

As amended vide SRO 813(I)/2025 dated 16<sup>th</sup> May 2025

(Refer to Regulations 45, 46 and 47)

REGISTERED No. M - 302  
L.-7646



EXTRAORDINARY  
PUBLISHED BY AUTHORITY

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ISLAMABAD, THURSDAY, DECEMBER 31, 2020

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PART II

Statutory Notifications (S. R. O.)

GOVERNMENT OF PAKISTAN

PAKISTAN NUCLEAR REGULATORY AUTHORITY

NOTIFICATION

*Islamabad, the 21st September, 2020*

**S.R.O. 1462(I)/2020.**—In exercise of the powers conferred by Section 16(2)(a) read with Section 56 of the Pakistan Nuclear Regulatory Authority Ordinance, 2001 (III of 2001), Pakistan Nuclear Regulatory Authority (PNRA) is pleased to make and promulgate the following regulations:

1. **Short Title, Extent, Applicability and Commencement.**—(1) These regulations may be called the “Regulations on the Safety of Nuclear Power Plants Operation - (PAK/913) (Rev.2)”.

(2) These regulations extend to the whole of Pakistan.

(3) These regulations shall be applicable to the commissioning and operation of Nuclear Power Plants (NPPs).

3117(1—73)

Price : Rs. 100.00

[6082(2020)/Ex. Gaz.]

- (4) These regulations shall come into force at once.

2. **Definitions.**—In these regulations, unless there is anything repugnant in the subject or context,

- (a) “*accident*” means any unintended event, including operating errors, equipment failures and other mishaps, the consequences or potential consequences of which are not negligible from the point of view of protection and safety;
- (b) “*accident conditions*” mean deviations from normal operation that are less frequent and more severe than anticipated operational occurrences, including design basis accidents and design extension conditions;
- (c) “*ageing management*” means engineering, operations and maintenance actions to control, within acceptable limits, the ageing degradation of structures, systems and components;
- (d) “*anticipated operational occurrences*” mean operational processes deviating from normal operation which are expected to occur at least once during the operating lifetime of a facility but which, in view of appropriate design provisions, do not cause any significant damage to items important to safety or lead to accident conditions;
- (e) “*commissioning*” means the process during which systems and components of facility having been constructed, are made operational and verified to be in accordance with the design and to have met the required performance criteria;
- (f) “*configuration management*” means the process of identifying and documenting the characteristics of a facility’s structures, systems and components, including computer systems and software; and of ensuring that changes to these characteristics are properly developed, assessed, approved, issued, implemented, verified, recorded and incorporated into the facility documentation;
- (g) “*controlled area*” means a defined area in which specific protection measures and safety provisions are or could be required for controlling exposures or preventing the spread of contamination in normal working conditions, and preventing or limiting the extent of potential exposures;
- (h) “*criticality*” means the state of a nuclear chain reacting medium when the chain reaction is just self-sustaining (or critical), i.e. when the reactivity is zero;

- (i) “*decommissioning*” means administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a facility;
- (j) “*design basis accidents*” mean a postulated accident leading to accident conditions for which a facility is designed in accordance with established design criteria and conservative methodology, and for which releases of radioactive material are kept within acceptable limits;
- (k) “*design extension conditions*” mean postulated accident conditions that are not considered for design basis accidents, but that are considered in the design process of the facility in accordance with best estimate methodology, and for which releases of radioactive material are kept within acceptable limits;
- (l) “*facility*” means nuclear power plant, and may also be called as plant;
- (m) “*integrated management system*” means a single coherent management system for facilities and activities in which all the component parts of an organization are integrated to enable the organization’s objectives to be achieved;
- (n) “*licensee*” means the holder of a valid license issued by the Authority;
- (o) “*limit*” means the value of quantity used in certain specified activities or circumstances that must not be exceeded and is acceptable to and notified by the Authority;
- (p) “*long shutdown*” means a shutdown planned for a duration exceeding one (1) month;
- (q) “*management system*” means a set of interrelated or interacting elements for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective manner;
- (r) “*near miss*” means a potentially significant event that could have occurred as the consequence of a sequence of actual occurrences but did not occur owing to the facility conditions prevailing at the time;
- (s) “*normal operation*” means operation within specified operational limits and conditions;
- (t) “*nuclear safety*” means the achievement of proper operating conditions, prevention of accidents and mitigation of accident

consequences, resulting in protection of workers, the public and the environment from undue radiation risks;

- (u) “*operating personnel*” mean individual workers engaged in the operation of the authorized facility;
- (v) “*operation*” means all activities performed to achieve the purpose for which an authorized facility was constructed;
- (w) “*operational limits and conditions (OLCs)*” mean a set of rules setting forth parameter limits, the functional capability and the performance levels of equipment and personnel approved by the Authority for safe operation of an authorized facility. Technical specifications and operating policies and principles are also referred as OLCs;
- (x) “*operational states*” mean states defined under normal operation and anticipated operational occurrences;
- (y) “*Ordinance*” means the Pakistan Nuclear Regulatory Authority Ordinance, 2001 (III of 2001);
- (z) “*reactor operator (RO)*” means licensed technician responsible for manipulating the controls of a nuclear reactor in the control room and in the field under the supervision of a licensed shift supervisor or shift engineer;
- (aa) “*safety*” means the protection of people and the environment against radiation risks, and the safety of facilities and activities that give rise to radiation risks;
- (bb) “*safety function*” means a specific purpose that must be accomplished for safety;
- (cc) “*safety limits*” mean limits on operational parameters within which an authorized facility has been shown to be safe;
- (dd) “*safety system settings*” mean the settings for levels at which safety systems are automatically actuated in the event of anticipated operational occurrences or design basis accidents, to prevent safety limits from being exceeded;
- (ee) “*safety system*” means a system important to safety, provided to ensure

the safe shutdown of the reactor or the residual heat removal from the reactor core, or to limit the consequences of anticipated operational occurrences and design basis accidents;

- (ff) “*site personnel*” mean all persons working on the site of a facility either permanently or temporarily;
- (gg) “*shift engineer (SE)*” means licensed engineer, second in command, assisting shift supervisor and responsible for manipulating the controls of a nuclear reactor and supervising the activities of licensed reactor operator in the control room and in the field;
- (hh) “*shift supervisor (SS)*” means licensed engineer responsible for direct supervision of plant operation and in-charge of operation shift; and
- (ii) “*station health physicist (SHP)*” means technical head of the health physics department.

3. **Scope.**—These regulations deal with the safety aspects of commissioning and operation of NPPs.

4. **Interpretation.**—The decision of the Chairman regarding interpretation of any word or phrase of these regulations shall be final and binding.

#### MANAGEMENT AND ORGANIZATIONAL STRUCTURE

5. **Responsibilities of the Licensee.**—(1) The licensee shall have the prime responsibility for safety of the NPP. This prime responsibility shall cover all the activities relating to the commissioning and operation, directly and indirectly. It includes the responsibility for supervising and coordinating the activities of all other related groups, such as designers, suppliers, manufacturers and constructors, employers and contractors, as well as the responsibility for operation of the plant. The licensee shall discharge this responsibility in accordance with its management system.

(2) The licensee shall consider the following functions of an integrated management system while establishing its organizational structure:

- (a) Policy making for all areas of safety which includes:
  - (i) Setting management objectives;
  - (ii) Establishing policy for safety;

- (iii) Developing management and staff who value learning, have skills in creating, acquiring and transferring knowledge, and can adapt the organization on the basis of new knowledge and insights; and
- (iv) Promoting a strong safety culture.

Strategies and management objectives shall be developed in accordance with the policy in order to put the policy into effect.

- (b) Allocation of responsibilities with corresponding lines of authority and communication, for:
  - (i) Allocating resources;
  - (ii) Providing human resources with the appropriate level of education and training and material resources;
  - (iii) Retaining the necessary competences;
  - (iv) Approving the contents of management programs;
  - (v) Developing procedures and instructions, where necessary, and having a strict policy of adherence to these procedures and instructions;
  - (vi) Setting policies on fitness for duty; and
  - (vii) Establishing a program to make the necessary changes to any of these functions on the basis of the performance in achieving objectives.
- (c) Operating functions, which include executive decision making and actions for the operation of a plant for all operational states and accidents conditions;
- (d) Supporting functions, which include obtaining, from both on-site and off-site organizations including contractors, the technical and administrative services and the use of facilities necessary to perform the operating functions. For sites with shared safety related resources (e.g. sites with multiple units), the arrangements for the use of such shared resources shall be clearly defined;

- (e) Reviewing functions, which include monitoring and assessing the performance of the operating and supporting functions on a regular basis. Reviewing functions 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 (SAR), and to identify possible safety improvements; and
- (f) Design integrity, which includes maintaining a formally designated entity that has overall responsibility for the continuing integrity of the plant design throughout its lifetime, and managing the interfaces and lines of communication with the responsible designers and equipment suppliers contributing to this continuing integrity.

(3) The licensee shall establish liaison with the Authority and with relevant organizations to ensure a common understanding of, and to ensure compliance with, safety requirements.

6. **Management System.**—(1) The licensee shall establish, implement, assess and continually improve an integrated management system.

(2) The licensee shall ensure, through the establishment and use of a management system, that the plant is operated in a safe manner within the limits and conditions that are specified in the safety assessment and the terms and conditions specified in the authorization or license.

(3) The management system shall integrate all the elements of management so that processes and activities that may 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, physical protection and quality, so that safety is not compromised by other requirements.

(4) The management system of the licensee 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, rests with the licensee. The licensee shall establish a system for the supervision of work performed by support organizations. It shall be the responsibility of the licensee to ensure that the personnel of external support organizations performing activities on structures, systems or components important to safety or activities affecting safety are qualified to perform their assigned tasks.

The overall contracted activity shall be clearly specified and approved by the licensee prior to its commencement. The licensee shall ensure long term access to knowledge of the plant design and manufacturing and construction throughout the lifetime of the plant.

**7. Organizational Structure of the Licensee.**—(1) The licensee shall establish and document its organizational structure, functions and roles and responsibilities of its personnel.

(2) Functional responsibilities, lines of authority, and lines of internal and external communication for the safe operation of a plant in all operational states and in accident conditions shall be clearly specified. Necessary resources and support shall be provided to the plant management, in case the authority for safe operation of the plant is delegated to them.

(3) Documentation of the plant's organizational structure and the arrangements for discharging responsibilities shall be made available to the plant staff. The organizational structure of the licensee shall be specified so that all roles significant for safe operation are specified and described. Proposed organizational changes to the structure and associated arrangements, which might be of importance to safety, shall be analyzed in advance by the licensee.

**8. Staffing of the Licensee.**—(1) The licensee shall employ competent managers and qualified personnel for the safe operation of the plant.

(2) The licensee shall be responsible for ensuring that the necessary knowledge, skills, attitudes and safety expertise are sustained at the plant, and that long term objectives for human resource policy are developed and are met.

(3) 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 shall be an established practice for the operating personnel. The recruitment and selection policy of the licensee shall be directed at retaining competent personnel to cover all aspects of safe operation. A long term staffing plan aligned with long term objectives of the licensee shall be developed in anticipation of future needs of personnel and skills.

(4) The shift team shall be staffed to ensure that sufficient authorized operators are present to operate the plant in accordance with the OLCs. The shift staffing patterns, shift cycles and controls on working hours shall provide sufficient time for the training of shift personnel. Distractions to control room operators shall



be minimized. The activities shall be scheduled to reduce simultaneous activities as far as possible to avoid overburden of control room operators and to allow them to focus on their responsibilities for safety.

(5) All personnel of the licensee whose duties may affect safety shall be medically examined on appointment and at intervals subsequently as required to ensure their fitness for the duties and responsibilities assigned to them. Attention shall be paid to minimizing conditions causing stress, and to setting restrictions on overtime and setting requirements for rest breaks.

#### MANAGEMENT OF OPERATIONAL SAFETY

9. **Safety Policy.**—(1) The licensee shall establish and implement operational policies that give the highest priority to safety.

(2) The operational policies established and implemented by the licensee shall give safety the utmost priority, overriding the demands of production and project schedules. The safety policy shall promote a strong safety culture, including a questioning attitude and a commitment to excellent performance in all activities important to safety. Managers shall promote an attitude of safety consciousness among plant personnel.

(3) The safety policy shall stipulate clearly the leadership role of the highest level of management in safety matters. Senior management 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 site 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 the management for 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.

(4) Key aspects of the safety policy shall be communicated to external support organizations, including contractors, so that the licensee's requirements and expectations for the safety related activities, are understood and met.

(5) The safety policy of the licensee shall include commitments to perform periodic safety reviews of the plant throughout its operational lifetime. 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.

(6) The safety policy of the licensee shall include a commitment to achieve enhancement in operational safety. The strategy of the licensee for enhancing safety and for finding more effective ways of applying, and where feasible improving existing standards, shall be continuously monitored and supported by means of a clearly specified program with clear objectives and targets.

**10. Operational Limits and Conditions.**—(1) The licensee shall ensure that the plant is operated in accordance with the set of OLCs.

(2) The OLCs shall form an important part of the basis on which the licensee is authorized to operate the plant. The plant shall be operated within OLCs to prevent situations arising that could lead to anticipated operational occurrences or accident conditions, and to mitigate the consequences of such events if they do occur. The OLCs shall be developed for ensuring that the plant is being operated in accordance with the design assumptions and intent, as well as in accordance with its license conditions.

(3) The OLCs shall reflect the provisions made in the final design as described in the Final Safety Analysis Report (FSAR). All OLCs shall be substantiated by stating the reason for their adoption.

(4) The OLCs shall be reviewed and revised as necessary in consideration of experience, developments in technology and approaches to safety, changes in the plant and as a result of tests carried out during commissioning. If any modification is considered appropriate by the licensee in the approved OLCs, the safety case shall be submitted to the Authority for approval before implementation.

(5) The OLCs shall include requirements for normal operation, including shutdown and outage stages. These shall also cover actions to be taken and limitations to be observed by the operating personnel. The OLCs shall be readily accessible for control room personnel.

(6) The OLCs shall include the following:

- (a) Safety limits;
- (b) Limits on safety system settings;
- (c) Limits and conditions for normal operation;
- (d) Action statements for deviations from normal operation; and

(e) Surveillance and testing requirements.

(7) Operating personnel who are directly responsible for the conduct of operations shall be trained and thoroughly familiarized with the OLCs in order to comply with the provisions contained therein.

(8) The licensee shall ensure that an appropriate surveillance program is established and implemented to ensure compliance with the OLCs, and that its results are evaluated, recorded and retained.

(9) The plant shall be returned to a safe operational state when an event occurs in which parameters deviate from the limits and conditions for normal operation. Appropriate remedial actions shall be taken, and the licensee shall undertake review and evaluation of the event and shall notify the Authority in accordance with the established event reporting system.

(10) A process shall be established to ensure that deviations from OLCs are documented and reported 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.

(11) The licensee shall not intentionally exceed the OLCs. Where circumstances necessitate plant operation outside the OLCs, clear formal instructions for such operations shall be developed, on the basis of safety analysis, if applicable. These instructions shall include instructions for returning the plant to normal operation within the OLCs. The instructions shall also include specification of the arrangements for approval by the licensee and the Authority, as appropriate, of the changed OLCs, prior to operation under these changed OLCs.

**11. Qualification and Training of Personnel.**—(1) The licensee shall ensure that all activities that may affect safety are performed by suitably qualified and competent personnel.

(2) The licensee shall clearly define the criteria for qualification and competence to ensure that personnel performing safety related functions are capable of performing their duties safely. Individuals performing certain functions important to safety shall be required to hold a formal license issued by the Authority. Licensed and other key personnel shall meet qualification and licensing criteria given in Regulations 43 to 47 of these regulations.

(3) Suitably qualified personnel shall be selected and given necessary training and instructions to enable them to perform their duties correctly, for different

operational states of the plant and in accident conditions, in accordance with the appropriate procedures.

(4) The plant management shall be responsible for qualification and competence of plant personnel. Managers and supervisors shall determine the needs for training, and ensure that operating experience is taken into account in the training. Managers and supervisors shall ensure that production needs do not interfere with the conduct of training program.

(5) The plant management shall ensure that all personnel, who may be required to perform safety related duties, have a sufficient understanding of the plant and its safety features, and other relevant competences such as managerial and supervisory skills, to perform their duties properly and with due attention to safety.

(6) A suitable training program shall be established and maintained for the training of personnel before their assignment to safety related duties. The training program shall include provisions for periodic confirmation of the competence of personnel and for refresher training on a regular basis. The refresher training shall also include retraining provisions for personnel having extended absences from their authorized duties. The training shall emphasize the importance of safety in all aspects of plant operation and shall promote safety culture.

(7) A program shall be put in place to ensure that operating experience of events, at the plant concerned as well as of relevant events at other plants, is appropriately factored into the training program. The program shall ensure that training is conducted on the root cause of the events and on determination and implementation of the corrective actions to prevent their recurrence.

(8) Performance based programs for initial and continuing training shall be developed and put in place for each major group of personnel. The content of each program shall be based on a systematic approach. Training programs shall promote attitudes, which help to ensure that safety issues receive the attention that they warrant.

(9) The training programs shall be assessed and improved by means of periodic reviews. In addition, a system shall be put in place for the timely modification and updating of the training facilities, computer models, simulators and materials to ensure that they adequately reflect current plant conditions and operating policy, and that any differences are justified.

(10) Adequate training facilities, including a representative simulator, appropriate training materials, and maintenance and technical training facilities shall be made available for the training of plant personnel. Simulator training shall incorporate training for plant operational states and for accident conditions.

(11) All training positions shall be held by adequately qualified and experienced personnel, who provide the requisite technical knowledge and skills. Instructors shall be technically competent in their assigned areas of responsibility and shall have the necessary instructional skills, and shall also be familiar with routine and practices at the workplace. Qualification requirements shall also be established for the instructors.

(12) Plant personnel shall receive training in the management of design extension conditions. The training of operating personnel shall ensure their familiarity with the symptoms of design extension conditions and with the procedures for accident management.

(13) The plant management shall ensure that the qualifications and training of external personnel performing safety related duties are adequate for the functions to be performed.

**12. Performance of Safety Related Activities.**—(1) The licensee shall ensure that safety related activities are adequately analyzed and controlled to ensure that the risks associated with harmful effects of ionizing radiation are kept as low as reasonably achievable.

(2) All routine and non-routine operational activities shall be assessed for the potential risks associated with harmful effects of ionizing radiation. The level of assessment and control shall depend on the safety significance of the task.

(3) All activities important to safety shall be carried out in accordance with approved procedures to ensure that the plant is operated within the established OLCs. Acceptable margins shall be ensured between normal operating values and the established safety system settings to avoid undesirably frequent actuation of safety systems.

(4) If there is a need to conduct a non-routine operation, test or experiment which can affect safety and is not covered by existing operating procedures, it shall be subject to safety review. The specific OLCs shall be determined and a special procedure shall be prepared. If, during non-routine operation, any of the specific operational limits or conditions are violated, corrective action shall be taken immediately and the event shall be reviewed. Experiments shall not be conducted unnecessarily or without adequate justification.

(5) Written communication shall be preferred and spoken communication shall be minimized. If spoken communication is used, attention shall be given to ensuring that spoken instructions are clearly understood.

(6) Aspects of the working environment that influence human performance factors (such as workload or fatigue) 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 the responses of operating personnel.

(7) The licensee shall encourage plant personnel to have a questioning attitude and to make appropriate and conservative decisions, so as to minimize risk and to maintain the plant in a safe condition.

(8) The responsibilities and authorities 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. An investigation shall be carried out to determine the cause of the event, by means of root cause analyses wherever necessary, and corrective actions shall be taken to make its recurrence less likely. Prior to the restart or the resumption of full power of the affected plant, the plant management shall carry out necessary remedial actions, including inspection, testing and repair of damaged structures, systems and components, and shall revalidate the safety functions that might be challenged by the event. Restart conditions and criteria shall be established and followed after the timely implementation of the necessary corrective actions.

(9) In case of utilization of probabilistic assessment of risk for decision making, the licensee shall ensure that the risk analysis is of appropriate quality and scope. The risk analysis shall be performed by appropriately skilled analysts and shall be used in a manner that complements the deterministic approach to decision making, in compliance with applicable regulations and license conditions.

**13. Monitoring and Review of Safety Performance.**—(1) The licensee shall establish a system for continuous monitoring and periodic review of the safety of the plant and its performance.

(2) An adequate audit and review system shall be established by the licensee to ensure that the safety policy of the licensee is being implemented effectively and that lessons are being learned from its own experience and from the experience of others to improve safety performance.

(3) Self-assessment by the licensee shall be an integral part of the monitoring and review system. The licensee shall perform systematic self-assessment to identify achievements and to address any degradation in safety performance.

Where practicable, suitable objective performance indicators shall be developed and used to enable senior managers to detect and to react to shortcomings and deterioration in the management of safety.

(4) Monitoring of safety performance shall include the monitoring of: personnel performance; attitudes to safety; response to infringements of safety; and violations of OLCs, operating procedures, regulations and license conditions. The monitoring of plant conditions, activities and attitudes of personnel shall be supported by systematic walk-downs of the plant by the plant managers.

(5) The personnel and organization performing quality assurance functions shall have sufficient authority and organizational independence to identify problems relating to quality and to initiate, to recommend and to verify the implementation of solutions. These personnel and organizations shall report to a high level of management such that the necessary authority and organizational independence are provided, including sufficient independence from costs and schedules when considering safety related matters.

(6) The appropriate corrective actions shall be determined and implemented 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 the appropriate timescales. The completed corrective actions shall be reviewed to assess whether they have adequately addressed the issues identified in audits and reviews.

**14. Control of Plant Configuration.**—The plant management shall establish and implement a system for plant configuration management to ensure consistency between design requirements, physical configuration and plant documentation. Controls on plant configuration shall ensure that changes to the plant and its safety related systems are properly identified, screened, designed, evaluated, implemented and recorded. Proper controls shall be implemented to handle changes in plant configuration that result from maintenance work, testing, repair, OLCs and plant refurbishment, and from modifications due to ageing of components, obsolescence of technology, operating experience, technical developments and results of safety research.

**15. Management of Modifications.**—(1) The plant management shall establish and implement a program for management of modifications.

(2) A modification program shall ensure that all modifications are properly identified, specified, screened, designed, evaluated, authorized, implemented and recorded. Modification programs shall cover: structures, systems and components; OLCs; procedures; documents; and the organizational structure of the licensee. Modifications shall be characterized on the basis of their safety significance.

(3) Proposed modifications to structures, systems and components important to safety, which affect the bases on which the license was issued, to the OLCs, and to organizational aspects and other documents, originally approved by the Authority, shall be submitted to the Authority for approval before implementation. Any other modifications shall also be submitted to the Authority for prior approval, if so required.

(4) The licensee shall establish a mechanism to ensure proper design, safety assessment and review, control, implementation and testing of all permanent and temporary modifications. Consequences of the modification for human tasks and performance shall be systematically analyzed. For all plant modifications, human and organizational factors shall be adequately considered. The licensee shall ensure that the requirements of the plant SAR and applicable regulations are met.

(5) 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 plant management shall establish a formal system for informing relevant personnel well in time of temporary modifications and of their consequences for the operation and safety of the plant. A record of temporary modifications shall be available in Main Control Room (MCR).

(6) The plant management shall establish a system for modification control to ensure that plans, documents and computer programs are revised in accordance with the approved modifications.

(7) Implementation and testing of plant modifications shall be performed in accordance with the plant's work control system and appropriate testing procedures.

(8) Before commissioning a modified plant or putting plant back into operation after modifications, personnel shall be trained, as appropriate, and all relevant documents necessary for plant operation shall be updated and maintained.

(9) The licensee shall submit an annual report containing a brief description of any changes, tests, and experiments, including a summary of the safety evaluation of each. The report shall be submitted to the Authority in the first quarter of the following year.

**16. Ageing Management.**—(1) The plant management shall ensure that an effective ageing management program is established and implemented to ensure that required safety functions of systems, structures and components are fulfilled over the entire operating lifetime of the plant.



(2) The ageing management program shall determine the consequences of ageing and the activities necessary to maintain the operability and reliability of structures, systems and components. The ageing management program shall be coordinated with and consistent with other relevant programs, including the program for Periodic Safety Review (PSR). A systematic approach shall be taken to provide for the development, implementation and continuous improvement of ageing management programs.

(3) Long term effects arising from operational and environmental conditions (i.e. temperature conditions, radiation conditions, corrosion effects or other degradations in the plant that may affect the long term reliability of plant equipment or structures) shall be evaluated and assessed as part of an ageing management program. Account shall be taken in the program of the safety relevance of structures, systems and components.

**17. Records and Reports.**—(1) The plant management shall establish and maintain a system for the control of records and reports.

(2) The arrangements for management of records shall provide for:

- (a) Categorization of permanent and non-permanent records;
- (b) Stipulation of retention periods, with account taken of the regulatory requirements;
- (c) Establishment of procedures for updating of records or addition of supplements;
- (d) Receipt control, including completeness reviews;
- (e) Identifiable, readable, easy retrieval, accessibility and disposal arrangements;
- (f) Suitability of storage arrangements, including considerations for fire protection and physical protection;
- (g) Requirements for duplication of records and storage in separate locations;
- (h) Preservation of records, including measures to prevent deterioration; and
- (i) Periodic review by sampling and inspection.

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- (3) The management of records shall include records in respect of:
- (a) Design specifications;
  - (b) Safety analyses;
  - (c) Equipment and material supplied;
  - (d) As-built installation drawings;
  - (e) Manufacturers' documentation;
  - (f) Construction and installation documentation;
  - (g) Commissioning documents;
  - (h) Plant operational data;
  - (i) Events and incidents;
  - (j) Amounts and movements of fissile, fertile, radioactive and other special materials;
  - (k) Data from maintenance, testing, surveillance and inspection;
  - (l) History and data of modifications;
  - (m) Quality assurance;
  - (n) Qualifications, positions, medical examinations and training of site personnel;
  - (o) Plant chemistry;
  - (p) Occupational exposure;
  - (q) Radiation surveys;
  - (r) Discharges of effluents;
  - (s) Environmental monitoring;
  - (t) Storage and transport of radioactive waste;

- (u) Periodic safety reviews; and
- (v) Decommissioning documents.

(4) The document management system shall be such as to ensure that only the latest version of each document is used by personnel. Off-site storage of essential documents, such as the emergency plan, for use in the event of an emergency shall be considered.

(5) Periodic summary reports on matters relating to safety shall be provided by the licensee to the Authority as required. Reports and records relevant to reviews carried out, after abnormal events and accidents, shall be kept as required and shall be made available to the Authority.

**18. Program for Long Term Operation.**—(1) The licensee shall establish and implement, where applicable, a comprehensive program for ensuring the long term safe operation of the plant beyond a time frame established in the license conditions, design limits and applicable regulations.

(2) 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. The justification for long term operation shall utilize the results of PSR and shall be submitted to the Authority, for approval on the basis of an analysis of the ageing management program, to ensure the safety of the plant throughout its extended operating lifetime.

- (3) The comprehensive program for long term operation shall address:
  - (a) Preconditions including the current licensing basis, safety upgrading and verification, and operational programs;
  - (b) Setting the scope for all structures, systems and components important to safety;
  - (c) Categorization of structures, systems and components with regard to degradation and ageing processes;
  - (d) Revalidation of safety analyses made on the basis of time limited assumptions;
  - (e) Review of ageing management programs; and
  - (f) Implementation program for long term operation.

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**REQUIREMENTS FOR IMMEDIATE NOTIFICATION**

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**19. General Requirements.**—(1) The licensee shall notify the Authority:

- (a) The declaration of any of the emergency classes as specified in its approved emergency plan; and
- (b) Those non-emergency events, specified in Regulation 20 of these regulations that occurred within three (3) years of the date of discovery.

(2) The licensee shall notify via telephone or any other method which can ensure that notification is made to the Authority, as soon as practicable.

(3) The licensee shall notify the Authority immediately but not later than one (1) hour after the declaration of one of the emergency classes.

(4) When reporting under Regulation 19(1) of these regulations, the licensee shall identify:

- (a) The emergency class declared; and
- (b) The non-emergency event requiring a notification under Regulation 20 of these regulations.

**20. Non-Emergency Events.**—(1) One (1) Hour Reports: If not reported as a declaration of an emergency class under Regulation 19 of these regulations, the licensee shall notify the Authority as soon as practical and in all cases within one (1) hour of the occurrence of any deviation from the plant's technical specifications authorized in operating license.

(2) Four (4) Hour Reports: If not reported under Regulation 19 or Regulation 20(1) of these regulations, the licensee shall notify the Authority as soon as practicable and in all cases, within four (4) hours of the occurrence of any of the following:

- (a) The initiation of any NPP shutdown required by the plant's technical specifications;
- (b) Any event that results or should have resulted in Emergency Core Cooling Systems (ECCS) discharge into the reactor coolant system as a result of a valid signal except when the actuation results from and is part of a pre-planned sequence during testing or reactor operation;

- (c) Any event or condition that results in actuation of the Reactor Protection System (RPS) when the reactor is critical except when the actuation results from and is part of a pre-planned sequence during testing or reactor operation; and
  - (d) Any event or situation, related to the health and safety of the public or onsite personnel, or protection of the environment, for which a news release is planned or notification to other government agencies has been or will be made. Such an event may include an onsite fatality or inadvertent release of radioactively contaminated materials.
- (3) Eight (8) Hour Reports: If not reported under Regulation 19, or 20(1), or 20(2) of these regulations, the licensee shall notify the Authority as soon as practical and in all cases within eight (8) hours of the occurrence of any of the following:
- (a) Any event or condition that results in:
    - (i) The condition of the NPP, including its principal safety barriers, being seriously degraded; or
    - (ii) The NPP being in an unanalyzed condition that significantly degrades plant safety.
  - (b) Any event or condition that results in valid actuation of any of the systems listed below, except when the actuation results from and is part of a pre-planned sequence during testing or reactor operation:
    - (i) RPS including reactor scram and reactor trip;
    - (ii) General containment isolation signals affecting containment isolation valves in more than one system or multiple Main Steam Isolation Valves (MSIVs);
    - (iii) ECCS including high-head, intermediate-head, and low-head injection systems and the low pressure injection function of residual or decay heat removal systems;
    - (iv) Auxiliary or emergency feed water system;
    - (v) Containment heat removal and depressurization systems, including containment spray and fan cooler systems; and

- (vi) Emergency AC electrical power systems including Emergency Diesel Generators (EDGs).
- (c) Any event or condition that at the time of discovery could have prevented the fulfillment of the safety function of structures or systems that are needed to:
  - (i) Shutdown the reactor and maintain it in a safe shutdown condition;
  - (ii) Remove residual heat;
  - (iii) Control the release of radioactive material; or
  - (iv) Mitigate the consequences of an accident.
- (d) Events covered in Regulation 20(3)(c) of these regulations may include one or more procedural errors, equipment failures, and discovery of design, analysis, fabrication, construction, and procedural inadequacies. However, individual component failures need not be reported pursuant to Regulation 20(3)(c) of these regulations, if redundant equipment in the same system was operable and available to perform the required safety function;
- (e) Any event requiring the transport of a radioactively contaminated person for an off-site medical treatment;
- (f) Any event that results in a major loss of emergency assessment capability, off-site response capability, or off-site communications capability (e.g. significant portion of control room indication, or off-site notification system).

21. **Follow-up Notification.**—With respect to the notifications made under Regulations 19 and 20 of these regulations, in addition to making the required initial notification, each licensee, shall during the course of the event:

- (1) Immediately report:
  - (a) Any further degradation in the level of safety of the plant or other worsening plant conditions, including those that require the declaration of any of the emergency classes, if such a declaration has not been previously made;

- (b) Any change from one emergency class to another;
  - (c) A termination of the emergency class;
  - (d) The results of ensuring evaluations or assessments of plant conditions;
  - (e) The effectiveness of response or protective measures taken; and
  - (f) Information related to plant behavior that is not understood.
- (2) Maintain an open and continuous communication channel with the Authority.

#### EVENT REPORT SYSTEM OF THE LICENSEE

22. **Reportable Events.**—(1) For any event of the type described herein, the licensee shall submit a notification report within forty eight (48) hours if not reported under Regulation 20 of these regulations. The notification report shall contain, at least, name of the plant, date and time of the event, event title and classification, plant status prior to and after the event, brief description of the event, actions taken after the event, effect of the event on the plant, and information regarding reporting officer. In addition, Licensee Event Report (LER) shall also be submitted within sixty (60) days after the discovery of the event. Unless otherwise specified herein, the licensee shall report an event if it occurred within three (3) years of the date of discovery regardless of the plant mode or power level and the significance of the structure, system, or component that initiated the event.

- (2) The licensee shall report:
- (a) The death of any person at the NPP including anywhere within the exclusion area boundary as specified in the FSAR approved by the Authority;
  - (b) The injury or death of any person incurred as a result of the operation of the plant;
  - (c) The occurrence of an event that has resulted, that is likely to result, or that may result, in the exposure of a person or organ or tissue to radiation in excess of the applicable radiation dose limits;
  - (d) The misuse, by any person, of anything that is intended to protect the health or safety of persons or the environment from risks associated with the operation of the plant;

- (e) The completion of any NPP shutdown required by the plant's OLCs;
- (f) Any operation or condition which was prohibited by the plant's OLCs except when:
  - (i) The OLCs are administrative in nature;
  - (ii) The event consisted solely of a case of a late surveillance test where the oversight was corrected, the test was performed, and the equipment was found to be capable of performing its specified safety functions; or
  - (iii) The OLCs were revised prior to discovery of the event such that the operation or condition was no longer prohibited at the time of discovery of the event.
- (g) Any deviation from the plant's OLCs authorized in operating license;
- (h) Any event or condition that resulted in:
  - (i) The condition of the NPP, including its principal safety barriers, being seriously degraded; or
  - (ii) The NPP being in an unanalyzed condition that significantly degraded plant safety.
- (i) Any natural phenomenon or other external condition that posed an actual threat to the safety of the NPP or significantly hampered site personnel in the performance of duties necessary for the safe operation of the NPP;
- (j) Any event or condition that resulted in manual or automatic actuation of any of the systems listed in Regulation 22(3) of these regulations, except when:
  - (i) The actuation resulted from and was part of a pre-planned sequence during testing or reactor operation; or
  - (ii) The actuation was invalid and:
    - a. Occurred while the system was properly removed from service; or



- b. Occurred after the safety function had been already completed.
- (k) An event that results in an acute and unrecoverable loss of more than one hundred kilograms (100 kg) of heavy water (for CANDU type reactors).
- (3) The systems to which the requirements of Regulation 22(2)(j) of these regulations apply are:
  - (a) RPS including reactor scram or reactor trip;
  - (b) General containment isolation signals affecting containment isolation valves more than one system or multiple MSIVs;
  - (c) ECCS;
  - (d) Auxiliary or emergency feed water system;
  - (e) Containment heat removal and depressurization systems, including containment spray and fan cooler systems;
  - (f) Emergency AC electrical power systems including EDGs; and
  - (g) Systems for transferring residual heat from structures, systems and components important to safety to ultimate heat sinks.
- (4) Any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to:
  - (a) Shutdown the reactor and maintain it in a safe shutdown condition;
  - (b) Remove residual heat;
  - (c) Control the release of radioactive material; or
  - (d) Mitigate the consequences of an accident.
- (5) Any event where a single cause or condition caused at least one (1) independent train or channel to become inoperable in multiple systems or two (2) independent trains or channels to become inoperable in a single system designed to:
  - (a) Shutdown the reactor and maintain it in a safe shutdown condition;

- (b) Remove residual heat;
- (c) Control the release of radioactive material; or
- (d) Mitigate the consequences of an accident.

(6) (a) Any airborne radioactive release that, when averaged over a time period of one (1) hour, resulted in airborne radionuclide concentrations in an unrestricted area that exceeded twenty (20) times the authorized discharge limits;

(b) Any liquid effluent release that, when averaged over a time period of half (1/2) an hour, exceeds twenty (20) times the authorized discharge limits specified at the point of entry into the receiving waters (i.e. unrestricted area) for all radionuclides except tritium and dissolved noble gases.

(7) (a) Any event or condition that as a result of a single cause could have prevented the fulfillment of a safety function for two (2) or more trains or channels in different systems that are needed to:

- (i) Shutdown the reactor and maintain it in a safe shutdown condition;
- (ii) Remove residual heat;
- (iii) Control the release of radioactive material; or
- (iv) Mitigate the consequences of an accident.

(b) Events may include cases of procedural error, equipment failure, and discovery of a design, analysis, fabrication, construction, or procedural inadequacy. However, licensees are not required to report an event, if the event results from:

- (i) A shared dependency among trains or channels that is a natural or expected consequence of the approved plant design; or
- (ii) Normal and expected wear or degradation.

(8) Any event that posed an actual threat to the safety of the NPP or significantly hampered site personnel in the performance of duties necessary for the safe operation of the NPP including fires, toxic gas releases, or radioactive releases.

23. **Contents of the LER.**—The LER shall contain:

(1) A brief abstract describing the major occurrences during the event, including all component or system failures that contributed to the event and significant corrective action taken or planned to prevent recurrence.

(2) (a) A clear, specific, narrative description of what occurred so that knowledgeable readers conversant with the design of commercial NPPs, but not familiar with the details of a particular plant, can understand the complete event.

(b) The narrative description shall include the following specific information as appropriate for the particular event:

- (i) Plant operating conditions before the event;
- (ii) Status of structures, components, or systems that were inoperable at the start of the event and that contributed to the event including any reasons;
- (iii) Dates and approximate times of occurrences;
- (iv) The cause of each component or system failure or personal error, if known;
- (v) The failure mode, mechanism, and effect of each failed component, if known;
- (vi) For failures of components with multiple functions, include a list of systems or secondary functions that were also affected;
- (vii) For failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from the discovery of the failure until the train was returned to service;
- (viii) The method of discovery of each component or system failure or procedural error;
- (ix) For each human performance related root cause, the licensee shall discuss the causes and circumstances;
- (x) Automatically and manually initiated safety system responses; and
- (xi) The manufacturer and model number and any other identification of each component that failed during the event.

(3) An assessment of the safety consequences and implications of the event. This assessment shall include:

- (a) The availability of systems or components that could have performed the same function as the components and systems that failed during the event; and
- (b) For events that occurred when the reactor was shutdown, the availability of systems or components that are needed to shutdown the reactor and maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident.

(4) A description of any corrective actions planned as a result of the event, including those to reduce the probability of similar events occurring in the future.

(5) Reference to any previous similar events at the same plant that are known to the licensee.

(6) The name and telephone number of a person within the licensee's organization who is knowledgeable about the event or involved in the investigation process of the event and can provide additional information concerning the event and the plant's characteristics.

#### OPERATIONAL SAFETY PROGRAMS

24. **Emergency Preparedness.**—(1) The licensee shall develop an emergency plan and shall establish the necessary organizational structure, with assigned responsibilities for managing emergencies, and shall contribute to the development of off-site emergency procedures. The emergency plan shall meet requirements of the Regulations on Management of a Nuclear or Radiological Emergency - (PAK/914).

(2) Emergency arrangements shall cover the capability of maintaining protection and safety in the event of an accident; mitigating the consequences of accidents if they do occur; protection of site personnel and the public; protection of the environment; coordinating response organizations, as appropriate; and communicating with the public in a timely manner. Emergency arrangements shall include arrangements for: the prompt declaration of an emergency; timely notification and alerting of response personnel; assessment of the progress of the emergency, its consequences and any measures that need to be taken on the site; and the necessary provision of information to the authorities. Appropriate arrangements 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 completed before the commencement of fuel loading.

(3) The emergency plan shall cover all activities under the responsibility of the licensee and it shall be adhered to in the event of an emergency. The emergency plan shall include arrangements for emergencies involving a combination of non-radiological and radiological hazards, such as a fire in conjunction with significant levels of radiation or contamination, or toxic or asphyxiating gases in conjunction with radiation or contamination, with account taken of specific site conditions. Preparation of the emergency plan shall be coordinated with those bodies having responsibilities in an emergency, including public authorities, as relevant, and the plan shall be submitted to the Authority for approval. The plan shall be subject to review and updating in the light of experience gained.

(4) A training program for emergencies shall be established and implemented to ensure that plant staff and, as required, staff from other participating organizations possess the essential knowledge, skills and attitudes required for the accomplishment of non-routine tasks under stressful emergency conditions.

(5) 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 plant staff and staff from external response organizations to perform their tasks, and to evaluate their cooperation in coping with an emergency and in improving the efficiency of the response.

(6) Facilities, instruments, tools, equipment, documentation and communication systems to be used in an emergency, including those needed for off-site communication and for the accident management program, shall be kept available. They shall be maintained in operational condition in such a manner that they are unlikely to be affected by, or made unavailable by, accidents. The plant management shall ensure that relevant information on safety parameters is available in the emergency response facilities and locations, as appropriate, and that communication between the control rooms and these facilities and locations is effective in the event of an accident. These capabilities shall be tested periodically.

**25. Accident Management Program.**—(1) The licensee shall establish an accident management program which shall be periodically reviewed and revised, if necessary. An accident management program shall include the preparatory measures, procedures and guidelines, and equipment that are necessary for preventing the progression of accidents, including accidents more severe than design basis accidents, and for mitigating their consequences.

(2) For a multi-unit NPP site, concurrent accidents affecting all units shall be considered in the accident management program. 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 program.

(3) The accident management program shall include instructions for the utilization of available equipment (safety related equipment as far as possible, but also items not important to safety).

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

(5) The accident management program shall include the technical and administrative measures necessary to mitigate the consequences of an accident.

(6) The accident management program shall include training necessary for implementation of the program.

(7) In developing the accident management program and its procedures, the possibility of degradation of the following shall be taken into account to ensure that actions expected for accident management are feasible and taken in a timely and reliable manner:

- (a) Regional infrastructure;
- (b) Working conditions, e.g. elevated radiation levels, elevated temperatures, lack of lighting, limited access to the plant from off the site, for operating personnel; and
- (c) Operating conditions for equipment.

(8) Arrangements for accident management shall provide the operating personnel with appropriate competence, systems and technical support. These arrangements and guidance shall be available before the initial fuel loading, shall be validated and shall then be periodically tested as far as practicable in exercises and used in training and drills. In addition, arrangements shall be made, as part of the accident management program and emergency plan, to expand the emergency response arrangements, where necessary, to include the responsibility for long term actions.

**26. Radiation Protection.**—(1) The licensee shall establish and implement a radiation protection program to ensure that, for all operational states, doses due to exposure to ionizing radiation at the plant or due to any planned radioactive releases (discharges) from the plant are kept below authorized limits and be as low as reasonably achievable. This program shall meet requirements of the Regulations on Radiation Protection - (PAK/904). The licensee shall verify, by means of surveillance, inspections and audits, that the radiation protection program is being properly implemented and that its objectives are being met, and shall undertake corrective actions if necessary. The program shall be reviewed periodically and updated if required in the light of experience and submitted to the Authority for approval.

(2) The radiation protection program shall ensure control over radiation dose rates for exposures due to activities in areas where there is radiation arising from or passing through structures, systems and components, such as in inspection, maintenance and fuel handling. It also addresses plant chemistry activities as well as exposures due to radioactivity of substances in the fuel coolant, liquid or gas, and associated fluids. The program shall make arrangements to maintain these doses as low as reasonably achievable.

(3) The program shall be based on a prior assessment and shall cover but not limited to the following:

- (a) Classification of areas and access control, including local information on actual dose rates and contamination levels;
- (b) Co-operation in establishing operating and maintenance procedures when radiological hazards are anticipated, and providing direct assistance when required;
- (c) Instrumentation and equipment for monitoring;
- (d) Equipment for personal protection;
- (e) On-site radiological monitoring and surveys;
- (f) Decontamination of personnel, equipment and structures; and
- (g) Environmental radiological surveillance and monitoring.

(4) The radiation protection function of the licensee shall have sufficient independence and resources to be able to enforce and to advice on radiation protection regulations, standards and procedures, and safe working practices.

(5) The implementation of the radiation protection program shall be ensured by the appointment of a qualified Radiation Protection Officer (RPO) or Station Health Physicist (SHP) as per criteria mentioned in Regulation 44 of these regulations. He shall advise the plant management and shall have the authority to participate in establishing and enforcing the radiation protection program.

(6) All site personnel shall understand and acknowledge their individual responsibility for putting into practice the exposure control measures that are specified in the radiation protection program. Consequently, particular emphasis shall be given to training of these site personnel so that they are aware of radiological hazards and of necessary protective measures.

(7) All site personnel, including contractors, who are working in a controlled area or who are regularly present in a supervised area, shall have their occupational exposures assessed in accordance with the regulatory requirements. Dose records shall be kept and made available to site personnel, on demand, and to the Authority.

(8) The radiation protection program shall include health surveillance of site personnel who may be occupationally exposed to radiation to ascertain their physical fitness and for giving advice in case of accidental overexposures. This health surveillance shall consist of a preliminary medical examination followed by periodic checkups.

**27. Radioactive Waste Management.**—(1) The licensee shall establish and implement a program for the management of radioactive waste in accordance with the Regulations on Radioactive Waste Management - (PAK/915). Adequate operating practices shall be implemented to ensure that the generation of radioactive waste is kept to the minimum practicable in terms of both activity and volume.

(2) The program 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 for the predisposal management of radioactive waste. Records shall be maintained for waste generation and waste classification, as well as for the processing, storage and disposal of waste.

(3) The plant management shall establish and implement procedures consistent with PNRA Regulations and license conditions for the monitoring and control of discharges of radioactive effluents. The volume and activity of radioactive discharges to the environment shall be reported periodically to the Authority.



(4) The licensee shall establish and implement a program for monitoring the environment in the vicinity of the plant site, to assess the radiological consequences of any radioactive releases to the environment. The results from this environmental monitoring shall be made available to the public and in particular to the public living in the vicinity of the plant site.

28. **Fire Safety.**—(1) The arrangements for ensuring fire safety made by the plant management shall consist of adequate management for fire safety; preventing fires from starting; detecting and extinguishing quickly any fires that do start; preventing the spread of those fires that have not been extinguished; and providing protection from fire for structures, systems and components that are necessary to shutdown the plant safely. Such arrangements shall include, but are not limited to:

- (a) Application of the principle of defence in depth;
- (b) Control of combustible materials and ignition sources, in particular during outages;
- (c) Inspection, maintenance and testing of fire protection measures;
- (d) Establishment of a manual firefighting capability;
- (e) Assignment of responsibilities and training of plant personnel; and
- (f) Assessment of the impact of plant modifications on fire safety measures.

(2) A comprehensive fire hazard analysis shall be developed for the plant and shall be periodically reviewed and, if necessary, updated.

(3) In the arrangements for firefighting, special attention shall be paid to cases 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 and the management of releases to the environment.

(4) The plant management shall be responsible for ensuring that appropriate procedures, equipment and staff are in place for effectively coordinating and cooperating with all firefighting services involved. Periodic joint fire drills and exercises shall be conducted to assess the effectiveness of the fire response capability.

(5) Fire protection systems and firefighting systems shall be designed to ensure that damage to, or inadvertent operation of, these systems do not significantly

impair the capabilities of the structures, systems and components necessary for safe shutdown.

**29. Physical Protection.**—(1) The licensee shall establish and implement a physical protection program in accordance with the Regulations on Physical Protection of Nuclear Material and Nuclear Installations - (PAK/925). The licensee shall take measures to prevent or deter unauthorized access to, intrusion into, theft of, surface attack on and internal or external sabotage of safety related systems and nuclear materials. The licensee shall be responsible for managing and implementing the requirements by ensuring close cooperation among relevant managers, with the objective of minimizing risk. Safety and physical protection measures shall be designed and implemented in a manner that they do not compromise each other. The licensee shall establish mechanisms to resolve potential conflicts and to manage safety and physical protection interfaces.

(2) All reasonable precautions shall be taken to prevent individuals from deliberately carrying out unauthorized actions that could jeopardize safety.

**30. Non-Radiation Related Safety Program.**—(1) The plant management shall establish and implement a program to ensure that safety related risks associated with non-radiation related hazards to personnel involved in activities at the plant are kept as low as reasonably achievable.

(2) The non-radiation related safety program 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 and radiation safety program. All personnel, suppliers, contractors and visitors (where appropriate) shall be trained and shall have the necessary knowledge of the non-radiation related safety program and its interface with the nuclear and radiation safety program, and shall comply with its safety rules and practices. The licensee shall provide support, guidance and assistance for plant personnel in the area of non-radiation related hazards.

**31. Equipment Qualification.**—(1) The plant management shall ensure that a systematic assessment is carried out to provide reliable confirmation that safety related items are capable of required performance for all operational states and for accident conditions. Effective and practicable methods shall be used to upgrade and preserve equipment qualification.

(2) The licensee shall establish and implement equipment qualification program to confirm and maintain required equipment qualification throughout the design life of the plant including initial phases of design, supply and installation of the equipment. The effectiveness of equipment qualification programs shall be periodically reviewed.

(3) The scope and details of the equipment qualification process, in terms of required inspection areas, methods of non-destructive testing, possible defects inspected for, and required effectiveness of inspection, shall be documented and submitted to the Authority for review and approval. Relevant national and international experience shall also be taken into account.

**32. Feedback of Operating Experience.**—(1) The licensee shall establish an operating experience feedback program to learn from events at the plant and events in the nuclear industry and other industries worldwide.

(2) This program shall cover reporting, collection, screening, analyzing, trending, documenting and communicating operating experience at the plant in a systematic way. The licensee shall obtain and evaluate available information on relevant operating experience at other plants to draw and incorporate lessons for its own operations including its emergency arrangements. It shall also encourage the exchange of experience within national and international systems for the feedback of operating experience. Relevant lessons from other industries shall also be taken into consideration, as necessary. The operating experience program shall be periodically evaluated to determine its effectiveness and to identify necessary improvements.

(3) Events with safety implications shall be investigated in accordance with their actual or potential significance. Events with significant implications for safety shall be investigated to identify their direct and root causes, including causes relating to equipment design, operation, maintenance or human and organizational factors. The results of such investigations shall be included as appropriate in relevant training programs and shall be used in reviewing procedures and instructions. Plant event reports and non-radiation related accident reports shall identify tasks for which inadequate training may be contributing to equipment damage, excessive unavailability of equipment, the need for unscheduled maintenance work, the need for repetition of work, unsafe practices or lack of adherence to approved procedures.

(4) Operating experience shall be carefully examined by designated competent individuals for any precursors to, or trends in, adverse conditions for safety, so that necessary corrective actions can be taken before serious conditions arise.

(5) As a result of the investigation of events, clear recommendations shall be developed for the responsible managers, who shall take appropriate corrective action in due time to avoid any recurrence of the events. Corrective actions shall be prioritized, scheduled, and effectively implemented and shall be reviewed for their effectiveness. Operating personnel shall be briefed on events of relevance and shall take the necessary corrective actions to make their recurrence less likely.

(6) The licensee or plant management, as the case may be, shall be responsible for instilling an attitude 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.

(7) The licensee or plant management, as the case may be, shall maintain liaison as appropriate with the support organizations (manufacturer, research organization, and designer) involved in the design, construction, commissioning and operation of the plant with the aim of sharing back information on operating experience and obtaining advice, if necessary, in the event of equipment failures or other events.

(8) Data on operating experience shall be collected and retained for use as input for the management of plant aging, for the evaluation of residual plant life, and for Probabilistic Safety Assessment (PSA) and PSR.

#### COMMISSIONING OF THE PLANT

33. **Commissioning Program.**—(1) The licensee shall ensure that a commissioning program for the plant is established and implemented. The commissioning program for the plant shall cover the full range of plant conditions required in the design and the safety case. The results shall be used to demonstrate that the behavior of the plant as built is in compliance with the design assumptions and the license conditions. Special attention shall be paid to ensuring that no commissioning tests are performed that might place the plant in an unanalyzed condition. Commissioning stages, test objectives and acceptance criteria shall be specified in such a way that the program is auditable.

(2) The commissioning program shall provide the licensee and the Authority with the means of identifying hold points during the commissioning process at which approval may be required prior to proceeding to the next stage of the commissioning program.

(3) The commissioning program shall be divided into stages. A review of the test results for each stage shall be completed before commissioning is continued to the next stage. On the basis of review, a judgment shall be made on whether the commissioning program can proceed to the next stage. Judgments shall also be made on the basis of the review on whether the succeeding stages will be modified as a consequence of the test results, or because some tests in the stage had not been undertaken, or some tests had been undertaken but had not been completed. The results for some stages are subject to approval by the Authority before commissioning can proceed to the next stage.

(4) The commissioning program shall include all the tests necessary to demonstrate that the plant as built and as installed meets the requirements of the SAR and satisfies the design intent, and consequently the plant can be safely operated in accordance with the OLCs.

(5) Operating and maintenance procedures shall be validated to the extent practicable as part of the commissioning program, with the participation of future operating personnel.

(6) Suitably qualified operations personnel shall be directly involved in the commissioning process. Operating personnel and plant technical staff shall be involved in the commissioning process to the extent necessary to ensure proper preparation for the operational phase.

(7) The commissioning program shall be sufficiently comprehensive to provide reference data to characterize structures, systems and components. Such reference data shall be retained as they are important for ensuring the safety of the plant and for subsequent safety reviews.

(8) All the functions of the licensee shall be performed at the appropriate stages during commissioning. These functions shall include discharging responsibilities for management, training of personnel, radiation protection, waste management, management of records, fire safety, physical protection and emergency preparedness and response.

(9) Operating procedures and 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. Verification and validation of procedures shall be performed to confirm their applicability and quality, and to the extent possible shall be performed prior to fuel handling operations on site. This process shall continue during the commissioning phase. Verification and validation shall also be carried out for procedures for overall operation.

(10) Reviewed and approved arrangements by the licensee for work control, modification control and plant configuration control shall be in place from the commencement of commissioning to meet the conditions of the commissioning tests.

(11) To confirm that the plant is prepared for the initial core loading, prerequisites for systems, equipment, documentation and personnel shall be established well in advance of the fuel loading. These prerequisites shall be based on the SAR and applicable regulatory requirements.

(12) Initial fuel loading shall not be authorized until all relevant pre-operational tests have been performed and the results have been accepted by the licensee and the Authority. 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 licensee and the Authority, as appropriate. The tests of the commissioning program shall be successfully completed as necessary condition for authorization, as appropriate, for operation of the plant to be commenced.

(13) The licensee shall ensure that interfaces and the communication lines among different groups (i.e. for design, construction, contractors, commissioning and operations) shall be clearly specified and controlled.

(14) Authorities and responsibilities shall be clearly specified and shall be delegated to the individuals and groups performing the commissioning activities. The licensee shall be responsible for ensuring that construction activities are of appropriate quality, and that completion data on commissioning activities and comprehensive baseline data, documentation or information are provided. The licensee shall also be responsible for ensuring that the equipment supplied is manufactured under a quality assurance program that includes inspection for proper fabrication, cleanliness, calibration and verification of operability.

(15) During construction and commissioning, the plant shall be monitored, preserved and maintained so as to protect plant equipment, to support the testing stage and to maintain consistency with the SAR.

(16) During construction and commissioning, a comparison shall be carried out between the plant as built and its design parameters.

#### OPERATION OF THE PLANT

**34. Operating Instructions and Procedures.**—(1) Operating instructions and procedures shall be developed for normal operation, anticipated operational occurrences and accident conditions, in accordance with the regulatory requirements and policy of the licensee. The level of detail for a particular procedure shall be appropriate for the purpose of that procedure. The guidance provided in the procedures shall be clear, concise, and as far as possible verified and validated. The procedures and reference material shall be clearly identified and readily accessible in the control room and other operating locations, if necessary, and shall be made available to the Authority, if required. Strict adherence to the operating procedures shall be an essential element of safety policy at the plant.

(2) Procedures shall be developed for normal operation to ensure that the plant is operated within the OLCs.

(3) Procedures shall be developed and validated for use in the event of anticipated operational occurrences and design basis accidents. Guidelines or procedures shall be developed for the management of accidents more severe than the design basis accidents. Both event based approaches and symptom based approaches shall be used, as appropriate. The related analysis and justifications shall be documented.

(4) Operating procedures and supporting documentation shall be issued under controlled conditions 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. Any revision of these documents shall be known by the operating personnel and other holders of the documents. All instructions and procedures and their revisions shall be made available to the Authority, if required.

(5) Responsibilities and lines of communication for operating instructions shall clearly be set out in writing for situations in which the operating personnel discover that the status or conditions of plant systems or equipment are not in accordance with operating procedures. The control system for operating instructions shall prevent the use of unauthorized operating instructions and of any other unauthorized materials such as labels or instructions of any kind on the equipment, local panels, boards and measurement devices within the work areas. The control system for operating instructions shall be used to ensure that these contain correct information and that they are updated, periodically reviewed and approved.

(6) A clear operating policy shall be maintained to minimize the use of, and reliance on, temporary operating instructions. Where appropriate, temporary operating instructions shall be made into permanent plant features or shall be incorporated into plant procedures.

**35. Operation Control Rooms and Control Equipment.—**(1) The plant management shall ensure that the operation control rooms and control equipment are maintained in suitable condition.

(2) The habitability and condition of control rooms shall be maintained. Where the design of the plant foresees additional or local control rooms, which are dedicated to the control of processes that could affect plant conditions, clear communication lines shall be developed for ensuring an adequate transfer of information to the operators in the main control room.

(3) The emergency control room and the shutdown panel and all other safety related operational panels outside the control room shall be kept operable and free from obstructions as well as from nonessential material that would prevent

their immediate operation. The plant management shall periodically confirm that the emergency control room or the shutdown panel and all other safety related operational panels are in the proper state of operational readiness, including proper documentation, communications, alarm systems and habitability.

(4) The alarms in the main control room shall be managed as an important feature in operating a plant safely. The plant information system shall be such that off-normal conditions are easily recognizable by the operators. Control room alarms shall be clearly prioritized. The number of alarms, including alarm messages from process computers, shall be minimized for any analyzed operational state, outage or accident condition of the plant. The plant management shall establish procedures for operators to manage the response to alarms.

**36. Material Conditions and Housekeeping.**—(1) The plant management shall develop and implement programs to maintain high standard of material conditions, housekeeping and cleanliness in all working areas.

(2) 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. Equipment that is degraded shall be identified, reported and corrected in a timely manner.

(3) An exclusion program 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.

(4) The plant management shall be responsible for ensuring that the identification and labeling of safety equipment and safety related equipment, rooms, piping, and instruments are accurate, legible and well maintained, and that they do not cause any degradation.

**37. Chemistry Program.**—(1) The plant management shall establish and implement a chemistry program to provide the necessary support for chemistry and radiochemistry control.

(2) The chemistry program shall be developed prior to normal operation and shall be in place during the commissioning phase. The chemistry program shall provide the necessary information and assistance for ensuring safe operation, long term integrity of structures, systems and components, and minimization of radiation levels.

(3) Chemistry surveillance shall be conducted at the plant to verify the effectiveness of chemistry control in plant systems and to verify that structures,



systems and components important to safety are operated within the specified chemical limit values.

(4) The chemistry program shall include chemistry monitoring and data acquisition systems. These systems, together with laboratory analyses, shall provide accurate measuring and recording of chemistry data and shall provide alarms for relevant chemistry parameters. Records shall be kept available and shall be easily retrievable.

(5) Laboratory monitoring shall involve the sampling and analysis of plant systems for specific chemical parameters, concentrations of dissolved and suspended impurities, and radionuclide concentrations.

(6) The use of chemicals in the plant, including chemicals brought in by contractors, shall be kept under close control. The appropriate control measures shall be put in place to ensure that the use of chemical substances and reagents does not adversely affect equipment or lead to its degradation.

**38. Core Management and Fuel Handling.**—(1) The licensee shall be responsible and shall make arrangements for all activities associated with core management and with on-site fuel handling. Provisions shall be made to ensure that only fuel that has been appropriately manufactured is loaded into the core and that in each reactor only such fuel is loaded whose design and enrichment have been approved by the Authority for use with that reactor. The same requirements shall be applied before the introduction of fuel of a new design or of a modified design into the core.

(2) The licensee shall be responsible for the development of the specifications and procedures for the procurement, verification, receipt, accounting and control, loading, utilization, relocation, unloading and testing of fuel and core components. A fuelling program shall be established in accordance with the design assumptions. After the refueling, the licensee shall confirm by means of calculations and measurements that the performance of the core meets the safety criteria. The licensee shall also confirm that all core alterations comply with approved configurations. After batch refueling, tests shall be performed before and during startup to confirm that the core performance meets the design intent as given in Schedule I of these regulations.

(3) A comprehensive core monitoring program shall be established to ensure that core parameters are monitored, analyzed for trends and evaluated to detect abnormal behaviour; to ensure that actual core performance is consistent with core design requirements; and to ensure that the values of key operating parameters are recorded and retained in a logical, consistent and retrievable manner.

(4) The licensee shall be responsible for establishing a safe reactivity management program under the management system. Decisions and planning on evaluation, conduct and control of all operations or modifications involving the fuel, that are liable to affect reactivity control, shall be undertaken by using approved procedures and respecting predefined operational limits for the core.

(5) Reactivity manipulations shall be made in a deliberate and carefully controlled manner to ensure that the reactor is maintained within prescribed OLCs, and that the desired response is achieved.

(6) The operating procedures for reactor startup, power operation, shut down and refueling shall include the precautions and limitations necessary to maintain fuel integrity and to comply with the OLCs throughout the lifetime of the fuel.

(7) Radiochemistry data that are indicative of fuel cladding integrity shall be systematically monitored and analyzed for trends so as to be able to monitor whether fuel cladding integrity is maintained in all operating conditions.

(8) 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 locations, the probable root causes and the necessary corrective actions.

(9) For fuel and core components, handling procedures shall be developed to ensure the controlled movement of un-irradiated and irradiated fuel, proper storage on the site and preparation for transport from the site.

(10) Before any fuel handling takes place, the plant management 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 the approved procedures. Access to fuel storage areas shall be limited to authorized personnel only.

(11) Detailed auditable accounts shall be maintained as required for the storage, irradiation and movement of all fissile material, including un-irradiated and irradiated fuel.

(12) The packaging, carriage and transport of un-irradiated and irradiated fuel shall be carried out in accordance with the Regulations for Safe Transport of Radioactive Material - (PAK/916).

(13) Details of regulatory submissions regarding refueling outage and long shutdown have been provided in Schedule I and Schedule II respectively.

**39. Periodic Safety Review (PSR).**—(1) Systematic safety assessments of the plant shall be performed by the plant management throughout its operational lifetime, with due account taken of operating experience and significant new safety information from all relevant sources. PSR shall be aimed at ensuring a high level of safety throughout the operating lifetime of the plant. The strategy for review and safety factors to be evaluated shall be approved by the Authority.

(2) It shall be determined by means of the PSR to what extent the existing SAR remains valid. The PSR shall, at least, take into account; the plant design, actual conditions of systems, structures and components important to safety, equipment qualification, ageing, deterministic safety analysis, PSA, hazard analysis, safety performance, use of experience from other plants and research findings, organization, the management system and safety culture, procedures, human factors, emergency planning, radiological impact on the environment, any other aspect, and global assessment.

(3) The scope of the PSR shall include all safety aspects of an operating plant, including both on-site and off-site emergency planning, accident management and radiation protection aspects.

(4) In order to complement the deterministic assessment, use of PSA shall be made for input to the PSR to provide insight into the relative contributions to safety of different aspects of the plant.

(5) The plant management shall report to the Authority in a timely manner, the confirmed findings of the safety review that have implications for safety.

(6) On the basis of results of systematic safety assessment, the plant management shall implement necessary corrective actions and reasonably practical modifications for compliance with the applicable standards with the aim of enhancing safety of the plant by further reducing the likelihood and potential consequences of accidents.

(7) The licensee shall submit progress report on status of implementation of corrective actions generated as a result of PSR according to the frequency mutually agreed with the Authority. The report shall at least consist of the following information:

- (a) Total number of actions with titles;
- (b) Completed actions;
- (c) Progress on implementation on actions in comparison with target dates;

- (d) Reason for delay in corrective actions (if any) and measures taken to address these reasons;
- (e) Implications of delayed actions on plant safe operation; and
- (f) Alternative measures taken in connection with delayed corrective actions to ensure plant safety.

#### MAINTENANCE, TESTING, SURVEILLANCE AND INSPECTION

**40. Maintenance, Testing, Surveillance and Inspection of Structures, Systems and Components.**—(1) The plant management shall ensure that effective programs for maintenance, testing, surveillance and inspection of structures, systems and components are established and implemented. These programs shall be in place prior to fuel loading. These shall take into account OLCs as well as any other applicable regulatory requirements and shall be re-evaluated at a frequency so specified. The scope of the program shall include safety and those non-safety structures, systems, and components;

- (a) That are relied upon to mitigate accidents or transients or used in Emergency Operating Procedures (EOPs); or
- (b) Whose failure could prevent safety structures, systems, and components from fulfilling their safety function; or
- (c) Whose failure could cause a reactor scram or actuation of a safety system.

(2) The maintenance, testing, surveillance and inspection of all plant structures, systems and components important to safety shall be to such a standard and at such a frequency as to ensure that their levels of reliability and effectiveness remain in accordance with the assumptions and intent of the design throughout the service life of the plant.

(3) The program shall include periodic inspections or tests of systems, structures and components important to safety in order to demonstrate their reliability and to determine whether these are acceptable for continued safe operation of the plant or whether any remedial measures are necessary.

(4) The plant management shall develop procedures for all maintenance, testing, surveillance and inspection tasks. These procedures shall be prepared, reviewed, modified when required, validated, approved and distributed in accordance with established administrative procedures.

(5) Data on maintenance, testing, surveillance and inspection shall be recorded, stored and analyzed to confirm that operating performance is in accordance with design intent and with requirements for equipment reliability and availability.

(6) The frequency of preventive and predictive 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 structures, systems and components with insights from PSA taken into account;
- (b) Their reliability and availability for operation;
- (c) Their assessed potential for degradation in operation and their aging characteristics;
- (d) Operational experience; and
- (e) Vendors' recommendations.

(7) A comprehensive and structured approach to identifying failure scenarios shall be taken to ensure proper management of maintenance activities using methods of PSA as appropriate.

(8) New approaches that could result in significant changes to current strategies for maintenance, testing, surveillance and inspection shall be taken only after careful consideration of the implications for safety and after appropriate authorization as required.

(9) A comprehensive work planning and control system shall be implemented to ensure that maintenance, testing, surveillance and inspection work is properly authorized and is carried out in accordance with established procedures.

(10) An adequate work control system shall be established for the protection and safety of personnel and for the protection of equipment during maintenance, testing, surveillance and inspection. Pertinent information shall be transferred at shift turnovers and at pre-job and post-job briefings on maintenance, testing, surveillance and inspection.

(11) The work control system shall ensure that plant equipment is only released from service for maintenance, testing, surveillance or inspection with the authorization of designated operating personnel and in compliance with the OLCs. The work control system shall also ensure that permission to return equipment to

service following maintenance, testing, surveillance and inspection is given by the operating personnel. Such permission shall be given only after the confirmation that the new plant configuration is within the established OLCs, where appropriate, and after performing functional tests.

(12) Coordination shall be maintained between different maintenance groups (e.g. maintenance groups for mechanical, electrical, instrumentation & control, and civil). Coordination shall also be made among maintenance, operations and support groups (e.g. groups for fire protection, radiation protection, physical protection and non-radiation related safety). The plant management shall make arrangements with the external grid operators to ensure that appropriate procedures are applied in maintaining the connections of the plant to the external grid.

(13) A management system for managing and correcting deficiencies shall be established and used to ensure that operating personnel are not over burdened. This system shall also ensure that safety at the plant is not compromised by the cumulative effects of these deficiencies.

(14) The plant management shall ensure that maintenance work during power operation is carried out with adequate defence in depth. PSA shall be used, as appropriate, to demonstrate that the risks are not significantly increased.

(15) The plant management shall establish maintenance programs for non-permanent equipment to be used for accidents more severe than design basis accidents, in order to maintain high reliability of this equipment. The plant management shall carry out periodic training and exercises in handling the equipment and connecting it to the NPP

(16) Corrective maintenance of structures, systems and components shall be performed as promptly as practicable and in compliance with OLCs. Priorities shall be established with account taken first of the relative importance to safety of the defective structure, system or component.

(17) Arrangements shall be made to procure, receive, control, store and issue materials (including supplies), spare parts and components. The plant management shall be responsible to implement these arrangements and to ensure that the characteristics of such materials (including supplies), spare parts and components are consistent with the applicable safety standards and with the plant design.

(18) The plant management shall ensure that storage conditions are adequate and that materials (including supplies), spare parts and components are available and are in proper condition for use.

41. **Outage Management.**—(1) The plant management shall establish and implement arrangements to ensure the effective performance, planning and control of work activities during outages.

(2) Outage planning shall be a continually improving process involving past, present, scheduled and future outages. Reference points shall be determined and used to track pre-outage work.

(3) In the processes for planning and performing outage activities, priority shall be given to safety related considerations. Special attention shall be given to maintain the plant configuration in accordance with the OLCs.

(4) The plant management shall be responsible for issuing programs and procedures for outage management, and for the provision of adequate resources for ensuring safety during shutdown operations.

(5) The tasks, authorities and responsibilities of the groups and personnel involved in preparing, conducting or assessing outage schedules and activities shall be established and followed by all the plant personnel and contractors.

(6) The interfaces among 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.

(7) Optimization of radiation protection and non-radiation related safety, waste reduction, and control of chemical hazards shall be essential elements of outage programs and planning, and this shall be clearly communicated to relevant plant personnel and contractors.

(8) A comprehensive review shall be performed after each outage to determine lessons learnt.

#### PREPARATION FOR DECOMMISSIONING

42. **Preparation for Decommissioning.**—(1) The licensee shall prepare a decommissioning plan as per requirements of the Regulations on Decommissioning of Facilities Using Radioactive Material - (PAK/930) 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.

(2) The decommissioning plan shall be updated in accordance with the regulatory requirements, modifications to the plant, advances in technology, changes in the need for decommissioning activities and changes in national policies.

(3) A human resource program shall be developed for ensuring that sufficient motivated and qualified personnel are available for the safe operation of the plant up to final shutdown, for conducting activities in a safe manner during the preparatory period for decommissioning, and for safely carrying out the decommissioning of the plant.

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

(5) For a multiple unit plant, appropriate measures shall be put in place to ensure that common systems and common equipment remained fully available to support the safe operation of all the generating units.

(6) The licensee shall be aware, over the operating lifetime of the plant, of the needs in relation to future decommissioning. Experience and knowledge 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 of decommissioning. Complete and reviewed information shall be compiled to be transferred to the organization responsible for managing the decommissioning phase.

(7) The implications for safety of the 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.

#### CRITERIA FOR APPOINTMENT OF SPECIFIC POSITIONS AT PLANT

**43. Criteria for Appointment of Individual Responsible for Safety of a Nuclear Power Plant.**—(1) The licensee shall appoint an individual responsible for the safety of the plant with assurance of required qualities of his safety leadership and conservative decision making so as to implement effective policies that give due priority to safety.

(2) The individual shall have an overall power plant experience of about twenty five (25) years, including a minimum of fifteen (15) years experience at an NPP and proven managerial and administrative skills.

(3) The individual shall have worked as a licensed SS at the NPP or have participated in commissioning of the NPP or of an NPP of similar design.

OR



The individual shall have deputy, who have worked as a licensed SS at the NPP or have participated in commissioning of the NPP or of an NPP of similar design. In the absence of deputy, the senior most licensed SS shall officiate.

(4) The individual shall have knowledge and skills in all areas of nuclear safety, particularly in the following:

- (a) Legislative and regulatory regime;
- (b) Safety and security culture;
- (c) Problem analysis and conservative decision making;
- (d) Radiological safety;
- (e) Emergency plan and procedures;
- (f) Interpersonal and departmental communication; and
- (g) Administrative policies and procedures.

(5) The licensee shall inform the Authority of the appointment of the individual addressing all the above criteria before or at the time of appointment.

**44. Criteria for Appointment of RPO or SHP.**—(1) The licensee or plant management shall designate an RPO or SHP, as the case may be, meeting the qualification criteria as given below:

- (a) A graduate in engineering or masters in basic science or bachelor in basic science four (4) years with a minimum of six (6) years related experience which shall include four (4) years at an NPP in supervision of radiation protection, monitoring and control measures and familiar with radiation protection documentation.

OR

Masters in Nuclear Engineering or Nuclear Power Engineering or Medical Physics or Radiation Physics with a minimum of four (4) years related experience which shall include two (2) years at an NPP in supervision of radiation protection, monitoring and control measures and familiar with radiation protection documentation.

- (b) In addition to the above mentioned qualification requirements, he shall be:

- (i) Familiar with the regulatory requirements, policies, principles, plans, procedures and practices related to nuclear safety, radiation protection, emergency preparedness and response, environmental monitoring, and industrial safety;
- (ii) Familiar with the testing and maintenance requirements for radiation protection, emergency preparedness and response, and environmental monitoring infrastructure including systems and components etc.;
- (iii) Capable of performing his role in routine and emergency situations;
- (iv) Capable of coordination with off-site organizations and authorities for development and effective implementation of various plans of the plant;
- (v) Familiar with the mechanism of reporting the incidents significant to safety, emergency, and physical protection, to the Authority in accordance with the relevant national regulations; and
- (vi) Possessing good interpersonal and communication skills.

(2) The licensee shall inform the Authority of the appointment of the individual meeting the above criteria before or at the time of his employment.

#### CRITERIA AND PROCESS FOR LICENSING OF OPERATING PERSONNEL

45. **Criteria for Obtaining SS License.**—(1) All SS licenses shall be issued under the authority of the Chairman by an officer designated, for this purpose, on his behalf.

(2) Each applicant is required to undergo in-class and field training, to be arranged by the licensee or plant management, as the case may be. After successful completion of in-class and field training, and acquiring the prescribed minimum experience as per Regulation 45(3) below, the candidate shall become eligible to appear in the licensing examination.

(3) <sup>1</sup>Eligibility Criteria:

~~(a) The candidate shall possess SE license of the plant;~~

~~(b) The candidate shall have acquired a minimum of one (1) year in shift experience after the award of SE license at the plant. This experience may also include participation in commissioning at the plant;~~

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<sup>1</sup> Substituted by SRO 813(I)/2025 dated May 16, 2025.

- ~~(c) The candidate shall qualify the written, oral and operating examinations as per Regulation 45 (4 and 5) below;~~
  - ~~(d) In addition to above, a candidate having SE license at one plant and intends to appear for SS license at other plant of the same type with major design differences shall have:~~
    - ~~(i) Minimum of one (1) year work experience in operations division which may include experience in installation and commissioning at the new type or design, as the case may be, of plant. This experience may include participation in cold and hot functional tests (without nuclear fuel in the reactor); and~~
    - ~~(ii) Acquired training on Full Scope Training Simulator (FSTS) of the plant for handling operational states and accident conditions, etc.~~
  - ~~(e) Eligibility criteria for candidate having SE license at one plant and intends to appear for SS license at other plant of the same type with minor design differences shall be as follows:~~
    - ~~(i) The candidate shall possess SE license at the plant of the same type and shall have acquired a minimum of one (1) year shift experience after the award of SE license;~~
    - ~~(ii) The candidate shall have acquired training on FSTS of the plant for handling operational states and accident conditions etc.;~~
    - ~~(iii) The candidate shall have undergone additional training comprising on design differences; and~~
    - ~~(iv) The candidate shall have qualified the written, oral and operating examinations as per Regulation 45 (4 and 5) below.~~
- (a) The candidate possessing SE license of a plant and intends to appear for SS license of the same plant shall be required to:
- (i) acquire a minimum of three (03) years of shift experience at the plant after the award of SE license; and
  - (ii) qualify initial assessment as per Regulation 45 (4).
- (b) The candidate possessing SE license of a plant and intends to appear for obtaining SS license of another plant of the same type with minor design differences shall be required to:
- (i) acquire a minimum of three (03) years shift experience after the award of SE license at the plant for which SE license was already obtained;
  - (ii) acquire training on Full Scope Training Simulator (FSTS) of the plant, for which SS license is required, for handling operational states and accident conditions, etc.;
  - (iii) undergo additional training comprising on design differences between the two plants; and
  - (iv) qualify initial assessment as per Regulation 45 (4).

- (c) The candidate possessing SE license of a plant and intends to appear for acquiring SS license of another plant of the same type with major design differences or a new type of design shall be required to:
- (i) obtain a minimum of two years (02) of shift experience after the award of SE license at the plant for which SE license was already obtained. Additionally, obtain one (1) year work experience in operations division including installation and commissioning of cold and hot functional tests (without nuclear fuel in the reactor) at the plant for which SS license is required;
  - (ii) acquire training on FSTS of the plant, for which SS license is required, for handling operational states and accident conditions, etc.;
  - (iii) undergo additional training on design differences between the two plants; and
  - (iv) qualify initial assessment as per Regulation 45 (4).

**[Explanation:** After the award of SS license, the candidate must perform 20 shifts (at least five (5) morning and five (5) evening) in shadow capacity at the plant for which he qualified as SS.]

- (4) Initial Assessment:
- (a) The technical knowledge, skills and abilities of a candidate to perform the duties, as per approved operation documents, in a safe manner under all operational states and accident conditions shall be determined

through written, oral and operating examination. Each candidate has to qualify these examinations separately;

- (b) The plant management shall conduct the written examinations. All papers shall carry no less than 50% marks in descriptive (non-objective) type of questions;
- (c) The syllabus for the written examination shall, at least, cover the following topics:
  - (i) PNRA Regulations;
  - (ii) Nuclear safety;
  - (iii) Radiation protection and radioactive waste management;
  - (iv) Physical protection;
  - (v) OLCs;
  - (vi) Nuclear specifics;
  - (vii) Conventional specifics;
  - (viii) Reactor physics;
  - (ix) Emergency preparedness and response;
  - (x) Industrial safety;
  - (xi) Management system;
  - (xii) Safety culture and security culture; and
  - (xiii) Safety and physical protection interface.
- (d) The syllabus for the written examination, for training and retraining, shall be prepared by the licensee or plant management, as the case may be, and duly approved by the Authority.
- (5) Licensing Examination:
  - (a) Oral and operating examination of the individuals shall be conducted by the Authority;

- (b) The candidate shall qualify for oral and operating examination only if all the written papers are passed separately and he is recommended by the plant management. The passing marks for the written papers shall be 75% in each paper;
  - (c) The licensee or plant management, as the case may be, shall apply to the Authority for oral and operating examination on the prescribed application form for licensing of operating personnel along with the assessment on a separate sheet;
  - (d) The licensee or plant management, as the case may be, shall provide certification of the latest medical and psychological fitness of the candidate along with the application. Such certificates shall also record whether the candidate is or has been on prolonged medical treatment during the last twelve (12) months; and
  - (e) The candidate shall normally be allowed only two (2) attempts to clear the operating and oral licensing examinations. In very exceptional cases and on specific recommendations of the licensee, a third (last) chance may be allowed by the Chairman or an officer so designated on his behalf.
- (6) Issuance of License:

The Authority may issue operating license to the candidate upon successfully passing the written, operating and oral examinations. The Authority may attach such terms and conditions to the license, if so desired.

- (7) Retraining and Annual Renewal of License:
- (a) All licensed operating personnel shall have to undergo a formal retraining for two (2) periods of one (1) month duration each during a calendar year;
  - (b) After retraining, such licensed individuals shall be examined by the licensee or plant management, as the case may be, to assess their continued technical and professional competence for the assigned job. This assessment along with medical and psychological fitness certificates shall be submitted to the Authority at the time of renewal of the license; and
  - (c) The application for annual renewal of license containing necessary documents shall be submitted to the Authority one (1) month prior to its expiry date, each year. The license shall remain valid until the disposition of application for the annual renewal by the Authority.

- (8) Validity of License:
- (a) License of operating personnel routinely involved in shift duties shall remain valid for a period of ~~eight (8)~~ **ten (10)**<sup>2</sup> years subject to annual renewal. Whereas, license of operating personnel involved in activities other than plant operation (regular shift duties) shall remain valid for a period of four (4) years subject to annual renewal;
- (b) A license is deemed to be automatically cancelled on one of the following reasons:
- (i) Inability of a licensed individual to carry out his duties for medical reasons as recommended by a duly constituted medical board;
  - (ii) Permanent physical disability that renders the licensed individual unable to carry out the duties;
  - (iii) Lack of familiarity as a result of being away from operations of the plant, for which the license was issued, for a period of more than one (1) year;
  - (iv) Inability of licensed individual to complete retraining successfully as mentioned in Regulation 45(7) above; and
  - (v) Failure of licensed individual to perform a minimum of twenty (20) shift duties during a year and participation in one (1) startup (at plant or at FSTS). These twenty (20) shift duties should have been performed acting as independent in-charge of the shift.
- (c) Upon issuance of notice of gross negligence or incompetence in performance of duties as assessed by the plant management or by the Authority, as the case may be, the license shall summarily be suspended. In such cases, the aggrieved party may submit appeal within two (2) weeks to the Authority for review of the decision. However, the license shall remain suspended until the appeal is disposed off by the Authority;
- (d) Licensed individuals who are at the plant but fail to perform twenty (20) shift duties in plant operations as SS or have remained away from the plant operation (shift duties) for a period of more than one (1) year but less than two (2) years, can re-acquire operation license after doing the following:
- (i) Successful completion of retraining as provided in Regulation 45(7) above;
  - (ii) Performance of one (1) month shift duty along with a licensed

<sup>2</sup> [Substituted by SRO 813\(I\)/2025 dated May 16, 2025](#)

counterpart; and

- (iii) Oral and operating examination by the Authority to ascertain familiarity of the candidate with the current status of the plant and the plant operating procedures.
- (e) Licensed individuals who fail to perform twenty (20) shift duties in plant operation as SS or remained away from the plant operation (shift duties) for a period of more than two (2) years shall undergo complete licensing examination.
- (9) Revalidation of License:
  - (a) Licensee shall apply for revalidation of license of operating personnel three (3) months before expiry of the license subject to fulfillment of requirements mentioned in Regulation 45(7) above along with comprehensive assessment of the candidate for last ~~eight (8)~~ **ten (10)**<sup>3</sup> years made by the licensee or plant management, as the case may be. The license shall not expire until disposition of the revalidation application by the Authority; and
  - (b) Oral examination of these candidates shall be conducted by the Authority. Upon successfully passing the oral examinations, the operating license may be revalidated by the Authority for the next period.

(10) Retention of Record:

Record of written examination, medical fitness and all retraining exercises shall be retained by the plant management, either for ten (10) years or for two (2) years after formal withdrawal of the license, whichever is later.

(11) Transfer of License:

The requirements regarding transfer of license of operating personnel among different plants of the same type have been described in Schedule III.

**46. Criteria for Obtaining SE License.**—(1) All SE licenses shall be issued under the authority of the Chairman by an officer designated, for this purpose, on his behalf.

- (2) Each applicant is required to undergo in-class and field training, to be

<sup>3</sup> [Substituted by SRO 813\(I\)/2025 dated May 16, 2025](#)



arranged by the plant management. After successful completion of in-class and field training and acquiring the prescribed minimum experience as per Regulation 46(3) below, the candidate shall become eligible to appear in the licensing examination.

(3) Eligibility Criteria:

- (a) The minimum educational qualification for SE license is a bachelor degree in engineering or its equivalent from a university recognized by Higher Education Commission in any one of the following disciplines: Electrical, Electronics, Mechanical, Chemical, Metallurgy, Mechatronics, Power, or Nuclear;
- (b) The candidate shall possess a minimum of three (3) years of total operation experience at an NPP, which shall include at least one (1) year experience in operation division of the plant for which license is required including at least three (3) months working in MCR. This experience may include participation in commissioning at the plant. It also includes in-class and field training for operating personnel arranged by the licensee or plant management, as the case may be; and
- (c) The candidate shall qualify the written, oral and operating examinations as per Regulation 46 (4 and 5) below.

(4) Initial Assessment:

- (a) The technical knowledge, skills and abilities of a candidate to perform the duties, as per approved operation documents, in a safe manner under all operational states and accident conditions shall be determined through written, oral and operating examination. Each candidate has to qualify these examinations separately;
- (b) The plant management shall conduct the written examinations. All papers shall carry no less than 50% marks in descriptive (non-objective) type of questions;
- (c) The syllabus for the written examination shall, at least, cover the following topics:
  - (i) PNRA Regulations;
  - (ii) Nuclear safety;

- (iii) Radiation protection and radioactive waste management;
  - (iv) OLCs;
  - (v) Nuclear specifics;
  - (vi) Conventional specifics;
  - (vii) Reactor physics;
  - (viii) Emergency preparedness and response;
  - (ix) Industrial safety;
  - (x) Safety culture; and
  - (xi) Management system.
- (d) The syllabus for the written examination, for training and retraining, shall be prepared by the licensee or plant management, as the case may be, and duly approved by the Authority.
- (5) Licensing Examination:
- (a) Oral and operating examination of the individuals shall be conducted by the Authority;
  - (b) The candidate shall qualify for oral and operating examination only if all the written papers are passed separately and he is recommended by the plant management. The passing marks for the written papers shall be 75% in each paper;
  - (c) The licensee or plant management, as the case may be, shall apply to the Authority for oral and operating examination on the prescribed application form for licensing of operating personnel along with the assessment on a separate sheet;
  - (d) The licensee or plant management, as the case may be, shall provide certification of the latest medical and psychological fitness of the candidate along with the application. Such certificates shall also record whether the candidate is or has been on prolonged medical treatment during the last twelve (12) months; and

- (e) The candidate shall normally be allowed only two (2) attempts to clear the oral and operating licensing examinations. In very exceptional cases and on specific recommendations of the licensee, a third (last) chance may be allowed by the Chairman or an officer so designated on his behalf.

(6) Issuance of License:

The Authority may issue operating license to the candidate upon successfully passing the written, oral and operating examinations. The Authority may attach such terms and conditions to the license, if so desired.

(7) Retraining and Annual Renewal of License:

- (a) All licensed operating personnel shall have to undergo a formal retraining for two (2) periods of one (1) month duration each during a calendar year;
- (b) After retraining, such licensed individuals shall be examined by the licensee or plant management, as the case may be, to assess their continued technical and professional competence for the assigned job. This assessment along with medical and psychological fitness certificates shall be submitted to the Authority at the time of renewal of the license; and
- (c) The application for annual renewal of license containing necessary documents shall be submitted to the Authority one (1) month prior to its expiry date, each year. The license shall remain valid until the disposition of application for the annual renewal by the Authority.

(8) Validity of License:

- (a) License of operating personnel routinely involved in shift duties shall remain valid for a period of ~~eight (8)~~ **ten (10)**<sup>4</sup> years subject to annual renewal. Whereas, license of operating personnel involved in activities other than plant operation (regular shift duties) shall remain valid for a period of four (4) years subject to annual renewal;
- (b) A license is deemed to be automatically cancelled on one of the following reasons:
  - (i) Inability of a licensed individual to carry out his duties for medical reasons as recommended by a duly constituted medical board;

<sup>4</sup> [Substituted by SRO 813\(I\)/2025 dated May 16, 2025](#)

- (ii) Permanent physical disability that renders the licensed individual unable to carry out the duties;
  - (iii) Lack of familiarity as a result of being away from operations of the plant, for which the license was issued, for a period of more than one (1) year;
  - (iv) Inability of licensed individual to complete retraining successfully as mentioned in Regulation 46(7) above; and
  - (v) Failure of a licensed individual to perform a minimum of twenty (20) shift duties during a year and participation in one (1) startup (at plant or at FSTS). These twenty (20) shift duties should have been performed acting as independent in-charge of the shift.
- (c) Upon issuance of notice of gross negligence or incompetence in performance of duties as assessed by the plant management or by the Authority, as the case may be, the license shall summarily be suspended. In such cases, the aggrieved party may submit appeal within two (2) weeks to the Authority for review of the decision. However, the license shall remain suspended until the appeal is disposed off by the Authority;
- (d) Licensed individuals who are at the plant but fail to perform twenty (20) shift duties in plant operations as SE or have remained away from the plant operation (shift duties) for a period of more than one (1) year but less than two (2) years, can re-acquire operation license after doing the following:
  - (i) Successful completion of retraining as provided in Regulation 46(7) above;
  - (ii) Performance of one (1) month shift duty along with a licensed counterpart; and
  - (iii) Oral and operating examination by the Authority to ascertain familiarity of the candidate with the current status of the plant and the plant operating procedures.
- (e) Licensed individuals who fail to perform twenty (20) shift duties in plant operation as SE or remained away from the plant operation (shift duties) for a period of more than two (2) years shall undergo complete licensing examination.

(9) Revalidation of License:

- (a) Licensee shall apply for revalidation of license of operating personnel three (3) months before expiry of the license subject to fulfillment of requirements mentioned in Regulation 46(7) above along with comprehensive assessment of the candidate for last ~~eight (8)~~ **ten (10)**<sup>5</sup> years made by the licensee or plant management, as the case may be. The license shall not expire until disposition of the revalidation application by the Authority; and
- (b) Oral examination of these candidates shall be conducted by the Authority. Upon successfully passing the oral examinations, the operating license may be revalidated by the Authority for the next period.

(10) Retention of Record:

Record of written examination, medical fitness and all retraining exercises shall be retained by the plant management, either for ten (10) years or for two (2) years after formal withdrawal of the license, whichever is later.

(11) Transfer of License:

The requirements regarding transfer of license of operating personnel among different plants of the same type have been described in Schedule III.

**47. Criteria for Obtaining RO License.**—(1) All RO licenses shall be issued under the authority of the Chairman by an officer designated, for this purpose, on his behalf.

(2) Each applicant is required to undergo in-class and field training, to be arranged by the plant management. After successful completion of in-class and field training and acquiring the prescribed minimum experience as per Regulation 47(3) below, the candidate shall become eligible to appear in the licensing examination.

(3) Eligibility Criteria:

- (a) The minimum educational qualification for RO license is a three (3) years Diploma of Associate Engineer or its equivalent from an institute recognized by any Board of Technical Education in Pakistan in any one of the following disciplines: Electrical, Electronics, Mechanical, Chemical, Metallurgy, Mechatronics, or Power;

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<sup>5</sup> [Substituted by SRO 813\(I\)/2025 dated May 16, 2025](#)

- (b) The candidate shall possess a minimum of three (3) years of total operation experience at an NPP, which shall include at least one (1) year experience in operation division at the plant. This experience may include participation in commissioning at the plant. It also includes in-class and field training for operating personnel arranged by the plant management; and
- (c) The candidate shall qualify the written, oral and operating examinations as per Regulation 47 (4 and 5) below.
- (4) Initial Assessment:
  - (a) The technical knowledge, skills and abilities of a candidate to perform the duties, as per approved operation documents, in a safe manner under all operational states and accident conditions shall be determined through written, oral and operating examination. Each candidate has to qualify these examinations separately;
  - (b) The plant management shall conduct the written examinations. All papers shall carry no less than 50% marks in descriptive (non-objective) type of questions;
  - (c) The syllabus for the written examination shall, at least, cover the following topics:
    - (i) PNRA Regulations;
    - (ii) Nuclear safety;
    - (iii) Radiation protection;
    - (iv) OLCs;
    - (v) Nuclear general;
    - (vi) Conventional general;
    - (vii) Safety culture; and
    - (viii) Management system.
  - (d) The syllabus for the written examination, for training and retraining, shall be prepared by the licensee or plant management, as the case may be, and duly approved by the Authority.

(5) Licensing Examination:

- (a) Oral and operating examination of the individuals shall be conducted by the Authority;
- (b) The candidate shall qualify for oral and operating examination only if all the written papers are passed separately and he is recommended by the plant management. The passing marks for the written papers shall be 75% in each paper;
- (c) The licensee or plant management, as the case may be, shall apply to the Authority for oral and operating examination on the prescribed application form for licensing of operating personnel along with the assessment on a separate sheet;
- (d) The licensee or plant management, as the case may be, shall provide certification of the latest medical and psychological fitness of the candidate along with the application. Such certificates shall also record whether the candidate is or has been on prolonged medical treatment during the last twelve (12) months; and
- (e) The candidate shall normally be allowed only two (2) attempts to clear the oral and operating licensing examinations. In very exceptional cases and on specific recommendations of the licensee, a third (last) chance may be allowed by the Chairman or an officer so designated on his behalf.

(6) Issuance of License:

The Authority may issue operating license to the candidate upon successfully passing the written, oral and operating examinations. The Authority may attach such terms and conditions to the license, if so desired.

(7) Retraining and Annual Renewal of License:

- (a) All licensed operating personnel shall have to undergo a formal retraining for two (2) periods of one (1) month duration each during a calendar year;
- (b) After retraining such licensed individuals shall be examined by the licensee or plant management, as the case may be, to assess their continued technical and professional competence for the assigned job. This assessment along with medical and psychological fitness

certificates shall be submitted to the Authority at the time of renewal of the license; and

- (c) The application for annual renewal of license containing necessary documents shall be submitted to the Authority one (1) month prior to its expiry date, each year. The license shall remain valid until the disposition of application for the annual renewal by the Authority.

(8) Validity of License:

- (a) License of operating personnel routinely involved in shift duties shall remain valid for a period of ~~eight (8)~~ **ten (10)** <sup>6</sup>years subject to annual renewal. Whereas, license of operating personnel involved in activities other than plant operation (regular shift duties) shall remain valid for a period of four (4) years subject to annual renewal;
- (b) A license is deemed to be automatically cancelled on one of the following reasons:
- (i) Inability of a licensed individual to carry out his duties for medical reasons as recommended by a duly constituted medical board;
  - (ii) Permanent physical disability that renders the licensed individual unable to carry out the duties;
  - (iii) Lack of familiarity as a result of being away from operations of the plant, for which the license was issued, for a period of more than one (1) year;
  - (iv) Inability of licensed individual to complete retraining successfully as mentioned in Regulation 47(7) above; and
  - (v) Failure of a licensed individual to perform a minimum of twenty (20) shift duties during a year and participation in one (1) startup (at plant or at FSTS). These twenty (20) shift duties should have been performed acting as independent in-charge of the shift.
- (c) Upon issuance of notice of gross negligence or incompetence in performance of duties as assessed by the plant management or by the Authority, as the case may be, the license shall summarily be suspended. In such cases, the aggrieved party may submit appeal within two (2) weeks to the Authority for review of the decision. However, the license shall remain suspended until the appeal is disposed off by the Authority;

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<sup>6</sup> [Substituted by SRO 813\(I\)/2025 dated May 16, 2025](#)



- (d) Licensed Individuals who are at the plant but fail to perform twenty (20) shift duties in plant operations as RO or have remained away from the plant operation (shift duties) for a period of more than one (1) year but less than two (2) years, can re-acquire operation license after doing the following:
  - (i) Successful completion of retraining as provided in Regulation 47(7) above;
  - (ii) Performance of one (1) month shift duty along with a licensed counterpart; and
  - (iii) Oral and operating examination by the Authority to ascertain familiarity of the candidate with the current status of the plant and the plant operating procedures.
- (e) Licensed individuals who fail to perform twenty (20) shift duties in plant operations as RO or remained away from the plant operation (shift duties) for a period of more than two (2) years shall undergo complete licensing examination.
- (9) Revalidation of License:
  - (a) Licensee shall apply for revalidation of license for operating personnel three (3) months before expiry of the license subject to fulfillment of requirements mentioned in Regulation 47(7) above along with comprehensive assessment of the candidate for last ~~eight (8)~~ **ten (10)**<sup>7</sup> years made by the licensee or plant management, as the case may be. The license shall not expire until disposition of the revalidation application by the Authority; and
  - (b) Oral examination of these candidates shall be conducted by the Authority. Upon successfully passing the oral examinations, the operating license may be revalidated by the Authority for the next period.
- (10) Retention of Record:

Record of written examination, medical fitness and all retraining exercises shall be retained by the plant management, either for ten (10) years or for two (2) years after formal withdrawal of the license, whichever is later.

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<sup>7</sup> [Substituted by SRO 813\(I\)/2025 dated May 16, 2025](#)

**48. Performance and Status of Licensed Personnel.**—(1) A licensee shall file a report within twenty one (21) days of the occurrence of certain situations or events, as the case may be, relating to the performance and status of personnel who have been licensed by the Authority, in response to any of the following situations or events, as the case may be:

- (a) Termination of the employment of a licensed person from the position for which the person is licensed by the Authority;
  - (b) Failure, by a licensed person, to pass a re-qualification test referred to in the license or failure to take any re-qualification test referred to in the license; and
  - (c) Cancellation of operating license under the obligations of Regulations 45(8)(b), 46(8)(b) and 47(8)(b) of these regulations.
- (2) The report shall contain the following:
- (a) Full name and position of the licensed person;
  - (b) Date of termination of employment of a licensed person from a position for which the person was licensed;
  - (c) Type and date of test that the person failed or did not appear in the test as per Regulation 48(1)(b) above; and
  - (d) Name and address of sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

**49. Reporting the Problems Identified through Research Findings or Revised Safety Analyses.**—(1) The plant management shall report, within twenty one (21) days of becoming aware, the outcome of research findings or new or revised safety analyses, of a problem or potential problem that represents a hazard or potential hazard to the health and safety of personnel or the environment, physical protection of the plant, or that is different in nature, greater in probability, or greater in magnitude than was previously analyzed. The problems or potential problems shall include the following occurrences:

- (a) When an FSAR for an NPP contains an assumption, input, analytical method or safety analysis result that is or may be invalid;

- (b) When a limit defined in the NPP licensing documents or in appendix to these documents is or may be inadequate to assure safety;
  - (c) When an analysis, from which a limit in a licensing document was derived, may be invalid or uncertain such that the margin of safety may be less than predicted;
  - (d) When the defined specifications of a safety system or of a safety-related system of an NPP are or may be invalid;
  - (e) When an NPP licensing document contains an error that, if accepted, relied or acted upon as being valid, could give rise to increased risks to the health and safety of personnel or the environment, physical protection of the plant; and
  - (f) When the measures that are in place for the purpose of protecting the environment from the operating impacts of an NPP are, or may be, inadequate.
- (2) The report shall include at least the following information:
- (a) Identification of the plant (unit) that is or may be affected by the problem or potential problem;
  - (b) Identification of any structure, system, component or function of the plant that is or may be affected by the problem or potential problem;
  - (c) Description of the problem or potential problem, and its actual or potential safety significance;
  - (d) Summary of the research or analysis that led to awareness of the problem or potential problem;
  - (e) Evaluation of the degree of any impairment of a safety system or safety related system;
  - (f) Description of the corrective actions that have been taken, or that are proposed to be taken, to address the problem or potential problem; and
  - (g) Name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

50. **Repeal.**—The “Regulations on the Safety of Nuclear Power Plants Operation - (PAK/913) (Rev.1)” notified vide S.R.O. 995(I)/2004 dated 22<sup>nd</sup> December, 2004 are hereby repealed.

#### Schedule I

##### **Submission Requirements for Refueling Outage**

(1) The licensee shall submit following documents to the Authority at least one (1) month before the scheduled date of shutdown for refueling outage, except outage job list, which shall be submitted two (2) months before the planned shutdown:

- (a) A refueling safety analysis report which shall include prediction of core condition after completing refueling and comparison of core prediction results with the technical specifications of the plant;
- (b) Administrative procedures on the following:
  - (i) Overall organizational set-up for the refueling outage including outside organizations;
  - (ii) Responsibilities and authorities of various divisions/sections of the licensee’s organization for the refueling outage;
  - (iii) Responsibilities and authorities of outside organizations involved in activities during refueling outage;
  - (iv) Interfaces and communication lines within the licensee and with outside organizations; and
  - (v) Control measures of the licensee on the activities performed by outside organizations.
- (c) Training program for personnel involved in activities during refueling outage but are not part of plant organization regarding access control, radiation protection, work control, reporting of event, and other relevant administrative requirements;
- (d) Detailed refueling plan and schedule for the activities to be conducted during refueling outage including the following:
  - (i) Handling and transportation of fuel and other core components and their inspections;

- (ii) Maintenance, modification and subsequent testing of structures, systems and components important to safety;
  - (iii) In-Service Inspections of structures, systems and components important to safety;
  - (iv) Surveillance tests of structures, systems and components important to safety;
  - (v) Tests during fuel unloading and loading; and
  - (vi) Criticality tests and subsequent tests at low power and power ascension.
- (e) Dose estimation for the refueling outage, bases for the estimation, and the methodology adopted or procedure followed for dose estimation;
- (f) Estimation for radioactive waste generation during the refueling outage including gaseous, liquid and solid wastes, methodology adopted or procedure followed for the estimation, capability and resources to handle, store and dispose-off the radioactive waste safely; and
- (g) Establishing personnel and process qualification requirements, for personnel engaged and processes involved in various activities, during the refueling outage.
- (2) Any subsequent change in these documents shall also be submitted to the Authority immediately.
- (3) The licensee shall provide any other document and information, as required by the Authority, to facilitate inspections and assessments.
- (4) After refueling of the plant, the licensee shall submit an application for making the reactor critical to the Authority at one (1) week before the expected criticality date and the licensee shall not make the reactor critical without approval of the Authority. The application shall contain the following:
- (a) Report on implementation of the refueling plan;
  - (b) Report on major problems encountered and events occurred during refueling outage, their causes and the corrective action taken or planned;

- (c) Refueling outage activities, which may affect safety, if any, that could not be completed along with the reason and any safety implication due to this; and
- (d) Assessment report on the doses received by the workers during refueling outage and a comparison with the dose estimated for the outage.

(5) The licensee shall submit completion report on refueling shutdown activities within four (4) months of making the reactor critical following refueling outage. The report shall include the following:

- (a) An overall summary of refueling activities;
- (b) Details of implementation of the refueling plan;
- (c) Results of criticality tests and subsequent tests at low power and power ascension;
- (d) Test and inspection reports of important activities;
- (e) Details of doses received during the refueling outage including overall dose, doses received by individuals, doses received in specific activities in high radiation areas, overexposure of individual, if any, and comparison with the estimated doses for the outage;
- (f) Details of radioactive waste generated and released during the refueling outage and comparison with the estimation made for the outage;
- (g) Description of the activities that were not completed along with the reason and safety implications of such non-completed activities;
- (h) Details of major problems encountered and events occurred during the outage, their root causes, and the corrective actions taken or planned to rectify the situation and avoid recurrence; and
- (i) Conclusion.

Schedule II

### **Submission Requirements for Long Shutdown**

(1) The licensee shall submit following documents to the Authority, at least one (1) month before the scheduled date of long shutdown except outage job list, which shall be submitted two (2) months before the planned shutdown:

- (a) Detailed long shutdown plan and schedule for the activities to be conducted during long shutdown including maintenance, modification and subsequent testing, in-service inspections and surveillance tests of structures, systems and components important to safety;
- (b) Dose estimation for the long shutdown period, bases for the estimation, and the methodology adopted or procedure followed for dose estimation;
- (c) Estimation for radioactive wastes generation during long shutdown including gaseous, liquid and solid wastes, methodology adopted or procedure followed for the estimation, capabilities and resources to handle, store and dispose-off the radioactive wastes safely; and
- (d) Establishing personnel and process qualification requirements, for personnel engaged and processes involved in various activities, during long shutdown.

(2) After completion of long shutdown, licensee shall submit an application for making the reactor critical to the Authority, one (1) week before the expected criticality date. Following documents and reports shall be submitted along with the application for reactor criticality:

- (a) Report on implementation of the long shutdown work plan;
- (b) Report on major problems encountered and events occurred during long shutdown, their causes and the corrective action taken or planned to rectify the situation and avoid recurrence;
- (c) Long shutdown activities, which may affect safety, if any, that could not be completed along with the reason and any safety implication due to this; and
- (d) Assessment report on the doses received by the workers during long shutdown and a comparison with the dose estimated for the outage.

(3) The licensee shall not make the reactor critical without approval of the Authority.

(4) The licensee shall submit completion report on long shutdown activities within four (4) months of making the reactor critical following long shutdown. The report shall include the following:

- (a) An overall summary of long shutdown activities;

- (b) Details of implementation of long shutdown work plan;
- (c) Results of criticality tests and subsequent tests at low power and power ascension;
- (d) Test and inspection reports of important activities;
- (e) Details of doses received during long shutdown including overall dose, doses received by individuals, doses received in specific activities in high radiation areas, overexposure of individual, if any, and comparison with the estimated doses for the outage;
- (f) Details of radioactive wastes generated and released during long shutdown and comparison with the estimation made for the outage;
- (g) Description of all the activities that were not completed along with the reason and safety implications of such non-completed activities;
- (h) Details of major problems encountered and events occurred during long shutdown, their root causes, and the corrective actions taken or planned to rectify the situation and avoid recurrence; and
- (i) Conclusion.

### Schedule III

#### **Requirements for Transfer of License of Operating Personnel among Different Plants of the Same Type**

Following cases describe the requirements regarding transfer of license of operating personnel from one plant to the other plant of the same type:

(1) **Case-1:** *Specific requirements for transfer of SS or SE license, as the case may be, from one plant to another plant of the same type with major and minor differences in design and technical specifications*

- (a) Candidate has SS license of a plant and intends to get the license for same position at another plant with major differences in design (e.g. system level differences) and technical specifications:
  - (i) The candidate shall go through training mainly comprising of design differences in addition to the normal retraining;



- (ii) The licensee or plant management, as the case may be, shall apply to the Authority for transfer of license along with internal assessment of the candidate on a separate sheet;
- (iii) Oral and operating examination shall be conducted by the Authority with the focus on design differences, technical specifications and plant familiarization; and
- (iv) The candidate shall perform twenty (20) shifts (at least five (5) morning and five (5) evening) at the plant in shadow capacity before assumption of charge as independent SS or SE, as the case may be.

**Explanation:** For first batch of a new unit, the experience of performing shift duties during hot commissioning before fuel loading may be accepted.

- (b) Candidate has SE or SS license of a plant and intends to get the license for same position at another plant with minor differences in design (e.g. slight changes in configuration of plant systems) and technical specifications:
  - (i) The licensee or plant management, as the case may be, shall apply to the Authority for transfer of license along with internal assessment of the candidate on a separate sheet;
  - (ii) Assessment of familiarization with MCR of the plant by the Authority;
  - (iii) Oral examination shall be conducted by the Authority; and
  - (iv) The candidate shall perform twenty (20) shifts (at least five (5) morning and five (5) evening) at the plant in shadow capacity before assumption of charge as independent SS or SE, as the case may be.

**Explanation:** For first batch of a new unit, the experience of performing shift duties during hot commissioning before fuel loading may be accepted.

(2) **Case-2:** *Specific requirements for transfer of SS or SE license, as the case may be, from one plant to another plant of the same type with no differences in design and technical specifications*

- (a) The licensee or plant management, as the case may be, shall apply to the Authority for transfer of license; and
- (b) The candidate shall perform twenty (20) shifts (at least five (5) morning and five (5) evening) at the plant in shadow capacity before assumption of charge as independent SS or SE, as the case may be.

**Explanation:** For first batch of a new unit, the experience of performing shift duties during hot commissioning before fuel loading may be accepted.

(3) After successful transfer of license of operator from one plant to other plant, the license originally issued to the operator shall be cancelled. Only one license shall be retained by the operator, at one plant, at a time.

[Ref: PNRA-PPD-02(13)/13.]

MOHAMMAD SALEEM ZAFAR,  
*Member (Corporate).*