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SECURITY DURING THE LIFETIME OF A NUCLEAR FACILITY

DRAFT IMPLEMENTING GUIDE

INTERNATIONAL ATOMIC ENERGY AGENCY
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FOREWORD

(Standard NSS Foreword to be added.)

CONTENTS

1. INTRODUCTION

BACKGROUND

1.1. Nuclear facilities have long lifetimes, from earliest planning through to decommissioning. Historically, nuclear facilities have often been designed without giving sufficient consideration to nuclear security until late in the design stage or after operational and safety features had already been determined. Nuclear security measures were added later, which often resulted in application of measures that were not integrated or fully compatible with safety, safeguards, operational and other requirements. Implementing new or additional nuclear security measures after a nuclear facility is in operation may be difficult and costly. Considering security requirements early in new designs, partial redesigns or modifications will result in a nuclear security regime that is more efficient and effective, and better integrated with other measures.

1.2. The Nuclear Security Fundamentals [1] set out essential elements of a State's nuclear security regime. The Nuclear Security Recommendations for nuclear material and nuclear facilities [2] and supporting guidance on implementing the Recommendations [3] describe physical protection measures for nuclear material and nuclear facilities consistent with those essential elements. These guidance publications indicate that nuclear security measures should be planned and introduced as early as possible in the lifetime of a nuclear facility, but focus primarily on measures that need to be in place during operation of the facility. This Implementing Guide provides guidance on appropriate nuclear security measures during all stages in the lifetime of a nuclear facility.

1.3. The IAEA's 'Milestones' publication on developing a national infrastructure for nuclear power [4] divides the lifetime of nuclear facilities leading up to operation into three phases, and specifies actions necessary to achieve defined milestones by the end of each phase. This structure has been followed in IAEA guidance on developing the necessary infrastructure for nuclear security [5] and for safety [6], and is broadly followed in this Implementing Guide. The eight more specific stages in the complete lifetime of a nuclear facility referred to in this Implementing Guide (including operation and post-operation stages) are broadly consistent with those defined for the IAEA safety standards.

OBJECTIVE

1.4. The objective of this document is to provide guidance to States, competent authorities and operators on appropriate nuclear security measures during the different stages in the lifetime of a nuclear facility, from initial planning through to final decommissioning, to ensure that effective nuclear security is maintained at a level appropriate to each stage, and in the transition between stages.

SCOPE

1.5. The focus of this publication is on the nuclear security of nuclear material and nuclear facilities throughout the lifetime of such a facility, and the approaches described may be used for all types of nuclear facilities. It provides a systematic approach to implementing the recommendations contained in Ref. [2] for all stages of a nuclear facility's lifetime, and should be used in conjunction with other relevant IAEA guidance as indicated. It does not specifically address the security of nuclear material during transport or the security of other radioactive material, which are addressed in other guidance within the Nuclear Security Series [7–9]. However, the general concepts and guidance may also be applicable, using a graded approach, to the nuclear security of radioactive material and associated facilities.

1.6. This Implementing Guide is written in a manner to maintain consistency with the framework defined in Ref. [4] and followed in Refs [5] and [6]. It is assumed that the actions for the establishment of the State's nuclear security regime set out for Phase 1 in Ref. [4] have already been completed.

1.7. This publication includes some consideration of the different phases and stages described in nuclear safety standards and safeguards publications. The actions described for nuclear security will need to be performed within the same timeframes and in close coordination with these other areas in order to provide the right balance between nuclear safety andsecurity, safeguards and operational requirements. Nuclear safety measures and nuclear security measures have in common the aim of protecting human life and health, society and the environment. Nuclear safety and nuclear security measures must be designed and applied in an integrated manner, and as far as possible in a complementary manner, so that security measures do not compromise safety and safety measures do not compromise security. In dealing with interfaces between nuclear safety and nuclear security, it must be borne in mind that nuclear safety and nuclear security are likewise important, and measures

to be taken must be mutually acceptable in both areas. However, the corresponding nuclear safety and safeguards actions are outside the scope of this publication, as guidance on nuclear safety and nuclear safeguards are issued in other IAEA publications.

STRUCTURE

1.8. Following this introduction, Section 2 of this document provides a description of the concept of security during the lifetime of a nuclear facility, along with the principles of the concept. Section 3 defines the specific stages during the lifetime of a nuclear facility, for the purposes of this Implementing Guide. Section 4 details actions for implementing nuclear security measures during each stage in the lifetime of a nuclear facility, derived either from existing IAEA publications or other relevant references.

2. THE LIFETIME OF A NUCLEAR FACILITY

FACILITY STAGES FOR NUCLEAR SECURITY

2.1 During its lifetime, a nuclear facility goes through many stages, from earliest planning for a new nuclear facility to its final decommissioning. Various disciplines have divided the facility lifetime into stages to suit their specific needs. For purposes of nuclear security, the lifetime of a nuclear facility has been divided into the following eight stages: planning; siting; design; construction; commissioning; operation; cessation of operation; and decommissioning.

2.2 Detailed descriptions of the eight stages are provided below. Although not an explicitly defined stage, there are unique periods during the lifetime of a nuclear facility when it is undergoing some type of modification during a defined stage. This primarily occurs in the operation stage, but may occur in other stages as well. An example is the construction of a new nuclear power plant at an existing operational nuclear site, requiring changes in the physical protection measures on the whole site to account for the new power plant.

2.3. The **planning** stage of a nuclear facility includes activities such as conceptual design, obtaining required approvals, etc., prior to authorization to begin formal siting and design stages.

2.4. The **siting** stage for a nuclear facility generally consists of consideration of candidate sites by taking into account various factors such as available infrastructure and workforce,

geographical and security considerations, followed by a detailed evaluation of the candidate sites which culminates in a request for and approval of a selected site.

2.5. In some cases, the **design** stage is an iterative process, from conceptual design through final design, resulting in a request for approval to construct a nuclear facility. In other cases, when the facility design is procured from a vendor, the designs may be developed and approved prior to siting of the facility.

2.6. The **construction** stage is the process of manufacturing, acquiring, and assembling the components of a nuclear facility, the incorporation of associated public works, the installation of components and equipment, and the performance of associated tests.

2.7. The **commissioning** stage includes the process by means of which systems and components of facilities and activities, having been constructed, are made operational and verified to be in accordance with the design and to have met the required performance criteria.

2.8. The **operation** stage includes activities performed to achieve the purpose for which a nuclear facility was constructed. The operation stage includes all routine and emergency operations of the facility.

2.9. The **cessation of operation** stage describes a planned condition at a nuclear facility where facility operations have ceased either permanently in preparation for decommissioning or for an extended period of time for major modifications, maintenance or repair.

2.10. The **decommissioning** stage includes the administrative and technical actions taken to remove the nuclear material and other assets, which form the basis for regulatory controls of a nuclear facility. For purposes of nuclear security, the regulatory controls can be removed when nuclear and other radioactive materials no longer remain at the facility and there is no potential for theft of nuclear material or an act of sabotage that causes an unacceptable radiological consequence.

RELATIONSHIP TO OTHER IAEA PUBLICATIONS

2.11. Several IAEA publications address the infrastructure needed for new nuclear facilities. The ‘Milestones’ publication [4] defines three phases in the development of a national nuclear power programme with associated actions and milestones leading up to operation of the first nuclear power plant. Although focused on nuclear power, this may be useful for any State developing a nuclear programme, even if solely for research and development and not associated with nuclear power. Ref. [4] defines Phase 1 (leading to Milestone 1) to include

the preparatory work in order to make informed decisions about a potential nuclear programme, which is largely prior to the first stage considered in this Implementing Guide. Phase 2 (leading to Milestone 2) includes the development of infrastructure required to begin and supervise construction, which corresponds approximately to the planning stage in this Implementing Guide. Phase 3 (leading to Milestone 3) includes the construction of a nuclear facility, ready to commission and operate, and so includes the siting, design and construction stages in this Implementing Guide.

2.12. The actions defined in Ref. [5] to be taken during Phase 1 are related to the establishment of the framework for a national nuclear security regime within the State. For the purposes of this Implementing Guide, all of these actions are assumed to have been completed, or to be in progress, as defined in Refs [1], [2] and [5]. The framework assumed to already be in place includes:

(a) Development of national policies and strategies for nuclear security.

(b) Establishment of the national legal and regulatory framework for nuclear security.

(c) Identification of competent authorities along with roles and responsibilities.

(d) Identification of human and financial resources necessary for implementation of national security strategies and policies.

(e) Development of human resource capabilities to effectively oversee the nuclear security regime.

(f) Recognition of the importance of nuclear security culture in national security strategies and policies.

(g) Implementation of a strategy to sustain the nuclear security regime.

2.13. Other IAEA publications address the necessary steps to be taken in developing the infrastructure needed for nuclear security [5] and safety [6] to support a nuclear power programme. Refs [5] and [6] use the three phases defined in Ref. [4] as the basis for defining nuclear security and safety actions, respectively, that should be taken by States, competent authorities, and nuclear facility operators during each phase.

2.14. A balance needs to be achieved between the various requirements during all stages in the lifetime of a nuclear facility. These requirements are derived from many sources, including safety, nuclear security, safeguards and operational goals. Ideally, the measures implemented in each area to meet these requirements would complement each other, but in

some cases, the requirements may conflict with one another. Informed and balanced decisions are needed, giving equal consideration to the different requirements from the outset, to exploit synergies where they exist and minimize conflicts between different requirements. In particular, nuclear security and safety measures should be designed and implemented in an integrated manner so that security measures do not compromise safety and safety measures do not compromise security.

ADDITIONAL CONSIDERATIONS

2.15. In this publication, the stages are defined as clear, distinct and separate. However, in practice a nuclear site may be in different stages simultaneously, stages may overlap, nuclear facilities on the site may transition from one stage to another, and a facility may have modifications during a stage that affect physical protection measures. For example:

(a) The operator of a nuclear site with three nuclear power plants receives approval to construct a fourth power plant on the same site while continuing operation of the original three. Part of the site remains in the operation stage, while the new power plant progresses from the design through commissioning stages followed by an operation stage with four power plants.

(b) During the operation stage of a nuclear facility, modifications affecting physical protection measures are completed, including change of a security boundary, addition of new target locations, removal of a target location, and installation of a new perimeter intrusion detection system. While the facility remains in the operation stage, physical protection equipment may be designed, constructed, tested and placed into operation.

2.16. This Implementing Guide identifies the major actions for the State, the competent authority and the operator for each stage during the lifetime of a nuclear facility. Consideration also needs to be given to the sequence in which such actions are implemented; for example:

(a) Some actions may need to be performed in a specific sequence, and the timing of specific actions identified in the stages set out in this Implementing Guide might not exactly match this sequence. Some actions may be implemented at any time within a stage, or are performed throughout the stage, while others need to be implemented at a

specific time. The State, the competent authority, and the operator should adapt the timing of actions as necessary according to their circumstances and requirements.

(b) Some actions are common to more than one stage. For clarity and completeness, these are included in all of the relevant stages.

3. SECURITY MEASURES DURING EACH STAGE

OVERVIEW

3.1 Nuclear security is essential to protecting nuclear material and nuclear facilities during all stages. The objectives, as defined in the Nuclear Security Recommendations [2], during all stages are:

(a) To protect against unauthorized removal

(b) To locate and recover missing nuclear material

(c) To protect against sabotage

(d) To mitigate or minimize effects of sabotage

3.2 This section focuses on nuclear security related actions consistent with Ref. [2], which the State, competent authorities, and operators should implement to protect nuclear material and nuclear facilities within a State's nuclear security regime. These actions are applicable to new facilities as well as existing facilities, although existing facilities may already have elements of these actions in place. Some aspects of security, such as information security and computer security, should be consistently maintained throughout all stages in the lifetime of a nuclear facility. Some State actions could be delegated to the competent authority by the State as deemed appropriate.

STAGE 1: PLANNING STAGE

Planning stage considerations

3.3 Security requirements for a new nuclear facility should be identified during the planning stage. Major policy decisions will be made during this stage, and the importance of nuclear security should be recognized and reflected in these decisions.

3.4 A new nuclear facility can affect and be affected by the national and local security environment. This influence should be adequately considered in the planning stage of the facility. Additionally, various organizations may be involved in fulfilling all the requirements of the State.

3.5 Nuclear security considerations at this stage, for the State, the competent authority and the operator, include:

(a) Specific nuclear security requirements based on the risks for the proposed facility and the type and quantity of nuclear material expected to be in use or storage at the facility.

(b) Integrating nuclear security requirements with operational goals and safety requirements in the facility design specifications.

(c) Identifying nuclear security roles and responsibilities and assigning them to the various organizations involved.

(d) Establishing a framework for communication among all relevant stakeholder organizations (nuclear safety, security, safeguards, and facility operations).

(e) Identifying and developing security competencies (human resources, technical capabilities, etc.) necessary to implement the nuclear security system.

(f) Raising awareness of security issues among all relevant stakeholders organizations.

Planning stage actions

3.6 The following actions should be completed during the planning stage of a nuclear facility.

State actions

Action 1-1: The State should establish legislation to give appropriate legal authority to the competent authority(ies).

Action 1-2: The State should define and assign roles and responsibilities and organizational relationships for all involved organizations within the nuclear security regime, including evaluating applications, granting licenses or authorizations and inspection of nuclear facilities and activities..

Action 1-3: The State should develop a threat assessment or a design basis threat (DBT).

Action 1-4: The State should develop a trustworthiness policy.

Action 1-5: The State should establish requirements for protecting the confidentiality of information. The requirements should address limiting access to sensitive information to those whose trustworthiness has been established appropriate to the sensitivity of the information and who have the need to know in the performance of their job functions.

Action 1-6: The State should define thresholds for unacceptable radiological consequences as well as other objectives to be met. **Or** The State should determine appropriate physical protection levels to be implemented using a graded approach, applying the more stringent security measures to facilities with the potential for high radiological consequences.

Action 1-7: The State should establish a policy for nuclear security culture for the competent authority and operators.

Action 1-8: The State should establish a sustainability programme to ensure that its nuclear security regime remains effective by committing the necessary resources.

Competent authority actions

Action 1-9: The competent authority should recruit, train, and qualify staff to ensure adequate nuclear security knowledge and expertise to regulate nuclear facilities and activities and implement elements of a sustainability programme to maintain the necessary competence.

Action 1-10: The competent authority should develop nuclear security requirements in the areas of physical protection, information security, computer security, sustainability, contingency planning, crisis management, incident reporting, trustworthiness, quality assurance, nuclear security culture, and nuclear material accounting and control (NMAC) for security purposes and define in which stages they should be applied.

Action 1-11: The competent authority should ensure its plans and procedures for licensing and inspections are sufficiently robust to address each stage of a nuclear facility.

Action 1-12: The competent authority should ensure the operator has relevant information from the threat assessment or DBT to fulfil their obligations during each stage.

Operator actions

Action 1-13: The operator should determine expected quantity and type of nuclear material at the facility and its associated category to determine which State requirements for protection from theft will apply.

Action 1-14: The operator should conduct a preliminary analysis of the material proposed for the facility to determine potential radiological consequences from sabotage.

Action 1-15: The operator should promote awareness and conduct training to ensure organizations and individuals involved in planning fully understand security policies and responsibilities.

Action 1-16: The operator should require security organizations to be represented in all planning activities.

Action 1-17: The operator should coordinate its nuclear security activities with safety, safeguards, and facility operations to avoid conflicts and find synergies.

Action 1-18: The operator should identify the resources and organizational structure needed to implement its nuclear security strategy.

Action 1-19: The operator should develop a programme to protect sensitive information, including protection measures, and need-to-know procedures consistent with requirements from the State and competent authority.

Action 1-20: The operator should implement nuclear security requirements for physical protection, computer security, sustainability, contingency planning, crisis management, incident reporting, trustworthiness, quality assurance, nuclear security culture, and NMAC as applicable during this stage.

STAGE 2: SITING STAGE

Siting stage considerations

3.7 The suitable siting of a nuclear facility from a security point of view is important for effective and sustainable security. The location of the facility could potentially increase its vulnerability to external security threats as well as the potential consequences resulting from malicious acts, and may involve the need for agreements with neighbouring States. Security considerations should be evaluated with safety and other considerations in the selection of a site for a facility, including seismic activity, geology, meteorology, hydrology and population distribution.

3.8 Nuclear security considerations at this stage for the State, the competent authority, and the operator include:

(a) Local/regional threats

(b) Location of the site in relation to population, critical infrastructure, airports and other transportation assets, and international borders

(c) Topography that may enhance or increase the vulnerability of the security of site, e.g., adjacent roadways or hills, which may aid in a stand-off attack

(d) Potential impact of radiological releases to the environment or populated areas

(e) Availability of sufficient off-site forces to respond in a timely manner to a security event to support on-site forces

(f) Room for site reconfiguration, including expansion, if security needs are increased (e.g., sufficiently sized security areas around the facility)

Siting stage actions

3.9 The following actions should be completed during the siting stage of a nuclear facility.

State actions

Action 2-1: The State should examine treaties, agreements, security conditions and relationships with neighbouring States to determine impact on site selection.

Action 2-2: The State should ensure arrangements and protocols for on-site and off-site response, and provide the information to the operator to aid in site selection decisions.

Action 2-3: The State should approve the final site selection, if required, considering nuclear security factors, and interfaces with safety.

Competent authority actions

Action 2-4: The competent authority should ensure that national and local threat information is considered in the siting criteria.

Action 2-5: The competent authority should ensure that site characteristics, including major security criteria, are considered during site selection.

Operator actions

Action 2-6: The operator should analyse site characteristics including major security criteria, particularly national and local threat information, during site selection and provide the results to the State or the competent authority as applicable.

Action 2-7: The operator should evaluate the availability of infrastructure, including availability of response to a nuclear security event, needed for effective nuclear security.

Action 2-8: The operator should develop programmes for selection, qualification and training of security personnel who will support the design effort.

Action 2-9: The operator should implement nuclear security requirements for physical protection, computer security, information security, sustainability, contingency planning, crisis management, incident reporting, trustworthiness, quality assurance, nuclear security culture, and NMAC as applicable during this stage.

STAGE 3: DESIGN STAGE

Design stage considerations

3.10 During this stage, security requirements should be integrated into the overall design requirements, to ensure that conflicts between safety, safeguards and security requirements are resolved appropriately, and to ensure that the final design incorporates all security requirements. The design stage of a nuclear facility affords the opportunity to make major design decisions that help make nuclear security intrinsic in the facility over its entire lifetime.

3.11 It is important that the design team includes security personnel to ensure nuclear security requirements and considerations are well understood. Effective management of the interface between safety and security includes implementing safety and security requirements in such a way that they are mutually supportive. It is also desirable to minimize conflicts with other design requirements (e.g., safeguards and facility operations) while taking advantage of opportunities for complementary and synergistic design, for example by eliminating potential vulnerabilities with suitable engineering solutions.

3.12 Nuclear security considerations at this stage for the State, the competent authority, and the operator include:

(a) Developing nuclear security design requirements for inclusion in the overall facility design specifications using State nuclear security requirements, State developed threat assessments or DBT, and preliminary facility analyses.

(b) Characterizing the planned nuclear facility, the nuclear material, and evaluating possible consequences of radiological sabotage, to determine the required protection levels for the facility.

(c) Determining the number, type, and location of required security areas including protective layers providing defence in depth.

(d) Determining location and type of critical security assets such as the central alarm station and guard stations.

(e) Identifying synergies and resolving conflicts between nuclear security requirements and those of other disciplines as early in the design stage as practicable such as balancing the access needs for safety and security.

(f) Reviewing a final design procured from a vendor, to determine if facility-specific changes are required in the design stage to meet security requirements.

Design stage actions

3.13 The following actions should be considered during the design stage of a nuclear facility.

Competent authority actions

Action 3-1: The competent authority should ensure a threat assessment or DBT and relevant nuclear security requirements are provided to the operator for development of a comprehensive set of security requirements for use during the design of the facility.

Action 3-2: The competent authority should ensure that design modifications remain in compliance with nuclear security requirements.

Action 3-3: The competent authority should assess the final design of a facility to ensure that it meets nuclear security requirements for protection of nuclear facilities and nuclear materials before licensing or granting authorization.

Operator actions

Action 3-4: The operator should determine the nuclear security measures against theft or sabotage, which should be included in the design. The determination should include the number and type of security areas (limited access, protected, inner, and vital), including material balance areas (MBAs) used for NMAC.

Action 3-5: The operator should develop and implement an information security programme based on State requirements for sensitive information used or generated during the design stage.

Action 3-6: The operator should identify the category of nuclear material for theft and possible radiological consequences of sabotage, to implement nuclear security design requirements, including MBA design requirements for NMAC, as required by the applicable regulations.

Action 3-7: The operator should require security organizations to be included in design activities.

Action 3-8: The operator should coordinate nuclear security design measures with other disciplines (e.g. safety, safeguards and operations) to compare relevant requirements, identify synergies and resolve potential conflicts.

Action 3-9: The operator should evaluate technologies and components (e.g. barriers, sensors and assessment systems) to determine which may best meet physical protection and NMAC requirements (such as controls to enforce a two-person rule). This information should be used to develop detailed design specifications for physical protection equipment.

Action 3-10: The operator should review all engineering and design packages for inclusion of security measures.

Action 3-11: The operator should ensure that the final nuclear facility design, and any subsequent facility design changes that affect nuclear security, meets nuclear security requirements.

Action 3-12: The operator should provide the final design of the physical protection equipment, as well as other systems and equipment (such as NMAC) that contribute to nuclear security, to the competent authority for assessment and approval.

Action 3-13: The operator should provide subsequent design changes of the physical protection equipment and other systems that contribute to nuclear security, to the competent authority as required, incorporating the concept of configuration management as defined in Ref. [2].

Action 3-14: The operator should implement nuclear security requirements for physical protection, computer security, information security, sustainability, contingency planning, crisis management, incident reporting, trustworthiness, quality assurance, nuclear security culture, and NMAC as applicable during this stage.

STAGE 4: CONSTRUCTION STAGE

Construction stage considerations

3.14 The primary security considerations during the construction stage of a nuclear facility are to ensure that the facility security requirements are implemented as designed and appropriate security measures are implemented during the various stages of construction.

3.15 At or near the end of construction, physical protection measures should be tested to determine that they are installed and operate correctly in preparation for the commissioning stage. Three types of testing are commonly conducted, namely functional, operational and performance tests. Functional tests are conducted to determine if systems and components operate as designed. An example of a functional test is a test of a door sensor to determine if the sensor contacts operate properly when the door is opened. Operational tests are conducted to determine if personnel use the systems or components correctly. An example of an operational test is a test to determine if an operator can interact with the alarm system and activate or deactivate the alarms in a secure area when directed. Performance tests are conducted to determine if an overall system or a component meets its design objectives. An example of a performance test is a test to determine if a person climbing the perimeter fence is detected by the alarm system, and if the alarm is correctly assessed as a human intrusion by the alarm system operator.

3.16 Nuclear security considerations at this stage for the State, the competent authority, and the operator include:

(a) Ensuring the construction and installation of nuclear security related facilities and equipment meets design specifications.

(b) Providing protection to the areas which house critical components, hazardous material, and radioactive sources (used for activities such as radiography) during construction, and prevention of the introduction of contraband or tampering with facilities or equipment that may be used to perform or to aid in a malicious act when the facility becomes operational. These protection measures are typically described in a construction security plan.

(c) Conducting preparatory activities, such as establishing a security organization, conducting training, and developing plans and procedures to enable the security organization to be ready to operate after commissioning of the facility.

(d) Conducting acceptance and validation testing of physical protection equipment, as well as other systems and equipment that contribute to nuclear security, after installation to ensure they meet functional, operational, and performance requirements.

(e) Isolating construction activities from facilities that are in an operational stage.

Construction stage actions

3.17 The following actions should be completed during the construction stage of a nuclear facility.

State actions

Action 4-1: The State should ensure implementation of requirements for trustworthiness checks of personnel with access to sensitive information or access to security areas. The State may also consider trustworthiness checks or other measures for personnel who perform sensitive or critical functions concerning nuclear security.

Competent authority actions

Action 4-2: The competent authority may review and approve the operator's construction security plan, if required, prior to the start of construction.

Action 4-3: The competent authority should ensure the operator has a management system that integrates nuclear security into the overall management system of the facility, including security personnel training and qualifications.

Action 4-4: The competent authority should establish quality assurance requirements for the procurement, installation, and acceptance testing of security systems and components.

Operator actions

Action 4-5: The operator should implement a programme for trustworthiness checks of personnel with access to sensitive information, such as facility drawings or systems during the construction stage.

Action 4-6: The operator should integrate nuclear security into the facility management system, including implementing security personnel training and qualification processes.

Action 4-7: The operator should develop organizational relationships for nuclear security during the construction stage, including roles and responsibilities, job descriptions and interface with external agencies (e.g. law enforcement, intelligence and customs agencies).

Action 4-8: The operator may develop a construction security plan for the construction stage and provide it to the competent authority for approval prior to the start of construction activities, if required. Procedures to implement the construction security plan should be developed.

Action 4-9: The operator should implement the measures defined in the construction security plan to ensure adequate protection of facilities, critical equipment, and other assets during construction.

Action 4-10: The operator should implement a configuration management programme to ensure design changes during construction do not impact the ability to meet security requirements.

Action 4-11: The operator should ensure physical protection equipment, other systems and equipment that contribute to nuclear security, and security support systems, are securely procured and, if necessary, kept in secured storage until installation.

Action 4-12: The operator should ensure installation of physical protection equipment, other systems and equipment that contribute to nuclear security, and security support systems, such as backup power, meets specifications.

Action 4-13: The operator should conduct security related training activities for facility personnel, including those in the security organization.

Action 4-14: The operator should conduct acceptance tests of physical protection equipment, as well as other systems and equipment that contribute to nuclear security, after installation to ensure they meet defined functional, operational and performance requirements.

Action 4-15: The operator should implement nuclear security requirements for physical protection, computer security, information security, sustainability, contingency planning, crisis management, incident reporting, trustworthiness, quality assurance, nuclear security culture, and NMAC as applicable during this stage.

STAGE 5: COMMISSIONING STAGE

Commissioning stage considerations

3.18 The commissioning stage is a progressive transition between construction and operation of the nuclear facility. Commissioning has the objective of demonstrating that the facility as constructed meets the design requirements, including that all physical protection measures are

effective and meet the security requirements. This stage also includes the administrative and technical actions, which form the basis for regulatory controls of a nuclear facility, taken to introduce the nuclear material.

3.19 Nuclear security considerations at this stage for the State, the competent authority, and the operator include:

(a) Validating that the facility's nuclear security plans, operating procedures, assessment procedures, contingency and emergency procedures are adequate.

(b) Verifying that all physical protection equipment, as well as other systems and equipment that contribute to nuclear security, functions and meets the requirements as designed.

(c) Implementing compensatory measures if physical protection measures or other systems and equipment that contribute to nuclear security are not fully operational upon arrival of the nuclear material into the nuclear facility, to provide protection until they are fully operational.

(d) Familiarizing the facility personnel, including operating, maintenance, and technical staff with the nuclear security processes and procedures.

(e) Developing a commissioning protocol to provide evidence the nuclear facility as constructed meets the design intent and complies with nuclear security requirements.

(f) Evaluating the physical protection measures described in the nuclear security plan through assessments, including performance testing.

(g) Identifying and correcting deficiencies in the nuclear security processes and procedures.

Commissioning stage actions

3.20 The following actions should be completed during the commissioning stage of a nuclear facility.

State actions

Action 5-1: The State should ensure off-site response forces are familiar with the facility.

Competent authority actions

Action 5-2: The competent authority should require the operator to develop plans that describe the verification processes and acceptance criteria for physical protection equipment, as well as other systems and equipment that contribute to nuclear security.

Action 5-3: The competent authority should carry out inspections to ensure that overall nuclear security meets requirements.

Action 5-4: The competent authority should implement an approval process for review of the nuclear security plan including the contingency plan.

Action 5-5: The competent authority should perform an assessment of the physical protection measures, as validated by the operator using acceptance tests, and approve them before implementation.

Action 5-6: The competent authority should assess and approve the operator's nuclear security plan, including the contingency plan. Implementation of the nuclear security plan should then be a part of the licence conditions.

Operator actions

Action 5-7: The operator should ensure the security organizational structure is in place.

Action 5-8: The operator should develop acceptance criteria for security systems.

Action 5-9: The operator should implement approved compensatory measures in case of security system failure.

Action 5-10: The operator should conduct functional, operational and performance testing of security systems in accordance with requirements from the competent authority to ensure they meet nuclear security requirements.

Action 5-11: Prior to the operation stage, the operator should document compliance with regulatory requirements in the nuclear security plan, including the contingency plan, and submit the nuclear security plan for approval to the competent authority.

Action 5-12: The operator should ensure adequate provision is made for the availability of necessary resources (personnel, support systems, resources for use in an emergency, information and knowledge, resources for the working environment, infrastructure, financing and materials) for commissioning.

Action 5-13: The operator should test the validity of operational plans and procedures and provide an opportunity for security personnel to learn skills and to acquire experience in operating the security systems.

Action 5-14: The operator should implement nuclear security requirements for physical protection, computer security, information security, sustainability, contingency planning, crisis management, incident reporting, trustworthiness, quality assurance, nuclear security culture and NMAC as applicable during this stage.

STAGE 6: OPERATION STAGE

Operation stage considerations

3.21 The primary security consideration during the operation stage is to ensure sustained, effective nuclear security and protect the nuclear facility against potential malicious acts. The elements of nuclear security are described in a nuclear security plan, which is the basis for oversight by the competent authority and is part of the license or authorization of the facility. Major changes and modifications to the facility's nuclear security are subject to review and approval by the competent authority.

3.22 Nuclear security considerations at this stage for the State, the competent authority, and the operator include:

(a) Testing the effectiveness of the nuclear security plan, the contingency plan and procedures through inspections and performance evaluations, including security exercises and drills.

(b) Ensuring a formal process is in place to evaluate the impacts on nuclear security from proposed operational changes, safety changes, or facility modifications prior to implementation.

(c) Ensuring a formal process is in place to evaluate the impacts on operations or safety from proposed nuclear security changes prior to implementation.

(d) Ensuring compensatory measures are developed to address failure of parts of the nuclear security system or due to results of assessments, exercises, or drills that indicate system performance weaknesses or non-compliance with requirements.

(e) Maintaining an appropriate nuclear security culture.

(f) Ensuring changes in the threat environment are addressed as appropriate by changes to the nuclear security system.

(g) Developing a sustainability and quality assurance programme to ensure effective nuclear security.

Operation stage actions

3.23 The following actions should be completed during the operation stage of a nuclear facility.

State actions

Action 6-1: The State should prepare its contingency plan for the response to nuclear security events and conduct exercises to assess and validate the plan.

Action 6-2: The State should periodically review its threat assessment or DBT and nuclear security requirements, and revise as necessary.

Competent authority actions

Action 6-3: The competent authority should perform inspections during the operation stage.

Action 6-4: The competent authority should review and approve the operator's analyses of the nuclear material categorization and potential radiological consequences that are used to determine the effects of sabotage, with the aim to determine appropriate levels of nuclear security as required by the applicable regulations.

Action 6-5: The competent authority should require regular reviews and updates of nuclear security plans with a defined frequency to ensure they reflect current conditions at the nuclear site and changes in the threat assessment, DBT, or nuclear security requirements.

Action 6-6: The competent authority should periodically review the interface between the contingency plans of the State and the operator to ensure they are consistent and integrated.

Action 6-7: The competent authority should implement and maintain training and qualification for its personnel who perform nuclear security functions.

Operator actions

Action 6-8: The operator should maintain and update the nuclear security plan, including the contingency plan, and provide updates to the competent authority for approval as part of the licence conditions as required.

Action 6-9: The operator should implement NMAC for nuclear security purposes to update information such as the material type, form, quantity, and location of nuclear materials, along with a system of approvals and record-keeping at the facility.

Action 6-10: The operator should continually monitor changes to the categories of nuclear materials at the facility, as required by the applicable regulations for protection against theft, and adjust physical protection measures as necessary.

Action 6-11: The operator should perform analyses to determine whether changes in the inventory of the nuclear and other radioactive materials, or modifications to plant equipment, systems, or devices, have the potential to result in unacceptable radiological consequences from sabotage.

Action 6-12: The operator should implement configuration management processes to ensure nuclear security plans, procedures and other documents are developed, assessed and updated as necessary.

Action 6-13: The operator should prepare a contingency plan for the response to nuclear security events and ensure it is coordinated with the State contingency plan. The contingency plan should also include procedures to coordinate with relevant State agencies.

Action 6-14: The operator should implement protection measures for computer-based systems used for physical protection, nuclear safety, and NMAC are consistent with applicable requirements.

Action 6-15: The operator should ensure training and qualification for all facility personnel who perform nuclear security functions, as well as awareness training regarding nuclear security for all facility personnel are part of the sustainability programme.

Action 6-16: The operator should develop, implement and maintain a plan for compensatory measures to implement whenever the physical protection measures are determined to be incapable of providing the required level of protection.

Action 6-17: The operator should develop a human resources management programme, including measures for monitoring an individual’s suitability for duty in performing nuclear security functions.

Action 6-18: The operator should ensure that a mechanism exists to ensure the availability of technical services and expertise as necessary to maintain functionality of physical protection equipment, as well as other systems and equipment that contribute to nuclear security.

Action 6-19: The operator should conduct regular security exercises and drills for all potential operational conditions, including coordination with off-site resources, to ensure continued validity of the contingency plan and procedures.

Action 6-20: The operator should conduct regular evaluation, including periodic performance testing, to validate the effectiveness of individual nuclear security measures as well as the efficiency of nuclear security as a whole. This testing protocol should assess the performance of physical protection measures and security personnel, including response forces.

Action 6-21: The operator should implement a formal process to evaluate the impacts on nuclear security from proposed operational changes, changes in safety measures or facility modifications prior to implementation.

Action 6-22: The operator should implement a formal process to evaluate the impacts on facility operations or safety from proposed nuclear security changes prior to implementation.

Action 6-23: The operator should obtain approval of major modifications to physical protection measures, in accordance with regulations, from the competent authority before implementation.

Action 6-24: The operator should develop and document compensatory measures as necessary to ensure adequate protection of the facility during facility modifications, and submit them for approval to the competent authority if required, prior to implementation.

Action 6-25: The operator should update its nuclear security plan and related procedures to reflect changes after operational changes, facility modifications or changes in nuclear security measures.

Action 6-26: The operator should conduct awareness training for facility personnel and ensure security personnel are trained in the use of the revised nuclear security plan and related procedures after operational changes, facility modifications or changes in nuclear security measures.

Action 6-27: The operator should implement nuclear security requirements for physical protection, computer security, information security, sustainability, contingency planning, crisis management, incident reporting, trustworthiness, quality assurance, nuclear security culture, and NMAC as applicable during this stage.

STAGE 7: CESSATION OF OPERATION STAGE

Cessation of operation stage considerations

3.24 A nuclear facility that has ceased operation, either permanently in preparation for decommissioning or for an extended period of time for major modifications, maintenance or repair continues to require nuclear security until it is decommissioned, all nuclear material has been removed, and there is no risk of unacceptable radiological consequences.The risk for theft of nuclear materials remains during the period of time nuclear materials are present on the site. The risk of sabotage to facilities also remains if it could lead to radiological release due to sabotage of radioactive materials or contaminated equipment. Even with the reduction of operational assets during cessation, as long as these risks remain, they will require continued nuclear security, tailored to the changing nature of operations on the site.

3.25 When the facility has ceased operation for an extended period of time for major modifications, such as to increase capacity of the facility, the actions defined in the earlier stages, such as design, construction and commissioning, should be followed as applicable, while the rest of the facility is protected in accordance with the measures approved in the current nuclear security plan. This stage is not intended to cover actions necessary after an unplanned shutdown, such as after an incident or accident, which will require unique actions tailored to the situation.

3.26 Nuclear security considerations at this stage for the State, the competent authority, and the operator include:

(a) Relocating, removing, adding, or other changes to the nuclear material inventories may require changes in physical protection requirements.

(b) Reducing or reassigning personnel resources, may impact nuclear security.

(c) Bringing new entities and personnel on the nuclear site to support activities.

(d) Evaluating possible changes to nuclear security to account for changes to the facility that impact the potential for radiological sabotage.

(e) Reconfiguring security areas to address new physical protection measures required from the changes.

(f) Evaluating process operations equipment and structures, involved with nuclear or radioactive materials, for possible “hold-up” of nuclear or radioactive materials.

Cessation of operation stage actions

3.27 The following actions should be completed during the cessation of operation stage of a nuclear facility.

Competent authority actions

Action 7-1: The competent authority, in accordance with regulations and based on the reason for the cessation, may issue a specific authorization under the existing license for nuclear security of the facility during the cessation of operation stage.

Action 7-2: The competent authority should review and approve the operator's revised nuclear security plan, including the contingency plan, prior to implementation.

Action 7-3: The competent authority should verify that the new configuration of nuclear security at the nuclear site is in compliance with regulatory requirements.

Action 7-4: The competent authority should adapt its inspection activities (including the type and frequency of the inspections) to the cessation of operation stage based on related risks.

Operator actions

Action 7-5: The operator should notify the competent authority of the intent to transition to the cessation of operation stage.

Action 7-6: The operator should identify the changes to the nuclear material or nuclear facilities in this stage, re-evaluate the risk of theft and sabotage, and develop protection measures using a graded approach.

Action 7-7: The operator should ensure that the revised nuclear security plan has taken into account the changes in operation, the facility configuration and nuclear security measures.

Action 7-8: The operator should submit the revised nuclear security plan to the competent authority for approval.

Action 7-9: The operator should implement nuclear security requirements for physical protection, computer security, information security, sustainability, contingency planning, crisis management, incident reporting, trustworthiness, quality assurance, nuclear security culture, and NMAC as applicable during this stage.

STAGE 8: DECOMMISSIONING STAGE

Decommissioning stage considerations

3.28 The decommissioning stage includes activities that will ultimately lead to the removal of nuclear and other radioactive materials from the nuclear facility. Although the inventory of nuclear materials will eventually be reduced, it is necessary to continue to maintain the security of the facility throughout the decommissioning stage, based on the types, quantities and configuration of nuclear material and targets which, if damaged, could lead to radiological releases.

3.29 Nuclear security considerations at this stage for the State, the competent authority, and the operator include:

(a) Re-evaluating nuclear security requirements as the inventory of nuclear material and potential radiological consequences change.

(b) Re-evaluating process operations equipment and structures, involved with nuclear or radioactive materials, for possible “hold-up” of nuclear or radioactive materials.

(c) Balancing competing objectives during decommissioning, such as those of safety and security with potential reuse of land and equipment, which may require delaying decommissioning for dose reduction purposes or the immediate removal of material and sensitive information for security purposes.

(d) Reducing security measures as appropriate as material is removed, while continuing to meet regulatory requirements.

(e) Ensuring proper disposal of sensitive information and security related equipment.

(f) Managing changes of workforce or organizations that impact nuclear security.

(g) Maintaining vigilance regarding security awareness and nuclear security culture as the decommissioning impacts human resources.

Decommissioning stage actions

3.30 The following actions should be completed during the decommissioning stage of a nuclear facility.

State actions

Action 8-1: The State should modify its contingency plan as appropriate to reflect the status of the facility during the decommissioning stage.

Competent authority actions

Action 8-2: The competent authority should either issue a new authorization, or modify an existing one, as required for this stage, based on the operator's nuclear security plan.

Action 8-3: The competent authority should review and approve the operator's nuclear security plan for the decommissioning stage.

Action 8-4: The competent authority should ensure the operator's contingency plan is consistent with the contingency plan established by the State.

Action 8-5: The competent authority should adapt its inspection activities for the decommissioning stage and the related risks, including the scope and frequency of inspections, and taking into account new organizations and entities involved in the decommissioning stage.

Operator actions

Action 8-6: The operator should notify the competent authority of the intent to transition to the decommissioning stage.

Action 8-7: The operator should identify the new targets in this stage, re-evaluate the risk of theft and sabotage, and develop physical protection measures using a graded approach in accordance with requirements.

Action 8-8: The operator should revise the nuclear security plan prior to the transition to the decommissioning stage, and provide the plan to the competent authority for approval. The plan should be coordinated with facility operations, safety, and other involved entities to avoid conflicts.

Action 8-9: The operator should modify nuclear security system documents for conducting drills and exercises as appropriate.

Action 8-10: The operator should adjust specific protection for sensitive information assets, as the nuclear security level is changed and the assets are removed from service.

Action 8-11: The operator should implement nuclear security requirements in the areas of physical protection, computer security, information security, sustainability, contingency

planning, crisis management, incident reporting, trustworthiness, quality assurance, nuclear security culture, and NMAC as applicable during this stage.

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