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NUCLEAR SAFETY AND RADIATION PROTECTION ACT

(1995 No. 19)

NIGERIAN REGULATIONS FOR DECOMMISSIONING OF NUCLEAR POWER PLANTS, 2016

In exercise of the powers conferred on it by section 47 of the Nuclear Safety and Radiation Protection Act 1995 and of all other powers enabling it in that behalf, THE NIGERIAN NUCLEAR REGULATORY AUTHORITY, with the approval of the President, hereby makes the following Regulations.

PART I - GENERAL

Objectives

1.1. The objective of the regulations is to establish the general safety requirements to be met during planning for decommissioning, conduct of decommissioning actions and termination of the authorization for decommissioning.

Scope

1.2. These regulations apply to the preparatory work on decommissioning, and also to the whole decommissioning process of NPP following its final shutdown and operations aiming at achieving the end state of the facility as specified in the approved final decommissioning plan and that allow for the termination of the decommissioning license.

The management of fresh nuclear fuel and the management of spent nuclear fuel and of radioactive waste generated during the operational phase of a facility are not usually considered part of decommissioning. These are not addressed in this document.

Interpretation

“*Act*” means the Nuclear Safety and Radiation Protection Act, No 19 of 1995.

“*Activation*” means the process of inducing radioactivity. Most commonly used to refer to the induction of radioactivity in moderators, coolants structural and shielding materials caused by irradiation with neutrons.

“*As low as reasonably achievable (ALARA)*” means the process of determining what level of protection and safety makes exposures, and the probability and magnitude of potential exposures, ‘as low as reasonably achievable, economic and social factors being taken into account’.

“*Authority*” means the Nigerian Nuclear Regulatory Authority established under the Nuclear Safety and Radiation Protection Act 1995.

“*Clearance*” means removal of radioactive material or radioactive objects within authorized practices from any further regulatory control by the Authority.

“Contamination” means (1) Radioactive substances on surfaces, or within solids, liquids or gases (including the human body), where their presence is unintended or undesirable, (2) the presence of such substances in such places or (3) the process giving rise to their presence in such places.

“Decommissioning” means administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a facility (except for a repository or for certain nuclear facilities used for the disposal of residues from the mining and processing of radioactive material, which are closed and not decommissioned).

“Decommissioning Plan” means a document containing a description of the final shutdown and decommissioning strategy, and an estimate of decommissioning costs, including sources of finance.

“Decontamination” means the complete or partial removal of contamination by a deliberate physical, chemical or biological process.

“Deferred dismantling” means is deferred after *permanent shutdown*. For a *nuclear installation*, the *nuclear fuel* is first removed. Part or all of a *facility* containing *radioactive material* is either processed or put in such a condition that it can be put into *storage*. The *facility* is maintained until it can subsequently be decontaminated and/or dismantled **plans**.

“Design” means the process and the result of developing a concept, detailed supporting calculations and specifications for a facility and its parts.

“Dismantling” means the disassembly and removal of any structure, system or component during decommissioning. Dismantling may be performed immediately after the permanent retirement of a nuclear facility, or may be deferred.

“Disposal” means emplacement of waste in an appropriate facility without the intention of retrieval.

“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.

“Operating organization (operator)” means the organization (and its contractors) which undertakes the siting, design, construction, commissioning and/or operation of a nuclear facility.

“Records” means information created, received and maintained as evidence and information collected by an organization or person, in pursuance of legal obligations or in the transaction of business.

“Safety assessment” means the process, and the result, of analyzing systematically and evaluating the hazards associated with all aspects of facilities and activities that are relevant to protection and safety; for an authorized facility, this includes siting, design, operation; Decommissioning and Dismantling of the facility.

“Safety culture” means the assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, *protection and safety issues* receive the attention warranted by their significance.

“Site” means the area containing, or under investigation for its suitability for, a nuclear facility (e.g. a repository). It is defined by a boundary and is under effective control of the operating organization.

“Spent fuel” means nuclear fuel removed from a reactor following irradiation, which is no longer usable in its present form because of depletion of fissile material, buildup of poison or radiation damage

“Storage” means the holding of radioactive sources, spent fuel or radioactive waste in a facility that provides for containment, with the intention of retrieval.

“Structures, systems and components (SSCs)” means a general term encompassing all of the elements (items) of a facility or activity that contribute to protection and safety, except human factors. Structures are the passive elements: buildings, vessels, shielding, etc. A system comprises several components, assembled in such a way as to perform a specific (active) function. A component is a discrete element of a system. Examples of components are wires, transistors, integrated circuits, motors, relays, solenoids, pipes, fittings, pumps, tanks and valves.

PART II - PROTECTION OF PEOPLE AND THE ENVIRONMENT

2.1. The Operating organization shall consider the exposure during decommissioning to be a planned exposure situation and the relevant requirements of the Nigerian Basic Ionizing Radiation Regulation (NiBIRR) shall be applied accordingly during decommissioning.

2.2 The Operating organization shall apply relevant dose limits for the exposure of workers and the members of the public during decommissioning. Radiation protection of persons who are exposed as a result of decommissioning actions shall be optimized with due regard to the relevant dose constraints.

2.3. The Operating organization shall make provisions during decommissioning for protection against, and for reduction of, exposure due to an incident; if the incident or the particular situation is of such a nature as to warrant remediation or to require confinement of releases of radioactive material under emergency conditions, Nigerian National Emergency Preparedness and Response Regulations shall apply.

2.4. The Operating organization shall comply with relevant National regulations on the protection of the environment and the requirements of Nigerian Radiation Protection Regulations addressing protection of the environment during decommissioning, and beyond if a facility is released from regulatory control with restrictions on its future use.

2.5. The Operating organization shall apply graded approach in all aspects of decommissioning in determining the scope and level of detail for any particular nuclear facility, consistent with the magnitude of the possible radiation risks arising from the decommissioning.

2.6. The Operating Organization shall carry out Safety assessment for all facilities for which decommissioning is planned and for all facilities undergoing decommissioning. The final decommissioning plan shall be supported by a safety assessment addressing the planned decommissioning actions and incidents, including accidents that may occur or situations that may arise during decommissioning.

2.7. The type of information and the level of detail in the decommissioning plans and supporting documents, including the safety assessments, shall be commensurate with the type, scale, complexity, status and stage in the lifetime of the facilities and with the hazards associated with the decommissioning of the facilities

PART III - RESPONSIBILITIES ASSOCIATED WITH DECOMMISSIONING

3.1 The Operating Organization shall plan for decommissioning and shall conduct the decommissioning actions in compliance with the authorization for decommissioning and with relevant national requirements.

3.2 The Operating Organization shall be responsible for all aspects of safety, radiation protection and protection of the environment during decommissioning.

3.3 The responsibilities of the Operating Organization shall include:

- a) Selecting a decommissioning strategy as the basis for preparing and maintaining the decommissioning plans (i.e. the initial decommissioning plan and the final decommissioning plan) throughout the lifetime of the facility.
- b) Preparing and submitting an initial decommissioning plan and its updates for review.
- c) Establishing and implementing an integrated management system. Where the Operating Organization changes during the lifetime of the facility, procedures shall be put in place to ensure the transfer of responsibilities for decommissioning to the new Operating Organization.
- d) Fostering a safety culture in order to encourage a questioning and learning attitude towards safety and to discourage complacency.
- e) Estimating the cost of decommissioning actions and providing financial assurances and resources to cover the costs associated with safe decommissioning, including the management of the resulting radioactive waste.
- f) Notifying the Authority prior to the permanent shutdown of the facility.

- g) Submitting a final decommissioning plan and supporting documents for review and approval by the Authority, in accordance with national regulations, in order to obtain an authorization to conduct decommissioning.
- h) Managing the decommissioning project and conducting decommissioning actions or ensuring oversight of the actions conducted by contractors.
- i) Managing the remaining operational waste from the facility and all other waste from decommissioning.
- j) Ensuring that the facility is maintained in a safe configuration during the period of transition following permanent shutdown and until the approval of the final decommissioning plan.
- k) Performing safety assessments and environmental impact assessments in support of decommissioning actions.
- l) Preparing and implementing appropriate safety procedures, including emergency plans.
- m) Ensuring that properly trained, qualified and competent staff is available for the decommissioning project.
- n) Performing radiological surveys in support of decommissioning.
- o) Verifying that end state criteria have been met by performing a final survey.
- p) Keeping and retaining records and submitting reports as required by the Authority

PART IV - MANAGEMENT OF DECOMMISSIONING

4.1. The Operating Organization shall ensure that its integrated management system covers all aspects of decommissioning, which shall include safety, health, security, environmental, quality and economic elements.

4.2. The Operating Organization shall ensure that the integrated management system enables the planning and implementation of decommissioning actions with the prime goal of ensuring that decommissioning is conducted safely.

4.3. The prime responsibility for safety shall remain with the Operating Organization. Where the Operating Organization delegates the performance of specified tasks to contractors the integrated management system shall make provisions to ensure that the work of contractors is appropriately specified, controlled and conducted safely.

4.4. Individuals performing decommissioning actions shall have the necessary skills, expertise and training to perform decommissioning safely. Provisions shall be made to ensure that institutional knowledge about the facility is obtained and made accessible and, as far as possible, that key staff from the facility are retained.

4.5. All individuals performing decommissioning actions shall have the responsibility to inform management of the operating organization of any concerns about safety. The Operating Organization shall ensure that processes are put in place to grant authority and support to such individuals if they decide to suspend decommissioning actions for safety reasons.

4.6. The Operating Organization shall establish methodology for issuing, modifying and terminating written work procedures which shall be reviewed by the safety department and approved by the management. Decommissioning shall be controlled through the use of the approved procedures.

4.7. Where the Operating Organization changes during the lifetime of the facility, procedures shall be put in place to ensure the proper transfer of responsibility for decommissioning to the new organization.

PART V - DECOMMISSIONING STRATEGY

5.1. The Operating Organization shall select a decommissioning strategy that will form the basis for the planning for decommissioning. The strategy shall be consistent with the:

- a. Nigeria Nuclear Fuel Cycle and Radioactive Waste Policy
- b. Fuel Cycle and Radioactive Waste Management Strategy

5.2. The selection of a decommissioning strategy shall be justified by the Operating Organization.

5.3. The Operating organization shall demonstrate that, for the selected strategy, the facility will be maintained in a safe configuration at all times and will reach the specified decommissioning end state as described in the approved final decommissioning plan, and that no undue burdens will be imposed on future generations.

5.4. The Operating Organization shall review the decommissioning strategy in the event of a sudden shutdown of a facility, on the basis of the situation that initiated the sudden shutdown, to determine whether revision of the strategy is required. Where a shutdown is caused by an accident, the facility shall be brought to a safe configuration before an approved final decommissioning plan is implemented.

5.5. The Operating Organization shall develop decommissioning strategy for sites with more than one unit of facility in a manner that ensures that interdependences between the units facilities are taken into account in the planning for individual facilities that will lead to final decommissioning plans for each unit of the facility.

5.6 The decommissioning strategy shall take into account that, until authorization has been given to implement the final decommissioning plan, the facility shall be considered an operating facility. All regulatory requirements prescribed by relevant regulations shall remain applicable unless the Authority or other National Regulatory Authorities have agreed to their reduction on the basis of a reduction of the hazards.

PART VI - FINANCING OF DECOMMISSIONING

6.1. The Operating Organization shall be responsible for financial provisions for decommissioning. These provisions shall include establishing a mechanism to provide adequate financial resources and to ensure that they are available when necessary to ensure safe decommissioning, including management of the resulting waste. This financial assurance shall be provided before authorization to operate the facility.

6.2. The cost estimate for decommissioning shall be updated by the Operating Organization on the basis of the periodic update of the initial or final decommissioning plan. The mechanism used to provide financial assurance shall be consistent with the cost estimate for the facility and shall be changed if necessary.

6.3. In the event of a sudden shutdown of the facility, the Operating Organization shall put in place a provision to use the financial resources for decommissioning when they are needed.

6.4. The Operating Organization shall ensure that financial resources are available for monitoring, surveillance and control of the facility throughout the necessary time period if the decommissioned facility is to be released with restrictions on its future use.

6.5. If financial assurance for the decommissioning of an existing facility has not yet been obtained, adequate financial resources shall be put in place as soon as possible. Approval of a renewal or extension of the authorization for operation of the facility shall include provision for financial assurance.

PART VII - PLANNING FOR DECOMMISSIONING DURING THE LIFETIME OF THE FACILITY

7.1. The Operating Organization shall prepare a decommissioning plan and maintain it throughout the lifetime of the facility, in accordance with the requirements of the Authority, in order to show that the decommissioning can be accomplished safely to meet the defined end state.

7.2. The Operating Organization shall take decommissioning into account in the siting, design, construction, commissioning and operation of the facility, by means which include features to facilitate decommissioning, the maintenance of records of the facility, and consideration of physical and procedural methods to limit contamination and/or activation.

7.3. The Operating Organization shall carry out a background survey of the site including the obtaining of information on radiological condition of the site and baseline data shall be updated prior to its commissioning. For those facilities for which no such background survey has been made in the past, data from analogous and undisturbed areas with similar characteristics shall be used instead of pre-operational baseline data.

7.4. Planning for decommissioning shall begin early in the design stage and shall continue through to termination of the authorization for decommissioning.

7.5. The Operating Organization shall prepare and submit to the Authority an initial decommissioning plan together with the application for authorization to operate the facility. This initial decommissioning plan shall be required in order to identify decommissioning options, to demonstrate the feasibility of decommissioning, to ensure that sufficient financial resources will be available for decommissioning, and to identify categories and estimate quantities of waste that will be generated during decommissioning.

7.6. The decommissioning plan shall be updated by the Operating Organization and reviewed by the Authority periodically, or when specific circumstances warrant, such as if changes in an operational process necessitate significant changes to the plan.

7.7 For existing facilities where there is no decommissioning plan, a suitable plan for decommissioning shall be prepared by the Operating Organization as soon as possible. The plan shall be periodically reviewed and updated by the Operating Organization.

7.8. The decommissioning plan shall be updated as necessary in the light of relevant operational experience gained, available lessons learned from the decommissioning of similar facilities, new or revised safety requirements, or technological developments relevant to the selected decommissioning strategy.

7.9. If an accident occurs or a situation arises with consequences relevant for decommissioning, the decommissioning plan shall be updated by the Operating organization as soon as possible and shall be reviewed by the regulatory body.

7.10. Appropriate records and reports that are relevant to decommissioning (e.g. records and reports of events) shall be retained by the Operating Organization throughout the lifetime of the facility. The design of the facility, modifications to the facility and the facility's operating history shall be identified and considered in preparing the decommissioning plans. Where permanent shutdown takes place before a final decommissioning plan has been prepared, such a plan shall be prepared as soon as possible and adequate arrangements made to ensure the safety of the facility until the approval of the final decommissioning plan.

7.11. The authorization for operation of the facility shall remain in place during a transition period (between the permanent shutdown of operations at the facility and approval of the final decommissioning plan), unless the Authority has approved modifications to the authorization on the basis of a reduction in the hazards associated with the facility. During this period, some preparatory actions for decommissioning can be performed in accordance with the authorization for operation of the facility or a modified authorization.

7.12. Prior to the conduct of decommissioning actions, the Operating Organization shall prepare a final decommissioning plan and submit to the Authority for approval.

7.13. The Operating Organization shall inform the Authority prior to shutting down a facility permanently. Where a facility is to be permanently shut down and/or is no longer used for its intended purpose, a final decommissioning plan shall be submitted to the Authority for approval THREE (3) years before the decommissioning of the facility.

7.14. The final decommissioning plan and supporting documents shall cover the following amongst others:

- i. the selected decommissioning strategy;
- ii. the schedule, type and sequence of decommissioning actions;
- iii. the waste management strategy applied, including clearance, the proposed end state and how the Operating Organization will demonstrate that the end state has been achieved;
- iv. the storage and disposal of the waste from decommissioning;
- v. the timeframe for decommissioning; and
- vi. financing for the completion of decommissioning.

7.15. The Operating Organization shall describe in the final decommissioning plan and supporting documents, all phases necessary to reach the end state. Updates of the final decommissioning plan shall include additional information for subsequent phases.

7.16. Where the final decommissioning plan or its updates include new technologies and concepts for decommissioning actions, the Operating Organization shall demonstrate that such methods are safe and can effectively achieve the desired result prior to their use.

7.17. During the preparation and updating of the final decommissioning plan the extent and type of radioactive material at the facility shall be determined by means of a detailed characterization survey and on the basis of records collected during the operational period. Where contamination or radioactive waste from operation remains at the facility, such radioactive material shall be included in the characterization survey. Additional characterization of the site for the purpose of evaluating and preventing the potential migration of radionuclides shall be considered.

7.18. Where deferred dismantling has been selected as a decommissioning strategy, the Operating Organization shall demonstrate in the final decommissioning plan and supporting documents that such an option will be implemented safely. The availability of adequate financial resources to ensure that the facility is maintained in a safe condition during the deferral period and for subsequent decontamination and/or dismantling shall be demonstrated.

7.19. Updates to the final decommissioning plan shall be made as necessary in the light of experience gained in decommissioning, or new or revised national regulations. Updates of the final decommissioning plan by the Operating Organization shall be subject to review and, if warranted, approval by the Authority.

7.20. The Operating Organization shall provide all information requested by the Authority in order to provide interested parties with an opportunity to examine the final decommissioning plan, and as appropriate and subject to national regulations, supporting documents, and to provide comments prior to its approval.

PART VIII - CONDUCT OF DECOMMISSIONING ACTIONS

8.1. The Operating Organization shall implement the approved final decommissioning plan, including the management of radioactive waste, in compliance with the applicable regulations.

8.2. In the case of deferred dismantling, the Operating Organization shall ensure that the facility is maintained in a safe configuration so that subsequent decontamination and/or dismantling can be performed.

8.3. The Operating Organization shall develop an appropriate programme for maintenance, monitoring and surveillance, which shall be subject to approval by the Authority to ensure safety throughout the period of deferral.

8.4. The Operating Organization shall select decommissioning techniques such that protection and safety is optimized, protection of the environment is ensured, the generation of waste is minimized and any potential negative impact on the storage and disposal of waste minimized.

8.5. The impact of decontamination, cutting and handling of large components shall be assessed and managed so that the potential consequences of new hazards are prevented or are detected and mitigated.

8.6. During decommissioning, the Operating Organization shall maintain an up to date list of structures, systems and components important to safety. Such structures, systems and components can progressively be declassified and dismantled as the decommissioning progresses, provided that the facility's inspection and maintenance programme is updated accordingly.

8.7. Emergency response arrangements for decommissioning, commensurate with the hazards, shall be established and maintained by the Operating Organization and events significant to safety shall be reported to the Authority in a timely manner.

8.8. A proper waste management path shall be established by the operating organization for all waste streams arising from decommissioning activities.

8.9. Prior to starting decommissioning, the Operating Organization shall ensure the availability of adequate processing and storage capabilities and transport packages for the radioactive waste.

8.10. The Operating Organization shall ensure traceability for all waste generated during decommissioning.

8.11. The Operating Organization shall maintain up to date records of the waste generated, stored in the facility, or transferred to another authorized facility, specifying its quantities, characteristics, treatment methods and destination.

8.12. Where operational radioactive waste or nuclear fuel is present in the facility after its permanent shutdown, such material shall be removed prior to the conduct of decommissioning actions and shall be transported to an authorized facility in compliance with the applicable

transport regulations. In case such removal is not possible during the period of transition between permanent shutdown and the granting of the authorization for decommissioning, the approved final decommissioning plan shall address the removal of these materials as part of decommissioning. In both cases, the management of such material shall be carried out in accordance with the relevant Authority requirements.

PART IX - COMPLETION OF DECOMMISSIONING ACTIONS AND TERMINATION OF THE AUTHORIZATION FOR DECOMMISSIONING

9.1. On the completion of decommissioning actions, the Operating Organization shall demonstrate that the end state criteria as specified in the final decommissioning plan and any additional regulatory requirements have been met.

9.2. A final decommissioning report shall be prepared by the Operating Organization that demonstrates the end state of the facility as specified in the approved final decommissioning plan has been reached and submitted to the Authority for approval.

9.3. If the approved decommissioning end state is release from regulatory control with restrictions on the future use of the remaining structures, the Operating Organization shall establish appropriate controls and programmes for monitoring and surveillance to be implemented and maintained for the optimization of protection and safety, and protection of the environment. These controls and programmes shall be subject to approval by the Authority. Responsibility for implementing and maintaining these controls and programmes shall be clearly assigned. The Authority shall ensure that a mechanism is put in place to ensure compliance with the restrictions on the future use of the facility and/or the site.

9.4. Where radioactive waste is stored on the site after decommissioning has been completed, the Operating Organization shall seek for a revised or new, separate authorization from the Authority, for the waste storage facility. This authorization shall include requirements for the decommissioning of the storage facility.

9.5. Where part of the site is released from regulatory control, the Operating Organization shall seek for a revised or new, separate authorization from the Authority for the remainder of the site remaining under regulatory control.

9.6. The Operating Organization shall address Inputs from the public before authorization for decommissioning is terminated.

9.7. The Operating Organization shall establish a system to ensure that all records are maintained in accordance with the requirements for retention of records specified in the integrated management system and with the regulatory requirements. This system shall ensure that the new users of the site after its release from regulatory control are informed about the presence of a facility on the site in the past, and about the nature of the activities that were conducted at the site.

PART X - OFFENCES AND PENALTIES

10.1. Any person who contravenes any of the provisions of these Regulations has committed an offence

10.2. Anyone who commits an offence under these regulations shall be liable to the penalties as established in the enforcement policy issued by the Authority.

10.3. The Authority shall impose penalties such as suspension or revocation of authorization, imposing administrative fine or closure of facility or any combination of these

10.4. The person or corporate body who, being a holder of authorization under this regulations, who commits an offence shall be liable to prosecution in the court of law and upon conviction be liable to pay fines up to ₦10, 000,000 for an individual and up to ₦100, 000,000 for a corporate body or be given a jail term of up to ten years or both.

10.5. Any person or organization may appeal to the Board of the Authority against any decision made by the Authority pursuant to these regulations.

10.6. These Regulations may be cited as the Nigerian Regulations for Decommissioning of Nuclear Power Plants, 2016.

References

- i. INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Facilities GSR Part 6, IAEA, Vienna (2014)
- ii. Draft Nigerian Safety Of Research Reactors Regulations (2016)
- iii. Nuclear Safety and Radiation Protection Act 19 of 1995
- iv. INTERNATIONAL ATOMIC ENERGY AGENCY, IAEA Safety Glossary Terminology Used in Nuclear Safety and Radiation Protection, 2007 Edition, IAEA, Vienna (2007).