emphasis shall be given to the training of all site personnel on radiological hazards and the necessary protective measures. For activities involving high or potentially high dose rates, the radiation protection programme shall include special training and procedures for site personnel, including those employed by contractors, to ensure that protection and safety are optimized.

6.5. The operating organization shall ensure that all site personnel — including those employed by contractors — who work in a controlled area or who are regularly present in a supervised area have their occupational exposures assessed in accordance with Requirement 25 of GSR Part 3 [4]. Dose records shall be kept and shall be made available to personnel and to the regulatory body.

6.6. The radiation protection programme shall include the health surveillance of site personnel who are or may be occupationally exposed to radiation in order to ascertain their physical fitness and give advice in cases of accidental exposure or overexposure. This health surveillance shall consist of a preliminary medical examination followed by periodic checkups.

6.7. The radiation protection programme shall include controls over radiation dose rates in accessible areas of the nuclear power plant, including during activities such as inspection, maintenance and fuel handling. The radiation protection programme shall ensure that exposures due to radioactivity in the fuel coolant and associated fluids are as low as reasonably achievable.

REQUIREMENT 30: MANAGEMENT OF RADIOACTIVE WASTE

The operating organization shall establish and implement a programme for the management of radioactive waste from the nuclear power plant.

6.8. Adequate operating practices shall be implemented at the nuclear power plant to ensure that the generation of radioactive waste is kept to the minimum practicable in terms of both activity and volume.

6.9. The programme for the management of radioactive waste shall include the characterization, classification, processing (i.e. pretreatment, treatment and conditioning), transport, storage and disposal of radioactive waste, as well as regular updating of the inventory of radioactive waste. Processing and storage of radioactive waste shall be strictly controlled in a manner consistent with the requirements established in GSR Part 5 [5]. Records shall be maintained for waste generation and waste classification, as well as for the inventory, processing, storage and disposal of waste.

6.10. The operating organization shall establish and implement procedures consistent with international standards, regulatory requirements and licence conditions for the monitoring and control of discharges of radioactive effluents. These procedures shall be made available to the regulatory body if required. The volume and activity of radioactive discharges to the environment shall be reported periodically to the regulatory body.

6.11. The operating organization shall ensure that a programme is established and implemented for monitoring the environment in the vicinity of the plant site, to assess radiological consequences of any radioactive releases to the environment. Results from this monitoring shall be made available to the public and in particular to the public living in the vicinity of the site. If the regulatory body requires a prospective radiological environmental impact assessment to be made, the operating organization shall keep such an assessment up to date.

7. EMERGENCY AND SEVERE ACCIDENT MANAGEMENT AT A NUCLEAR POWER PLANT

REQUIREMENT 31: EMERGENCY PREPAREDNESS AND RESPONSE

The operating organization of the nuclear power plant shall prepare an emergency plan for preparedness for, and response to, a nuclear or radiological emergency.

7.1. The operating organization shall develop its emergency plan in accordance with a hazard

assessment that considers site specific conditions. The events that shall be considered include those that lead to a nuclear or radiological emergency and events involving a combination of a nuclear or radiological emergency with a non-radiological emergency.

7.2. Emergency planning for the nuclear power plant shall also consider non-radiological events or hazards such as fire, explosions, and spills of chemicals, and events that could have an impact on the availability of plant personnel such as outbreaks or pandemics (see para. 3.67). Events of very low probability shall be considered in the hazard assessment. Requirements for emergency preparedness and response are established in IAEA Safety Standards Series No. GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency, [7].

7.3. Appropriate arrangements for emergency preparedness and response shall be established from the time that nuclear fuel is first brought to the site, and the emergency plan and all emergency arrangements shall be in place before the commencement of fuel loading. The emergency plan shall be tested and validated in exercises before the commencement of fuel loading. Emergency preparedness training, exercises and drills shall be planned and conducted at suitable intervals, to evaluate the preparedness of personnel to perform their tasks, and to evaluate their cooperation in implementing the emergency plan and in improving the efficiency of the response.

7.4. The emergency plan shall include all activities under the responsibility of the operating organization and shall establish the necessary organizational structure and resources to implement and maintain the emergency plan.

7.5. The operating organization shall prepare the emergency plan in coordination with those organizations that have responsibilities in an emergency, including government, regional and local authorities and private enterprises, as relevant, and the plan shall be submitted to the regulatory body as required. The plan shall be subject to review and update in the light of experience gained.

7.6. The operating organization shall ensure that an adequate number of suitably qualified personnel are available to manage an emergency response at all facilities that might be simultaneously subject to emergency conditions. A training programme for emergencies shall be established and implemented to ensure that plant personnel and, as appropriate, personnel from other participating organizations possess the knowledge, skills and attitudes necessary for the implementation of the emergency plan under stressful conditions.

7.7. In preparing the emergency plan, account shall be taken of any external events that could

hinder the emergency arrangements.

7.8. The operating organization of the nuclear power plant shall ensure that relevant facilities, instruments, tools, equipment, procedures, documentation and communication systems to be used in an emergency (including those required for off-site communication and for the accident management programme) are maintained in good operational condition and remain available during an emergency.

7.9. The operating organization, as part of its management system, shall establish a quality management programme to ensure the availability and reliability of all supplies, equipment, communication systems and facilities, plans, procedures, and other arrangements necessary during a nuclear or radiological emergency.

7.10. The authority and responsibility for directing the emergency response on-site and for making decisions on emergency response actions to be taken shall be clearly assigned. The operating organization shall make arrangements to coordinate the emergency response between on-site and off-site organizations within the emergency planning zone and emergency planning distance, each of which have been determined on the basis of plant and site-specific characteristics.

7.11. The emergency response arrangements for the nuclear power plant shall include: maintaining operational safety and security functions for all facilities on the site in the event of an accident; the prompt identification, classification, and declaration of an emergency; timely notification and alerting of response personnel; assessment of the progress of the emergency; mitigating the consequences of accidents if they do occur; protecting site personnel and the public; protecting the environment; coordinating response organizations, as appropriate; and communicating with the public in a timely manner [7].

7.12. The emergency plan and the nuclear security contingency plan for the nuclear power plant shall be coordinated and integrated to ensure their effectiveness and compatibility. The operating organization shall ensure that the measures taken within the emergency plan and nuclear security contingency plan do not adversely affect each other and that they are mutually supportive.

7.13. The operating organization of the nuclear power plant shall ensure that the exposure of emergency workers responding to a nuclear or radiological emergency is restricted in accordance with Appendix I of GSR Part 7 [7].

7.14. The operating organization shall make arrangements for first aid, management of contaminated persons and persons who have been overexposed to radiation, medical transport and initial medical treatment in designated medical facilities.

7.15. The operating organization of the nuclear power plant shall make arrangements to assist off-site officials in keeping the public informed in the event of a nuclear or radiological emergency and shall ensure that information provided to the public is coordinated and consistent with other response organizations.

REQUIREMENT 32: ACCIDENT MANAGEMENT PROGRAMME

The operating organization of the nuclear power plant shall establish, periodically review and, as necessary, revise an accident management programme.

7.16. The accident management programme shall include the preparatory measures, procedures, guidelines and equipment that are necessary for preventing the progression of accidents, including severe accidents, and for mitigating their consequences if they do occur. The accident management programme shall be consistent with the plant design and current configuration, documented, periodically reviewed and, as necessary, revised.

7.17. For a multiple unit nuclear power plant site, concurrent accidents (including concurrent severe accidents) affecting all units shall be considered in the accident management programme. Trained and experienced personnel, equipment, supplies and external support shall be made available for coping with concurrent accidents. Potential interactions between units shall be considered in the accident management programme.

7.18. The accident management programme shall include instructions for the utilization of equipment located both on and off-site. This shall be safety related equipment as far as possible, but items not important to safety (e.g. conventional equipment) may also be used.

7.19. The accident management programme shall include contingency measures, such as an alternative supply of cooling water and an alternative supply of electrical power, to mitigate the consequences of accidents, including any necessary equipment. This equipment shall be located, maintained and tested so as to be functional and readily accessible when needed.

7.20. The accident management programme shall include the technical support and administrative measures necessary to mitigate the consequences of an accident.

7.21. The accident management programme shall include training necessary for implementation of the programme.

7.22. In developing the accident management programme and its procedures, the possibility of degraded regional infrastructure and of adverse working conditions (e.g. elevated radiation levels, elevated temperatures, lack of lighting, limited access to the plant from off the site), as well as the possibility of degraded operating conditions for equipment, shall be taken into account so as to ensure that actions expected for accident management are feasible and can be taken in a timely and reliable manner.

7.23. The accident management programme shall ensure that operating personnel have the appropriate competence, systems and technical support. These arrangements and related guidance shall be available before the commencement of fuel loading, shall be validated and shall then be periodically tested as far as practicable in exercises and used in training and drills.

7.24. As part of the accident management programme, there shall be provisions within the emergency plan to expand the emergency arrangements, where necessary, to include the responsibility for long term actions arising from the severe accident.

8. COMMISSIONING OF A NUCLEAR POWER PLANT

REQUIREMENT 33: COMMISSIONING PROGRAMME

The operating organization shall ensure that a commissioning programme that covers the transition from construction to operations for the nuclear power plant is established and implemented.

8.1. The commissioning programme for the plant shall cover the full range of plant conditions specified in the design and the safety assessment . The programme shall demonstrate that the behaviour of the plant as built is in compliance with the design assumptions, that it meets the requirements of the safety assessment and the licence conditions, and that it can be safely operated in accordance with the operational limits and conditions. Special attention shall be paid to ensuring that no commissioning tests are performed that might place the plant in an unanalysed condition. Commissioning phases , test objectives and acceptance criteria shall be specified in such a way that the programme is auditable.

8.2. The commissioning programme shall provide the operating organization and the regulatory body with the means of identifying hold points in the commissioning process for which approval may be required prior to continuing to the next commissioning phase .

8.3. For modules that are to be built in a factory and transported to a site, the designer or

vendor shall provide a commissioning programme to enable representatives from the operating organization, or regulatory body as appropriate, to witness commissioning tests at the factory and at the site. The designer or vendor shall also specify any additional tests to be performed on-site and any tests needed to ensure that the safety functions of the equipment within the module(s) have not been adversely affected during transportation to the site.

8.4. The commissioning programme shall be divided into phases . A review of the test results for each phase shall be completed to determine if the commissioning programme can proceed to the next phase or if it is necessary to return to a previous phase , for example, for further tests.

8.5. Authority and responsibilities shall be clearly specified and shall be assigned to the individuals and groups performing the commissioning activities. The operating organization shall be responsible for ensuring that construction activities are of appropriate quality and that information and documentation on the completion of commissioning activities and comprehensive baseline data are provided. The operating organization shall ensure that equipment supplied is manufactured under a quality assurance programme that includes inspection for proper fabrication, and cleanliness, calibration and verification of functionality.

8.6. Suitably qualified personnel from the operating organization and designer or vendor shall be directly involved in the commissioning process to the extent necessary to ensure proper preparation for operation. When commissioning activities are conducted by contractors, the operating organization shall provide oversight and shall review and approve these activities at all phases .

8.7. The commissioning programme shall provide reference data to characterize structures, systems and components. These reference data shall be retained and used to ensure the safety of the plant and for subsequent safety reviews. Special attention shall be paid to the commissioning programme for passive safety systems to ensure that they have been correctly installed and that commissioning activities have not adversely impaired their ability to fulfil their safety functions.

8.8. The operating organization shall have responsibility for all activities relating to the commissioning phase directly or indirectly. This includes responsibility for management of safety, staff training, reactivity, radiation protection, radioactive waste, records, fire safety, nuclear security and the implementation of the emergency plan.

8.9. During commissioning, the operating, maintenance and periodic test procedures shall be

verified to ensure their technical accuracy and shall be validated to ensure their usability with the installed equipment and control systems, before fuel handling operations commence on the site. This verification and validation of procedures shall be performed with the participation of future operating personnel, , to the extent possible.. Operating personnel shall be involved in commissioning activities sufficiently in advance to benefit from the knowledge and experience of the personnel performing the commissioning activities. This process shall continue throughout the commissioning of the plant.

8.10. From the commencement of commissioning, reviewed and approved arrangements for the control of commissioning and maintenance work, management of modifications and control of plant configuration shall be in place to meet the conditions of the commissioning tests.

8.11. The operating organization shall ensure that the commissioning interfaces and the lines of communication between different groups (e.g. groups for design, procurement, construction, commissioning and operations, as well as contractors) shall be clearly specified and controlled.

8.12. The operating organization shall ensure that appropriate procedures are developed for the handover of the plant at the end of commissioning. This shall include the transfer of responsibilities for structures, systems and components, items of equipment and documentation, and it may include the transfer of personnel. The operating organization shall ensure that plant configuration at handover is prescribed for the required operating state at that time and is verified and maintained in accordance with the safety analysis prior to final acceptance.

8.13. Initial fuel loading shall not be authorized until all relevant pre-operational tests have been performed and the results have been accepted by the operating organization and the regulatory body. Reactor criticality and initial power increase shall not be authorized until all necessary tests have been performed and the results have been accepted by the operating organization and the regulatory body, as appropriate. The commissioning programme tests shall be successfully completed as a necessary precondition for authorization, as appropriate, for normal operation of the plant to commence.

8.14. During commissioning, the plant shall be monitored and maintained to protect plant equipment, to support the testing phase and to maintain consistency with the safety analysis report.

8.15. During commissioning, a comparison shall be performed between the as built plant and

the plants' design parameters. A comprehensive process shall be established to address non-conformances in design, manufacture, construction and operation. Resolutions to either accept differences between initial design and as-built plant or to correct non-conformances shall be documented.

9. PREPARATION FOR DECOMMISSIONING OF A NUCLEAR POWER PLANT

REQUIREMENT 34: PREPARATION FOR DECOMMISSIONING

The operating organization of the nuclear power plant shall prepare a decommissioning plan and shall maintain it throughout the lifetime of the plant to demonstrate that decommissioning can be accomplished safely and in such a way as to meet the specified end state.

9.1. The decommissioning plan shall be updated in accordance with changes in regulatory requirements, modifications to the plant, advances in technology, changes in the need for decommissioning activities and changes in national policies (see GSR Part 6 [6]).

9.2. Particular attention shall be given to planning the decommissioning of nuclear power plants with integrated reactor designs, transportable nuclear power plants, and plants that are designed for one-time fuelling. The decommissioning plans for such plants shall include provisions for the removal of equipment and for the shipment in accordance with the requirements of the Transport Regulations to enable off-site decommissioning.

9.3. A human resource programme shall be developed to ensure that sufficient qualified personnel are available for the safe operation of the plant up to final shutdown, for the safe conduct of activities during the preparatory period for decommissioning and for the safe decommissioning of the plant.

9.4. In the preparatory period for decommissioning, a high level of operational safety shall be maintained until the nuclear fuel has been removed from the plant.

9.5. During the decommissioning on multiple unit plants, appropriate measures shall be implemented to ensure that common systems and common equipment remain fully available to support the safe operation of all the operational units.

9.6. The operating organization shall, over the operating lifetime of the plant, continue to consider the needs in relation to future decommissioning. The knowledge and experience with

regard to contaminated or irradiated structures, systems and components gained in modification and maintenance activities at the plant shall be recorded and retained to facilitate the planning for decommissioning. Complete and reviewed information shall be compiled and transferred to the organization responsible for managing decommissioning.

9.7. The safety implications of activities in the transitional phase prior to the commencement of decommissioning shall be assessed and shall be managed so as to avoid undue hazards and to ensure safety.

9.8. All safety related activities conducted in support of future decommissioning shall be performed in accordance with written procedures to ensure that the plant is operated within the established operational limits and conditions.

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ANNEX
CORRESPONDENCE OF REQUIREMENT NUMBERS WITH THOSE IN THE PREVIOUS VERSION OF THE PUBLICATION

A-1. The structure of this publication has been changed from the previous version (IAEA Safety Standards Series No. SSR-2/2 (Rev. 1), Safety of Nuclear Power Plants: Commissioning and Operation[3]) to reflect the functional areas of nuclear power plant commissioning and operation. Table A-1 presents how the requirement numbers in the current version of this publication correspond to those in the previous version.

TABLE A–1: CORRESPONDENCE OF REQUIREMENT NUMBERS IN THE CURRENT VERSION OF THE PUBLICATION WITH THOSE IN THE PREVIOUS VERSION

Requirement No. in this publication	Requirement No. in SSR-2/2 (Rev. 1) (see footnote 1)
1	1
2	2
3	3
4	4
5	5
6	17
7	24
8	7
9	6
10	8
11	9
12	26
13	27
14	29
15	28

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16	22
17	23
18	15
19	31
20	32
21	10
22	11
23	30
24	12
25	13
26	14
27	16
28	New
29	20
30	21
31	18
32	19
33	25
34	33

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