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## **Regulatory Guide**

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# **Regulatory Guide for Operational Safety for Nuclear Facilities**

## **FANR-RG-030 Version 0 2020**

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## Basic Principle of Regulatory Guides

Regulatory guides are issued to describe methods and/ or criteria acceptable to the Authority for meeting and implementing specific requirements contained in the Authority's regulations. Regulatory guides are not substitutes for regulations, and compliance with them is not required. Methods of complying with the requirements in regulations different from the guidance set forth by the regulatory guide can be acceptable if the alternatives provide assurance that the requirements are met.

## Definitions

### Article (1)

For purposes of this regulatory guide, the following terms shall have the meaning set forth below. Other capitalised terms used but not defined herein shall have the meaning ascribed to them in Article 1 of Federal Law by Decree No 6 of 2009 Concerning the Peaceful Uses of Nuclear Energy (hereafter referred to as the Law).

### Accident Conditions

Deviations from Normal Operation more severe than an Anticipated Operational Occurrence including a Design Basis Accident and a Severe Accident.

### Accident Management

A set of actions taken during a Beyond Design Basis Accident:

- to prevent the escalation of the Event into a Severe Accident;
- to mitigate the consequences of a Severe Accident; and
- to achieve a safe and stable state in the long-term.

### Anticipated Operational Occurrence

An operational process that deviates from Normal Operation, which is expected to occur at least once during the operating lifetime of a Nuclear Facility. In view of appropriate Design provisions, an Anticipated Operational Occurrence does not cause any significant damage to Items Important to Safety or lead to Accident Conditions.

### Beyond Design Basis Accident

A postulated Accident with Accident Conditions more severe than those of a Design Basis Accident. A Severe Accident is a subset of Beyond Design Basic Accidents that involve significant core degradation.



**Design Basis Accident**

Accident Conditions against which a Nuclear Facility is designed according to established Design criteria, and for which the damage to the Nuclear Fuel and the release of Radioactive Material are kept within authorised limits.

**Deviation**

A departure from specified requirements.

**Equipment Operator**

An Operator who works in a Nuclear Facility normally outside the control room under the direction of a Reactor Operator and a Senior Reactor Operator.

**Event**

In the context of reporting and analysing an Event, an Event is any unintended occurrence by the Operator such as operating error, equipment failure or other mishap, deliberate action on the part of others, and unplanned occurrences; the consequences or potential consequences of which are not negligible from the point of view of protection or Safety, or that result in implications for Nuclear Safety and radiation Safety, Nuclear Security, and safeguards.

**Item Important to Safety**

An item that is part of a Safety Group and/ or whose malfunction or failure could lead to radiation exposure of the site personnel or members of the public. Items important to Safety include:

- those Structures, Systems and Components whose malfunction or failure could lead to undue radiation exposure of site personnel or members of the public;
- those Structures, Systems and Components that prevent Anticipated Operational Occurrences from leading to Accident Conditions; and
- those features that are provided to mitigate the consequences of malfunction or failure of Structures, Systems and Components.

**Licence Condition**

A binding requirement in a Licence issued by the Authority.



**Normal Operation**

Operation within specified Operational Limits and Conditions. For a Nuclear Facility this includes start-up, power operation (including low power), shutting down and shutdown, Maintenance, testing and refuelling.

**Operating Licence**

The Licence issued by the Authority granting the Licensee permission to operate a Nuclear Facility.

**Operating Personnel**

The Senior Reactor Operator(s), the Reactor Operator(s), or the Equipment Operators at a Nuclear Facility.

**Operational Limits and Conditions**

A set of rules setting forth parameter limits, the functional capability and the performance levels of equipment and personnel approved by the Authority for the safe Operation of an authorised Nuclear Facility.

**Operational States**

States defined under Normal Operation and Anticipated Operational Occurrences.

**Performance Indicator**

The characteristic of a process that can be observed or measured, or has a tendency to infer or directly indicate the current and future performance of the process with particular emphasis on the adequate performance for Safety.

**Protection and Safety**

The protection of people against exposure to Ionising Radiation or Radioactive Material, and the Safety of Radiation Sources including the means for achieving this, and the means for preventing Accidents and mitigating the consequences of Accidents should they occur.

**Reactor Operator**

A control room operator who normally manipulates the Nuclear Facility controls, particularly the controls affecting Nuclear Reactor reactivity under the supervision of the Senior Reactor Operator.

**Root Cause**

The fundamental cause of an initiating Event; the correction of which will prevent recurrence of the initiating Event i.e. the root cause is the failure to detect and correct the relevant latent weakness(es) and the reasons for that failure.



**Safety Analysis Report**

The detailed demonstration of the Safety, security and safeguards of a Nuclear Facility presented in the form of an integrated report, which presents the required information in support of the Licence application for authorisation of the Regulated Activity requested.

**Safety Culture**

The assembly of characteristics and attitudes in organisations and individuals, which establishes that, as an overriding priority, Protection and Safety issues receive the attention warranted by their significance.

**Safety Limit**

A restriction or range placed upon important process variables that are necessary to reasonably protect the integrity of the physical barriers (other than containment) that guard against the uncontrolled release of radioactivity.

**Safety Group**

The assembly of equipment designated to perform all actions required for a particular postulated initiating Event to ensure that the limits specified in the design basis for Anticipated Operational Occurrences and Design Basis Accidents are not exceeded.

**Senior Reactor Operator**

A senior control room Operator who oversees and directs the activities of the Reactor Operator and Equipment Operator.

**Severe Accident**

Accident Conditions that are more severe than a Design Basis Accident and involve significant core degradation.

**Structures, Systems and Components**

A general term encompassing all the elements of a Nuclear Facility or Activity, which contribute to Protection and Safety except human factors. Structures are the passive elements such as building vessels and shielding. Systems comprise several components assembled in such a way as to perform a specific active function. Components are discrete elements of systems.

## Requirements

### Article (2)

1. The Law stipulates that any Person intending to operate a Nuclear Facility shall obtain a Licence from the Authority (i.e. an Operating Licence).
2. FANR Regulation on Operational Safety including Commissioning (FANR-REG-16) establishes the requirements that must be satisfied to ensure the safe Operation of a Nuclear Facility specifically for Commissioning and Operation as well as the preparation for Decommissioning.
3. The Operating Licence establishes the authorised Regulated Activities for the Operation of a Nuclear Facility. It also includes, as may be required, mandatory Licence Conditions for Operation of the Nuclear Facility.

## Purpose

### Article (3)

This regulatory guide provides acceptable methods and guidance on implementing the requirements specified in FANR-REG-16 and the Operating Licence for a Nuclear Facility including routine and Event reporting requirements.

## Scope

### Article (4)

This regulatory guide includes guidance on the application of the requirements of FANR-REG-16 on the safe Operation of a Nuclear Facility, and the requirements of the Operating Licence. The requirements of the Operating Licence include Schedule 1 (Regulated Activities Authorised), Schedule 2 (Licence Conditions), and Schedule 3 (Application Documents). This regulatory guide also provides guidance on routine and Event reporting requirements.

## Structure

### Article (5)

1. This regulatory guide is structured as follows:
  - a) Article (6) provides guidance on FANR-REG-16 by article.
  - b) Article (7) provides guidance on the requirements of the Operating Licence including each Licence Condition.
  - c) Five appendices provide additional guidance, including a summary of routine and Event reporting requirements.
2. The documents listed as references describe acceptable methods and guidance for implementing the requirements of FANR-REG-16 and the Operating Licence. Nuclear Regulatory Commission (NRC) document revisions correspond to those used in the Final Safety Analysis Report (FSAR), unless otherwise noted. Revisions of other references are current as of this Regulatory Guide's approval date.

## Guidance on Application of FANR-REG-16

### Article (6)

1. Article (6) of this regulatory guide provides guidance for each article of FANR-REG-16. FANR-REG-16 establishes the requirements that must be satisfied by the holder of the Operating Licence to ensure the safe Operation of a Nuclear Facility. It includes Commissioning of the Nuclear Facility, which for the purposes of FANR-REG-16 and this regulatory guide, refers to all activities involved in preparing the Nuclear Facility for Operations subsequent to the issuance of the Licensee Operating Licence. FANR-REG-16 also covers testing, Inspection, Maintenance and modifications made through the lifetime of the Nuclear Facility including preparation for Decommissioning. FANR-REG-16 ceases to apply once the fuel in the Nuclear Facility is permanently removed in preparation for Decommissioning.

### 2. Guidance on FANR-REG-16, Article (3) on Responsibility for Safety

2.1 The holder of the Operating Licence of the Nuclear Facility is assigned the prime responsibility for Safety. This responsibility extends to all the activities related directly or indirectly to the Operation and Commissioning of the Nuclear Facility regardless of the entity performing those activities. As such, the Licensee is responsible for the activities not only of its own workforce, but also of all its contractors, sub-contractors, designers, manufacturers and suppliers working on the Operation and Commissioning of the Nuclear Facility.

2.2 Section 2 of the International Atomic Energy Agency (IAEA) document entitled IAEA Safety Standards on Leadership and Management for Safety, General Safety Requirements No. GSR Part 2 provides further guidance on responsibility for Safety.

### 3. Guidance on FANR-REG-16, Article (4) on Management System

3.1 As per FANR Regulation on Management Systems for Nuclear Facilities (FANR-REG-01), the Licensee is required to establish an integrated Management System, to implement it, assess it and continually improve it. The integrated Management System identifies and integrates all legislative and regulatory requirements that apply to the Regulated Activities and Nuclear Facilities of the Licensee. Its purpose is to bring together these requirements coherently so that all these requirements are satisfied in an integrated manner. Such coherent integration ensures that Safety requirements are not neglected when implementing requirements related to health, the environment, security, quality and economic health of the Licensee.

3.2 The Licensee is expected to manage all activities using the integrated Management System. The Licensee must manage the Operation of the Nuclear Facility by following the documentation of the integrated Management System. Using an alternate means of adherence is a contravention of both FANR-REG-01 and FANR-REG-16.

3.3 FANR Regulatory Guide on Application of Management Systems for Nuclear Facilities (FANR-REG-002) provides additional guidance on Management Systems.

### 4. Guidance on FANR-REG-16, Article (5) on Structure and Functions of the Organisation

4.1 The structure and function of the Licensee's organisation should be clearly described in writing and implemented before Commissioning.

4.2 IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4 provides guidance on the functions and responsibilities of the operating organisation in sections 3.1 to 3.9, and on management in sections 3.10 to 3.18. The Licensee should ensure that the functions and responsibilities in the operating organisation are clearly documented along with internal and external lines of communication. Sections 2.9 to 2.19 should be used as guidance on organisational structure.

4.3 FANR Regulatory Guide on Significance Evaluations for Modifications for Nuclear Facilities during Operation (FANR-RG-029), Article 9, provides guidance on making modifications to the organisational structure.

## **5. Guidance on FANR-REG-16, Article (6) on Staffing and Resources of the Organisation**

5.1 For the safe Operation of the Nuclear Facility, the Licensee is required to staff the Nuclear Facility with competent managers and a sufficient number of qualified personnel. The following paragraphs list the reference documents that should be used as implementation guidance for Article (6) of FANR-REG-16:

- i. Sustaining Safety expertise from Article (6)1
  - a) Section 6.11 to 6.15 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
- ii. Qualified and sufficient numbers of staff and management from Article (6)2
  - a) Section 6.11 to 6.15 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
  - b) FANR Regulatory Guide for Emergency Preparedness for Nuclear Facilities (FANR-RG-035)
- iii. Shift operating personnel from Article (6)3
  - a) Section 6.28 to 6.35 and section 6.61 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
  - b) Section 4.1 to 4.7 of IAEA Safety Standards on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
- iv. Staff health policy/ fitness for duty from Article 6(4)
  - a) Section 3.1 to 3.2(3) of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
  - b) NEI 06-11, Rev 2, Managing Personnel Fatigue at Nuclear Power Reactor Sites, provides guidance on fatigue management for specific personnel at Nuclear Facilities
  - c) Sections 2.10, 2.11, 2.13 and 3.12 of IAEA Safety Standard Series on Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, Safety Guide No. NS-G-2.8
  - d) ANSI/ANS-3.4-1996 Medical Certification and Monitoring of Personnel requiring

## Operator Licenses for Nuclear Power Plants

### v. Shared and off-site resources from Article 6(5)

- a) Section 2.10 to 2.13 and section 4.5 to 4.10 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4

## 6. Guidance on FANR-REG-16, Article (7) on Safety Policy

6.1 The Licensee is required to establish and implement operational policies that give Safety the highest priority. The following paragraphs list the reference documents that should be used as implementation guidance for Article (7) of FANR-REG-16:

- i. Safety as highest priority from Article (7)1
  - a) Section 2.6 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) Chapter 5 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
- ii. Senior management leadership of Safety from Article (7)2
  - a) Section 5.1 to 5.9 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
- iii. Communicating the Safety policy to contractors from Article (7)3
  - a) Section 5.4 to 5.5 and section 5.8 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
- iv. Continuous improvement in operational Safety from Article (7)4
  - a) Section 5.11 and section 5.17 to 5.22 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
  - b) Section 2.6 to 2.31 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5

## 7. Guidance on FANR-REG-16, Article (8) on Operational Limits and Conditions

7.1 The Licensee is required to ensure that the Nuclear Facility is operated in accordance with the Nuclear Facility's established Operational Limits and Conditions approved by the Authority. The following paragraphs list the reference documents that should be used as implementation guidance for Article (8) of FANR-REG-16:

- i. Operation in accordance with Operational Limits and Conditions from Article (8)1
  - a) Section 3.1 to 3.4, section 6.1 to 6.9 and section 10.1 to 10.6 of IAEA Safety Standards on Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, Safety Guide No. NS-G-2.2
- ii. Reactor Operator and Senior Reactor Operator Cognizance of Operational Limits and Conditions from Article (8)2
  - a) FANR Regulatory Guide on the Certification of Reactor Operators and Senior Reactor Operators at Nuclear Facilities (FANR-RG-017)
- iii. Operational Limits and Conditions review and revision from Article (8)3
  - a) Section 3.13 to 3.16 and section 10.6 of IAEA Safety Standard on Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, Safety Guide No. NS-G-2.2
- iv. Operational Limits and Conditions components from Article (8)4
  - a) Section 3.5 to 3.6 of IAEA Safety Standard on Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, Safety Guide No. NS-G-2.2
  - b) Chapter 16 of US NRC Regulatory Guide 1.70, Revision 3 on the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants
  - c) US Nuclear Regulatory Commission NUREG-1432, Revision 1, Standard Technical Specifications Combustion Engineering Plants
- v. Required training on and awareness of Operational Limits and Conditions from Article (8)5
  - a) Article (4) of FANR Regulatory Guide on the Certification of Reactor Operators and Senior Reactor Operators at Nuclear Facilities (FANR-RG-017)
  - b) Section 3.4 to 3.7 of IAEA Safety Standard on Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, Safety Guide No. NS-G-2.2
- vi. Monitoring of Operational Limits and Conditions from Article 8(6)
  - a) Chapter 7 of IAEA Safety Standard on Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, Safety Guide No. NS-G-2.2
- vii. Actions upon Deviation from Operational Limits and Conditions from Article (8)7
  - a) When plant parameters deviate from the Operational Limits and Conditions, the Nuclear Facility must be returned to a safe Operational State. The Deviations should

be documented, appropriate remedial actions taken, a review and evaluation of the surrounding circumstances undertaken, and the Authority notified as per the relevant requirements including those Licence Conditions related to reporting. The Licensee should clearly specify in writing the responsibilities and lines of communications to be used in responding to any deviation from Operational Limits and Conditions.

- b) Sections 3.7, 6.5 and 10.3 of IAEA Safety Standards on Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, Safety Guide No. NS-G-2.2

viii. Intentionally exceeding Operational Limits and Conditions parameters and reporting from Article 8(8)

- a) Although the Operational Limits and Conditions are not to be intentionally exceeded, the Licensee may take reasonable action that departs from the Operational Limits and Conditions in an Emergency when such action is immediately needed to protect the environment, public health and Safety, and no action consistent with Licence Conditions or the Operational Limits and Conditions that can provide adequate or equivalent protection is available. Regardless of the reason, exceeding the Operational Limits and Conditions intentionally without prior approval from the Authority should be promptly reported to the Authority in accordance with the regulatory reporting guidance in this document (see Article (7) 2.6 of this Regulatory Guide), and the plant should be maintained in a shutdown condition until approval to return to Mode 1 is received from the Authority.

## **8. Guidance on FANR-REG-16, Article (9) on Qualification and Training of Personnel**

8.1 The Licensee is required to ensure that all activities that may affect Safety are performed by suitably qualified and competent persons. Such competence may be identified through carefully documented training or equivalence from prior experience. FANR Regulatory Guide on Certification of Reactor Operators and Senior Reactor Operators at Nuclear Facilities (FANR-RG-017) provides guidance on training and qualification of Reactor Operators, Senior Reactor Operators and Equipment Operators. The following paragraphs list the reference documents that should be used as implementation guidance for Article (9) of FANR-REG-16, for all other personnel:

- i. Clearly defined requirements from Article (9)1
  - a) IAEA Safety Standard on Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, Safety Guide No. NS-G-2.8 except section 7
  - b) IAEA Technical Report Series No. 380 on Nuclear Power Plant Personnel Training and its Evaluation, 1996
- ii. Selection and training of suitably qualified personnel from Article (9)2
  - a) IAEA Safety Standard on Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, Safety Guide No. NS-G-2.8 (except section 7)
  - b) IAEA Technical Report Series No. 380 on Nuclear Power Plant Personnel Training and

its Evaluation, 1996

- iii. Management responsibility for qualification and competence from Article (9)3
  - a) IAEA Safety Standard on Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, Safety Guide No. NS-G-2.8 (except section 7)
  - b) IAEA Technical Report Series No. 380 on Nuclear Power Plant Personnel Training and its Evaluation, 1996
- iv. Training programme from Article (9)4
  - a) IAEA Safety Standard on Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, Safety Guide No. NS-G-2.8 (except section 7)
  - b) IAEA Technical Report Series No. 380 on Nuclear Power Plant Personnel Training and its Evaluation, 1996
- v. Systematic approach to training performance based programmes from Article (9)5
  - a) IAEA Safety Standard on Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, Safety Guide No. NS-G-2.8 except section 7
  - b) IAEA Technical Report No. 380 on Nuclear Power Plant Personnel Training and its Evaluation, 1996 except section 4.3 to 4.14 and section 7
  - c) The term 'if necessary' in Article (9)5 of FANR-REG-16 refers to the use of contractors and not whether the training is required for contractors. Performance-based programmes are required for each major group of personnel, including contractors, if the group is used to perform functions important to Safety.
- vi. Training programme review, assessment and update from Article (9)6
  - a) IAEA Safety Standard on Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, Safety Guide No. NS-G-2.8 (except section 7)
  - b) IAEA Technical Report Series No. 380 on Nuclear Power Plant Personnel Training and its Evaluation, 1996
- vii. Incorporating operating experience from Article (9)7
  - a) IAEA Safety Standard on Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, Safety Guide No. NS-G-2.8 except section 7
- viii. Instructor training requirements from Article (9)8
  - a) IAEA Safety Standard on Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, Safety Guide No. NS-G-2.8 (except section 7)
  - b) IAEA Technical Report No. 380 on Nuclear Power Plant Personnel Training and its Evaluation, 1996
- ix. Adequate training facilities from Article (9)9
  - a) IAEA Safety Standards on Recruitment, Qualification and Training of Personnel for

Nuclear Power Plants, Safety Guide No. NS-G-2.8 (except section 7)

**9. Guidance on FANR-REG-16, Article (10) on Performance of Important to Safety Activities**

9.1 The Licensee is required to ensure that Safety-related activities are adequately analysed and controlled to ensure that the risks associated with the harmful effects of Ionising Radiation are kept as low as reasonably achievable. The following paragraphs list the reference documents that should be used as implementation guidance for Article (10) of FANR-REG-16:

- i. Assessing radiation risk of Safety-related activities from Article (10)1
  - a) Section 7.1 and 7.2 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) FANR Regulatory Guide on Radiation Protection in Nuclear Facilities (FANR-RG-033)
- ii. Avoiding the undesirable and frequent activation of Safety systems from Article (10)2
  - a) Section 1.2 and 5.22 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) Section 6.1 to 6.9 of IAEA Safety Standard on Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, Safety Guide No. NS-G-2.2
- iii. Justification and procedural requirement for activities important to Safety from Article (10)3
  - a) Section 5.12 to section 5.16 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
  - b) Section 7.1 and section 7.15 to 7.17 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
- iv. Use of written procedures from Article (10)4
  - a) No additional guidance is necessary for Article (10)4.
- v. Human performance, environment and tools from Article (10)5
  - a) Section 6.61 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
  - b) NEI 06-11, Rev 2, Managing Personnel Fatigue at Nuclear Power Reactor Sites, provides guidance on fatigue management for specific personnel at Nuclear Facilities
- vi. Safety attitudes and expectations from Article (10)6
  - a) Section 2.6 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) Section 5.7 to 5.9 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
  - c) Section 2.6 to 2.21 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5

- vii. Reactor re-start after Event from Article (10)7
  - a) No additional guidance deemed necessary for Article (10)7.
- viii. Probabilistic Risk Assessment for decision-making purposes from Article (10)8
  - a) FANR Regulatory Guide on the Evaluation Criteria For Probabilistic Safety Targets and Design Requirements (FANR-RG-004)

## **10. Guidance on FANR-REG-16, Article (11) on Monitoring and Review of Safety Performance**

10.1 The Licensee is required to establish a system for continuous monitoring and periodic review of the Safety of the Nuclear Facility and the performance of the Licensee. The following paragraphs list the reference documents that should be used as implementation guidance for Article (11) of FANR-REG-16:

- i. Audit and review of implementation of Safety Policy from Article (11)1
  - a) Section 5.1 to 5.11 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
- ii. Safety performance monitoring from Article (11)2
  - a) Section 6 of IAEA Safety Standards on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
  - b) Section 5.17 to 5.22 of IAEA Safety Standard on The Operating Organization for Nuclear Power Plants, Safety Guide No. NS-G-2.4
- iii. Quality Assurance function Independence and Authority, from Article (11)3
  - a) American Society of Mechanical Engineers (ASME) Nuclear Quality Assurance (NQA) document NQA-1-1994 Basic Requirement 1

## **11. Guidance on FANR-REG-16, Article (12) on Control of Nuclear Facility Configuration**

11.1 A system for Nuclear Facility configuration management is required to ensure consistency between Design requirements, physical configuration, and Nuclear Facility documentation. The system is required to include controls on Nuclear Facility configuration to ensure that changes to the Nuclear Facility and its Safety-related systems are properly identified, screened, designed, evaluated, implemented and recorded. The following paragraphs list the reference documents that should be used as implementation guidance for Article (12) of FANR-REG-16:

- i. Management System for Nuclear Facility configuration from Article (12)1
  - a) Section 5.141 to 5.147 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
  - b) Safety Reports Series No. 65, Application of Configuration Management in Nuclear Power Plants, International Atomic Energy Agency, 2010
- ii. Controlling Nuclear Facility configuration from Article (12)2

- a) Section 5.141 to 5.147 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
- b) Safety Reports Series No. 65, Application of Configuration Management in Nuclear Power Plants, International Atomic Energy Agency

## **12. Guidance on FANR REG-16, Article (13) on Management of Modifications**

12.1 The Licensee is required to establish and implement a programme to manage modifications to ensure that all modifications are properly identified, specified, screened, designed, evaluated, authorised, implemented, and recorded. Modification programmes must cover Structures, Systems and Components, Operational Limits and Conditions, procedures, documents, plans, computer programmes and the organisational structure of the Licensee. All modifications are subject to the approval of the Authority in accordance with their Safety significance. The following paragraphs list the reference documents that should be used as implementation guidance for Article (13) of FANR-REG-16:

- i. Implementation of a modification programme from Article (13)1
  - a) IAEA Safety Standards on Modifications to Nuclear Power Plants, Safety Guide No. NS-G-2.3
  - b) FANR Regulatory Guide on Significance Evaluations for Modifications for Nuclear Facilities during Operation (FANR-RG-029)
- ii. Modification control from Article (13)2
  - a) Sections 3, 4 and 5 of IAEA Safety Standards on Modifications to Nuclear Power Plants, Safety Guide No. NS-G-2.3
- iii. Temporary modifications from Article (13)3
  - a) Section 6 of IAEA Safety Standard on Modifications to Nuclear Power Plants, Safety Guide No. NS-G-2.3
- iv. Training and documenting modifications from Article (13)4
  - a) Sections 7, 8, 9, 10 and 11 of IAEA Safety Standard on Modifications to Nuclear Power Plants, Safety Guide No. NS-G-2.3

## **13. Guidance on FANR-REG-16, Article (14) on Periodic Safety Review**

13.1 Periodic Safety reviews of the Nuclear Facility by the Licensee are required from the beginning of Facility Operation and then every 10 years throughout the Nuclear Facility's operating lifetime. The start of Operation is the date the unit enters into commercial Operation. The following paragraphs list the reference documents that should be used as implementation guidance for Article (14) of FANR-REG-16:

- i. A periodic Safety review every 10 Years from Article (14)1
  - a) IAEA Safety Standard on the Periodic Safety Review for Nuclear Power Plants, Specific

Safety Guide No. SSG-25

- ii. Cumulative effects on a Nuclear Facility from Article (14)2
  - a) IAEA Safety Standard on the Periodic Safety Review for Nuclear Power Plants, Specific Safety Guide No. SSG-25
- iii. Scope and approval from Article (14)3
  - a) The Licensee should identify and come to an agreement on the scope of the periodic Safety review with the Authority well in advance of the expected submission. The document entitled IAEA Safety Standards on the Periodic Safety Review for Nuclear Power Plants, Specific Safety Guide No. SSG-25 should be used as implementation guidance on Article (14)3.
- iv. Submission of a report on the periodic Safety review to the Authority for review and approval from Article (14)4
  - a) IAEA Safety Standard on the Periodic Safety Review for Nuclear Power Plants, Specific Safety Guide No. SSG-25

**14. Guidance on FANR-REG-16, Article (15) on Equipment Qualification**

14.1 The Licensee is required to ensure that a systematic Assessment is carried out to provide reliable confirmation that Safety-related items are capable of the required performance for all Operational States and for Accident Conditions. The following paragraphs list the reference documents that should be used as implementation guidance for Article (15) of FANR-REG-16:

- i. Establishing equipment qualification concepts, scope and process from Article (15)1
  - a) Safety Report Series No. 3 on Equipment Qualification in Operational Nuclear Power Plants: Upgrading, Preserving and Reviewing, International Atomic Energy Agency
  - b) Section 7.2 to 7.8 of IAEA Safety Standard on Ageing Management for Nuclear Power Plants, Safety Guide No. NS-G-2.12
  - c) US NRC Regulatory Guide 1.89, Revision 1 on Equipment Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants
  - d) US NRC Regulatory Guide 1.209 Guidelines for Environmental Qualification of Safety-related Computer-based Instrumentation and Control Systems in Nuclear Power Plants

**15. Guidance on FANR-REG-16, Article (16) on Ageing Management**

15.1 The Licensee is required to establish and implement a comprehensive programme that ensures the long-term safe Operation of the Nuclear Facility including the implementation of an effective ageing management programme. The following paragraphs list the reference documents that should be used as implementation guidance for Article (16) of FANR-REG-16:

- i. Comprehensive programme for long-term safe Operation from Article (16)1
  - a) IAEA Safety Standard on Ageing Management and Development of a Programme for

Long Term Operation of Nuclear Power Plants, Specific Safety Guide No. SSG-48

- ii. Ageing management programme from Article (16)2
  - a) IAEA Safety Standard on Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, Specific Safety Guide No. SSG-48
- iii. Erosion and corrosion monitoring programme from Article (16)3
  - a) IAEA Safety Standard on Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, Specific Safety Guide No. SSG-48
- iv. Programme to account for cyclical and transient occurrences from Article (16)4
  - a) IAEA Safety Standard on Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, Specific Safety Guide No. SSG-48

**16. Guidance on FANR-REG-16, Article (17) on Interfaces among Safety, Security and Safeguards**

16.1 The Licensee is required to implement mechanisms to ensure there is no conflict and to manage interfaces between Nuclear Safety, Nuclear Security, and safeguards. The document mentioned below is the reference that should be used as implementation guidance for Article (17) of FANR-REG-16.

- a) US NRC Regulatory Guide 5.74, Revision 1 on Managing the Safety/ Security Interface

**17. Guidance on FANR-REG-16, Article (18) on Emergency Preparedness**

17.1 The Licensee is required to develop an Emergency Plan for preparedness and response to a nuclear or radiological Emergency in accordance with the Authority's requirements. The regulatory guides mentioned below should be used as implementation guidance for Article (18) of FANR-REG-16.

- a) FANR Regulatory Guide for Preparation, Conduct, and Evaluation of Drills and Exercises for Nuclear Facilities (FANR-RG-034)
- b) FANR Regulatory Guide for Emergency Preparedness for Nuclear Facilities (FANR-RG-035)

**18. Guidance on FANR-REG-16, Article (19) on Accident Management Programme**

18.1 The Licensee is required to establish an Accident management programme for the Nuclear Facility and include in the programme preparatory measures and guidelines on how to deal with a Design Basis Accident and a Beyond Design Basis Accident including a Severe Accident. The following paragraphs list the reference documents that should be used as implementation guidance for Article (19) of FANR-REG-16:

- i. Establishing the Accident management programme from Article (19)1
  - a) IAEA Safety Standard on Accident Management Programmes for Nuclear Power Plants, Specific Safety Guide No. SSG-54
  - b) Safety Report Series No. 32 on Implementation of Accident Management Programmes

- in Nuclear Power Plants, International Atomic Energy Agency
- ii. Multi-unit site Accidents from Article (19)2
    - a) IAEA Safety Standard on Accident Management Programmes for Nuclear Power Plants, Specific Safety Guide No. SSG-54
    - b) Safety Report Series No. 32 on Implementation of Accident Management Programmes in Nuclear Power Plants, International Atomic Energy Agency
  - iii. Instructions, technical and administrative measures from Article (19)3
    - a) IAEA Safety Standard on Accident Management Programmes for Nuclear Power Plants, Specific Safety Guide No. SSG-54
    - b) Safety Report Series No. 32 on Implementation of Accident Management Programmes in Nuclear Power Plants, International Atomic Energy Agency
  - iv. Accident management contingency measures from Article (19)4
    - a) IAEA Safety Standard on Accident Management Programmes for Nuclear Power Plants, Specific Safety Guide No. SSG-54
    - b) Safety Report Series No. 32 on Implementation of Accident Management Programmes in Nuclear Power Plants, International Atomic Energy Agency
  - v. Organisational arrangements from Article (19)5
    - a) IAEA Safety Standard on Accident Management Programmes for Nuclear Power Plants, Specific Safety Guide No. SSG-54
    - b) Safety Report Series No. 32 on Implementation of Accident Management Programmes in Nuclear Power Plants, International Atomic Energy Agency
  - vi. Accident management training from Article (19)6
    - a) IAEA Safety Standard on Accident Management Programmes for Nuclear Power Plants, Specific Safety Guide No. SSG-54
    - b) Safety Report Series No. 32 on Implementation of Accident Management Programmes in Nuclear Power Plants, International Atomic Energy Agency
  - vii. Consideration of adverse conditions from Article (19)7
    - a) IAEA Safety Standard on Accident Management Programmes for Nuclear Power Plants, Specific Safety Guide No. SSG-54
    - b) Safety Report Series No. 32 on Implementation of Accident Management Programmes in Nuclear Power Plants, International Atomic Energy Agency
  - viii. Accident management systems and technical support from Article (19)8
    - a) IAEA Safety Standard on Accident Management Programmes for Nuclear Power Plants, Specific Safety Guide No. SSG-54
    - b) Safety Report Series No. 32 on Implementation of Accident Management Programmes in Nuclear Power Plants, International Atomic Energy Agency

### **19. Guidance on FANR-REG-16, Article (20) on Radiation Protection**

19.1 The Licensee is required to establish and implement a Radiation Protection programme in accordance with the Authority's requirements. The regulatory guide listed below is the reference document that should be used as implementation guidance for Article (20) of FANR-REG-16.

- a) FANR Regulatory Guide on Radiation Protection for Nuclear Facilities (FANR-RG-033)

### **20. Guidance on FANR-REG-16, Article (21) on Management of Radioactive Waste**

20.1 The Licensee shall establish and implement a programme for the management of Radioactive Waste in accordance with the Authority's requirements. The regulatory guide listed below is the reference document that should be used as implementation guidance for Article (21) of FANR-REG-16.

- a) FANR Regulatory Guide on Pre-disposal Management of Radioactive Waste (FANR-RG-018)

### **21. Guidance on FANR-REG-16, Article (22) on Fire Safety**

21.1 The Licensee is required to implement a fire protection plan to minimise the potential for a fire that could create a radiological hazard or have an adverse effect on Structures, Systems and Components. The regulatory guide listed below is the reference document that should be used as implementation guidance for Article (22) of FANR-REG-16.

- i. Fire protection plan requirements from Article (22)1
  - a) US NRC Regulatory Guide 1.189 on Fire Protection for Nuclear Power Plants
- ii. Release of Radioactive Material from fire from Article (22)2
  - a) US NRC Regulatory Guide 1.189 on Fire Protection for Nuclear Power Plants
- iii. Procedures, staffing, drills and exercises from Article (22)3
  - a) US NRC Regulatory Guide 1.189 on Fire Protection for Nuclear Power Plants

### **22. Guidance on FANR-REG-16, Article (23) on Feedback of Operating Experience**

22.1 The Licensee is required to establish an operating experience programme to learn from Events at the Nuclear Facility, and Events in the nuclear sector and other industries. The reference document listed below should be used as implementation guidance for Article (23) of FANR-REG-16.

- a) IAEA Safety Standard on Operating Experience Feedback for Nuclear Installations, Specific Safety Guide No. SSG-50

### **23. Guidance on FANR-REG-16, Article (24) on the Commissioning Programme**

23.1 The Licensee is required to implement a Commissioning programme for the Nuclear Facility that covers the full range of Nuclear Facility conditions required in Chapter 14 of the Safety Analysis Report. The following paragraphs list the reference documents that should be used as implementation guidance for Article (24) of FANR-REG-16, which relate to Chapter 14 of the

Safety Analysis Report:

- i. Implementation and consideration for the Commissioning programme from Article (24)1
  - a) US NRC Regulatory Guide 1.68, Revision 2, Initial Test Programs for Water-cooled Nuclear Power Plants
  - b) IAEA Safety Standard on Commissioning for Nuclear Power Plants, Specific Safety Guide No. SSG-28
- ii. Conduct and review of Commissioning tests from Article (24)2
  - a) US NRC Regulatory Guide 1.68, Revision 2, Initial Test Programs for Water-cooled Nuclear Power Plants
  - b) IAEA Safety Standard on Commissioning for Nuclear Power Plants, Specific Safety Guide No. SSG-28
- iii. Testing meets requirements of Design and Safety Analysis Report from Article (24)3
  - a) US NRC Regulatory Guide 1.68, Revision 2, Initial Test Programs for Water-cooled Nuclear Power Plants
  - b) IAEA Safety Standard on Commissioning for Nuclear Power Plants, Specific Safety Guide No. SSG-28
- iv. Validating operating and Maintenance procedures from Article (24)4
  - a) US NRC Regulatory Guide 1.68, Revision 2, Initial Test Programs for Water-cooled Nuclear Power Plants
  - b) IAEA Safety Standard on Commissioning for Nuclear Power Plants, Specific Safety Guide No. SSG-28
- v. Personnel requirements for Commissioning tests from Article (24)5
  - a) Article (6)6a FANR Regulatory Guide on the Certification of Reactor Operators and Senior Reactor Operators at Nuclear Facilities (FANR RG-017)
  - b) Appendix A of NEI 06-13A, Revision 2, Nuclear Energy Institute, Template for an Industry Training Program Description
  - c) IAEA Nuclear Energy Series, No. NG-T-22, Commissioning of Nuclear Power Plants: Training and Human Resource Considerations
- vi. Comprehensive test sufficiency for system operating reference data from Article (24)6
  - a) US NRC Regulatory Guide 1.68, Revision 2, Initial Test Programs for Water-cooled Nuclear Power Plants
  - b) IAEA Safety Standard on Commissioning for Nuclear Power Plants, Specific Safety Guide No. SSG-28
- vii. Work, modification and configuration control requirements from Article (24)7
  - a) Section 7 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power

Plants, Safety Guide No. NS-G-2.14

- b) Section 5.62 to 5.72 and section 5.141 to 5.147 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
- c) Section 4 of IAEA Safety Standard on Modifications to Nuclear Power Plants, Safety Guide No. NS-G-2.3
- d) Articles (12) and (13) of this regulatory guide

viii. Interfaces and communication lines from Article (24)8

- a) Section 3.36 to 3.49 of IAEA Safety Standard on Commissioning for Nuclear Power Plants, Specific Safety Guide No. SSG-28

ix. Protecting Nuclear Facility equipment during Commissioning from Article (24)9

- a) No implementation guidance is considered necessary for Article (24)9

x. Comparing as-built construction and performance with Design parameters from Article (24)10

- a) As-built Construction should be compared to Design parameters, and tested, as part of an ongoing process during Construction. During Commissioning, particular attention should be paid to those Structures, Systems and Components for which the as-built differs significantly from the original Design parameters to determine if performance has been impacted by the changes.
- b) Section 5.85 and section 5.141 to 5.147 of IAEA Safety Standard on the Management System for Nuclear Installations, Safety Guide No. GS-G-3.5

## **24. Guidance on FANR-REG-16, Article (25) on Procedures**

24.1 All important to Safety activities are required to be controlled by validated, approved and appropriately detailed procedures, instructions and drawings to ensure the Operation of the Nuclear Facility is within the established Operational Limits and Conditions. The following paragraphs list the reference documents that should be used as implementation guidance for Article 25 of FANR-REG-16:

i. Procedures, instructions and drawings from Article (25)1

- a) Section 3.5 of ANSI/ANS-3.2-2012, American National Standard Managerial, Administrative, and Quality Assurance Controls for the Operational Phase of Nuclear Power Plants
- b) IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
- c) NUREG/CR-6634 Computer-Based Procedure Systems: Technical Basis and Human Factors Review Guidance, US NRC

ii. Procedure content and detail from Article (25)2

- a) No implementation guidance is considered necessary for Article (25)2
- iii. Procedures for Anticipated Operational Occurrence and Design Basis Accident from Article (25)3
  - a) Appendix A of ANSI/ANS-3.2-2012, American National Standard Managerial, Administrative, and Quality Assurance Controls for the Operational Phase of Nuclear Power Plants
  - b) Section 3.32 to 3.57 of IAEA Safety Standard on Severe Accident Management Programmes for Nuclear Power Plants, Safety Guide NS-G-2.15
  - c) Safety Report Series No. 48 on the Development and Review of Plant Specific Emergency Operating Procedures, International Atomic Energy Agency
- iv. Development, review and revision of procedures from Article (25)4
  - a) Section 3.5 to 3.6 of ANSI/ANS-3.2-2012, American National Standard Managerial, Administrative, and Quality Assurance Controls for the Operational Phase of Nuclear Power Plants
- v. Operator aid programme from Article (25)5
  - a) Section 6.15 to 6.19 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
- iv. Minimising temporary Operator aids from Article (25)6
  - a) Section 6.15 to 6.19 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14

## **25. Guidance on FANR-REG-16, Article (26) on Control Rooms and Control Equipment**

25.1 The Licensee is required to ensure that the operation control rooms and control equipment are maintained in a suitable condition. The following paragraphs list the reference documents that should be used as implementation guidance for Article (26) of FANR-REG-16:

- i. Habitability and condition of control rooms and equipment from Article (26)1
  - a) Section 6.1 to 6.10 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
- ii. Requirements for important to Safety operational panels outside the control room from Article (26)2
  - a) Section 3.14 of ANSI/ANS-3.2-2012, American National Standard Managerial, Administrative, and Quality Assurance Controls for the Operational Phase of Nuclear Power Plants
- iii. Control room alarms and information display from Article (26)3
  - a) Section 6.1 to 6.10 of IAEA Safety Standard on the Conduct of Operations at Nuclear

Power Plants, Safety Guide No. NS-G-2.14

**26. Guidance on FANR-REG-16, Article (27) on Material Condition and House-Keeping**

26.1 The Licensee is required to develop and implement programmes that ensure a high standard is maintained of material conditions, housekeeping and cleanliness in all working areas. The following paragraphs list the reference documents that should be used as implementation guidance for Article (27) of FANR-REG-16:

- i. Maintenance of operational areas from Article (27)1
  - a) Section 6.20 to 6.26 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) US NRC Regulatory Guide 1.33 on Quality Assurance Program Requirements (Operation), Revision 3
  - c) Subpart of 2.3 of ASME NQA-1-1994 on Quality Assurance Requirements for Nuclear Facility Applications
- ii. Foreign material exclusion programme from Article (27)2
  - b) Section 6.20 to 6.26 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - c) Subpart of 2.3 of ASME NQA-1-1994 on Quality Assurance Requirements for Nuclear Facility Applications
- iii. Accurate identification and labelling from Article (27)3
  - a) Section 6.24 to 6.26 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) Requirement 8 of ASME NQA-1-1994 on Quality Assurance Requirements for Nuclear Facility Applications

**27. Guidance on FANR-REG-16, Article (28) on Chemistry Programme**

27.1 The Licensee is required to establish and implement a chemistry programme to provide the necessary support for chemistry and radiochemistry. The following paragraphs list the reference documents that should be used as implementation guidance for Article (28) of FANR-REG-16:

- i. Implementation of chemistry programme from Article (28)1
  - a) Section 2.27 and section 5.44 to 5.47 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) Sections 2 and 3, and section 4.1 to 4.13, section 4.26 to 4.31, section 4.42 to 4.49, and sections 5 and 8 of IAEA Safety Standard on the Chemistry Programme for Water Cooled Nuclear Power Plants, Specific Safety Guide No. SSG-13
- ii. Chemistry Surveillance from Article (28)2
  - a) Section 2.27 and section 5.44 to 5.47 of IAEA Safety Standard on the Conduct of

Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14

- b) Section 6.1 to 6.7 of IAEA Safety Standard on the Chemistry Programme for Water Cooled Nuclear Power Plants, Specific Safety Guide No. SSG-13
- iii. Chemistry monitoring and data acquisition systems from Article (28)3
  - a) Section 2.27 and section 5.44 to 5.47 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) Section 6.8 to 6.16, section 6.20 to 6.29, section 6.41 to 6.44, and section 7 of IAEA Safety Standard on the Chemistry Programme for Water Cooled Nuclear Power Plants, Specific Safety Guide No. SSG-13
- iv. Laboratory monitoring requirements from Article (28)4
  - a) Section 2.27 and section 5.44 to 5.47 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) Section 6.17 to 6.19 and section 6.30 to 6.40 of IAEA Safety Standard on the Chemistry Programme for Water Cooled Nuclear Power Plants, Specific Safety Guide No. SSG-13
- v. Inventory and chemical control from Article (28)5
  - a) Section 2.27 and section 5.44 to 5.47 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) Section 9 of IAEA Safety Standard on the Chemistry Programme for Water Cooled Nuclear Power Plants, Specific Safety Guide No. SSG-13

## **28. Guidance on FANR-REG-16, Article (29) on Core Management and Nuclear Fuel Handling**

28.1 The Licensee is required to be responsible and make arrangements for all activities associated with core management and on-site Nuclear Fuel handling. The following paragraphs list the reference documents that should be used as implementation guidance for Article (29) of FANR-REG-16:

- i. Nuclear Fuel Design criteria, Enrichment, and manufacturing requirements from Article (29)1
  - a) IAEA Safety Standard on Core Management and Fuel Handling for Nuclear Power Plants, Safety Guide No. NS-G-2.5
- ii. Specifications and procedures from Article (29)2
  - a) IAEA Safety Standard on Core Management and Fuel Handling for Nuclear Power Plants, Safety Guide No. NS-G-2.5
  - b) The safeguards, and nuclear material accountancy and control system should be implemented in accordance with FANR Regulation for the System of Accounting for and Control of Nuclear Material and Application of Additional Protocol (FANR-REG-

10) and conditions of the relevant Licences granted by the Authority. Since the Nuclear Facility is subject to international agreements and an IAEA safeguards' verification regime, which involves safeguards containment and surveillance equipment, it is vital to ensure that all Commissioning and operational activity involving nuclear material as well as changes to the Nuclear Facility Design or anticipated and actual interference with safeguards equipment are coordinated with the team responsible for the Nuclear Facility's safeguards' arrangements. International agreements together with FANR-REG-10 and the Nuclear Facility's nuclear material accountancy and control procedures define legally-binding timescales and procedures for providing advance information to the Authority and the IAEA on these types of activities.

- c) For Nuclear Fuel reload testing refer to ANSI/ANS-19.6.1-1997 Reload Startup Physics Tests for Pressurized Water Reactors
- iii. Safe reactivity management programme from Article (29)3
  - a) Section 5.21 to 5.25 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
- iv. Core monitoring programme from Article (29)4
  - a) ANSI/ANS-19.6.1-1997 Reload Startup Physics Tests for Pressurized Water Reactors
  - b) IAEA Safety Standard on Core Management and Fuel Handling for Nuclear Power Plants, Safety Guide No. NS-G-2.5
- v. Reactivity manipulations from Article (29)5
  - a) Section 5.21 to 5.25 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
- vi. Restrictions on reactor operating procedures from Article (29)6
  - a) Section 2.14 of IAEA Safety Standard on Core Management and Fuel Handling for Nuclear Power Plants, Safety Guide No. NS-G-2.5
- vii. Radiochemistry data monitoring and trending from Article (29)7
  - a) Section 2.27 and section 2.9 to 2.31 of IAEA Safety Standard on Core Management and Fuel Handling for Nuclear Power Plants, Safety Guide No. NS-G-2.5
  - b) Section 6.20 to 6.29 of IAEA Safety Standard on the Chemistry Programme for Water Cooled Nuclear Power Plants, Specific Safety Guide No. SSG-13
- viii. Identifying changes to coolant activity from Article (29)8
  - a) Section 2.27 and section 2.9 to 2.31 of IAEA Safety Standard on Core Management and Fuel Handling for Nuclear Power Plants, Safety Guide No. NS-G-2.5
  - b) Section 6.20 to 6.29 of IAEA Safety Standard on the Chemistry Programme for

Water Cooled Nuclear Power Plants, Specific Safety Guide No. SSG-13

- ix. Senior Reactor Operator requirements for fuel handling from Article (29)9
  - a) No implementation guidance is considered necessary for Article (29)9

**29. Guidance on FANR-REG-16, Article (30) on Maintenance, Testing, Surveillance and Inspection Programmes**

29.1 The Licensee is required to ensure that effective programmes for Maintenance, testing, surveillance and Inspection are established and implemented. The Licensee should refer to Licence Condition 10 on Inspection and testing for detailed guidance, and use the reference documents listed below as implementation guidance for Article (30) of FANR-REG-16:

- i. Maintenance and surveillance aspects of the programme from Article (30)1
  - a) IAEA Safety Standard on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
  - b) Section 5.6 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
  - c) US NRC Regulatory Guide 1.160, Revision 2 on Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- ii. Recording, storing and analysing data from Article (30)2
  - a) IAEA Safety Standard on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
  - b) Section 5.6 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
  - c) US NRC Regulatory Guide 1.160, Revision 2 on Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- iii. Maintenance, testing, surveillance and Inspection frequency from Article (30)3
  - a) IAEA Safety Standard on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
  - b) Section 5.6 of IAEA Safety Standard on the Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
  - c) US NRC Regulatory Guide 1.160, Revision 2 on Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- iv. Identifying Maintenance failure scenarios from Article (30)4
  - a) IAEA Safety Standards on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
  - b) US NRC Regulatory Guide 1.160, Revision 2 on Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

- v. Significant changes to Maintenance, testing, surveillance and Inspection approach from Article (30)5
  - a) FANR Regulatory Guide on Significance Evaluations for Modifications for Nuclear Facilities during Operation (FANR-RG-029)
  - b) IAEA Safety Standards on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
  - c) Section 5.6 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
  - d) US NRC Regulatory Guide 1.160, Revision 2 on Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- vi. Work planning and control system from Article (30)6
  - a) Section 7 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) IAEA Safety Standard on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
  - c) Section 5.6 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
  - d) US NRC Regulatory Guide 1.160, Revision 2 on Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- vii. Work and equipment control and tagging system from Article (30)7
  - a) Section 7 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) IAEA Safety Standards Series on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
  - c) Section 5.6 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
  - d) US NRC Regulatory Guide 1.160, Revision 2 on Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- viii. Senior Reactor Operator authorisation for work control from Article (30)8
  - a) Section 7 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) IAEA Safety Standard on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
  - c) Section 5.6 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5

- d) US NRC Regulatory Guide 1.160, Revision 2 on Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- ix. Coordination between different Maintenance groups from Article (30)9
  - a) Section 7 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) IAEA Safety Standards on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
  - c) Section 5.6 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
  - d) US NRC Regulatory Guide 1.160, Revision 2 on Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
  - e) Section 5.24 to 5.30 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
- x. Management System for controlling weaknesses from Article (30)10
  - a) Section 6.42 to 6.69 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
- xi. Defence-in-depth Maintenance work from Article (30)11
  - a) IAEA Safety Standard on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
  - b) Section 5.6 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
- xii. Structures, Systems and Components Corrective Maintenance from Article (30)12
  - a) US NRC Regulatory Guide 1.160, Revision 2 on Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
  - b) Section 7 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - c) IAEA Safety Standard on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
  - d) Section 5.6 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
  - e) US NRC Regulatory Guide 1.160, Revision 2 on Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- xiii. Identification and calibration requirements for tools and equipment from Article (30)13
  - a) Section 5.24 to 5.30 of IAEA Safety Standard on The Management System for

Nuclear Installations, Safety Guide No. GS-G-3.5

- b) IAEA Safety Standard on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
- c) Section 5.6 of IAEA Safety Standard on The Management System for Nuclear Installations, Safety Guide No. GS-G-3.5
- d) US NRC Regulatory Guide 1.160, Revision 2 on Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- e) Requirement 12 of ASME NQA-1-1994 Quality Assurance Requirements for Nuclear Facility Applications

### **30. Guidance on FANR-REG-16, Article (31) on Outage Management**

30.1 The Licensee is required to implement arrangements to ensure the effective performance, planning and control of work activities during outages. The following paragraphs list the reference documents that should be used as implementation guidance for Article (31) of FANR-REG-16:

- i. Outage performance, planning and control requirements from Article (31)1
  - a) Section 7.18 to 7.20 of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) Section 5.20 to 5.22 of IAEA Safety Standard on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
- ii. Priority of Safety issues and configuration management from Article (31)2
  - a) Section 7.2 (specifically but not exclusively) of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
- iii. Outage interfaces from Article (31)3
  - a) Section 7.4 (specifically but not exclusively) of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) Section 5.20 to 5.22 of IAEA Safety Standard on Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide No. NS-G-2.6
- iv. Optimisation of Radiation Protection and waste reduction from Article (31)4
  - a) Section 7.12 (specifically but not exclusively) of IAEA Safety Standard on the Conduct of Operations at Nuclear Power Plants, Safety Guide No. NS-G-2.14
  - b) IAEA Safety Standard on Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors, Specific Safety Guide SSG-40
  - c) FANR Regulatory Guide on Radiation Protection for Nuclear Facilities (FANR-RG-033)
  - d) FANR Regulatory Guide on Pre-disposal Management of Radioactive Waste (FANR-RG-018)

iv. Review for lessons learned from Article (31)5

a) No implementation guidance is considered necessary for Article (31)5

### **31. Guidance on FANR-REG-16, Article (32) on Preparation for Decommissioning**

31.1 The Licensee is required to prepare a Decommissioning plan and maintain it throughout the lifetime of the Nuclear Facility in accordance with the Authority's requirements. The following document should be used as implementation guidance for Article (32) of FANR-REG-16.

a) IAEA Safety Standard on Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities, Specific Safety Guide No. SSG-47

## Guidance on the Implementation of the Operating Licence

### Article (7)

#### 1. Schedule 1 on Regulated Activities Authorised

1.1 No additional guidance is considered necessary for Schedule 1.

#### 2. Schedule 2 on Licence Conditions

##### 2.1 Licence Condition 1 on the Law, Regulations, [the] Licence and the Licensee's Submissions

2.1.1 No additional guidance is considered necessary for Licence Condition 1.

##### 2.2 Licence Condition 2 on Safeguards and Nuclear Import/ Export Obligations

2.2.1 No additional guidance is considered necessary for Licence Condition 2 except for clause (e) (permits). In order to obtain a permit prior to each import, export or re-export of any 'nuclear material' as defined by the Safeguards Agreement and 'Regulated Items', as defined in FANR Regulation on the Export and Import Control of Nuclear Material, Nuclear Related Items and Nuclear Related Dual-Use Items (FANR-REG-09), the Licensee should first register on the Authority's NuTech portal, which is available on the Authority's website at [iservices.fanr.gov.ae](https://services.fanr.gov.ae). The instruction manual for registration on the NuTech portal can be downloaded from the NuTech portal itself.

2.2.2 'Government-to-Government Assurance,' as defined in FANR-REG-09, is required for the import, export and re-export of 'nuclear material' as defined by the Safeguards Agreement and 'Nuclear Related Items' as defined in FANR-REG-09. 'Government-to-Government Assurance' reflects the assurances that the condition of supply imposed by the supplier State will be met by the recipient State. For imports, the conditions that the Licensee must follow will be communicated to the Licensee by the Authority.

2.2.3 The Licensee is requested to provide the Authority with the following information in order to allow the Authority to manage the relevant 'Government-to-Government Assurance':

- a) Item(s) description and code in accordance with the International Atomic Energy Agency's INFCIRC/254/Part 1
- b) Quantity
- c) Country of origin
- d) Exporting country
- e) Supplier
- f) Manufacturer (if applicable)

##### 2.3 Licence Condition 3 on the Transfer of Licence

2.3.1 No additional guidance is considered necessary for Licence Condition 3.

##### 2.4 Licence Condition 4 on Modifications

2.4.1 Clause (a) of Licence Condition 4 requires Licensees to obtain written approval of the Authority prior

to implementing modifications that may result in significant implications for Safety and/ or safeguards, or that may have an impact on the Licensee's liability for nuclear damage or financial security.

2.4.2 When evaluating the significance of modifications, the Licensee is required to use the guidance found in FANR Regulatory Guide on Significance Evaluations for Modifications for Nuclear Facilities during Operations (FANR-RG-029), which provides guidance for modifications during Operation.

2.4.3 The Licence Condition 4 requires Licensees to maintain records of all changes made in accordance with Article (13) of FANR-REG-16. For the modifications that the Licensee deems as not requiring Authority approval, Licence Condition 4 requires that these records include a written evaluation that provides the basis for the determination that the change did not require prior approval from the Authority.

2.4.4 Each evaluation should be documented in accordance with the Licensee's procedural requirements. As a minimum, the documentation should be sufficiently detailed with the conclusions logically supported so that independent review by persons designated in the Licensee's procedures is possible without having to consult the document writer. The documentation should identify the scope of the review, and any assumptions, engineering analyses or judgements that were used.

2.4.5 The documentation of evaluations for temporary modifications should meet the same criteria on reviewability as for permanent changes. Summaries of evaluations for temporary modifications should be included in the periodic revision of the Final Safety Analysis Report in accordance with Licence Condition 5.

## **2.5 Licence Condition 5 on the Update of Documents**

2.5.1 Clause (a) of Licence Condition 5 requires that the Licensee submit to the Authority a full revision of the updated Final Safety Analysis Report within six months of each refuelling outage completion. A brief description of each change should also be included. The description should include a summary of any supporting evaluation for changes implemented without prior approval from the Authority.

2.5.2 Clause (b) of Licence Condition 5 requires that the Licensee provide the documents, as listed, to the Authority on an annual basis.

## **2.6 Licence Condition 6 on Reporting**

### **2.6.1 Guidance on clause (a) on Regular Reporting**

2.6.1.2 Clause (a) of Licence Condition 6 requires that quarterly reports be provided to the Authority on the Nuclear Facility's operational performance and operating data, and on physical protection. The performance and operating reports should consist of Nuclear and radiological Safety indicator information.

2.6.1.3 These reporting arrangements do not supersede any other reporting requirements or guidance identified in the Authority's regulations and regulatory guides.

2.6.1.4 Quarterly report data should be based on the World Association of Nuclear Operators' (WANO) performance indicators and the IAEA Power Reactor Information System, PRIS.

2.6.1.5 WANO has an agreed and defined set of performance indicators used globally by commercial nuclear Licensees. They consist of five key indicators and eight non-key indicators. All these indicators are listed below but key indicator III and non-key indicators VI and VIII are related to industrial safety, which is not regulated by the Authority. Thus, the inclusion of these three indicators is optional; the rest should be reported. Detailed definitions of the indicators that should be reported can be found in Appendix 1 of this regulatory guide.

a) Key indicators:

- I. Forced Loss Rate (FLR)
- II. Collective Radiation Exposure (CRE)
- III. Total Industrial Safety Accidents (TISA) – optional
- IV. Safety System Performance Indicator (SSPI)
- V. Unplanned Total Scrams per 7000 hours critical (US7)

b) Non-key indicators:

- I. Unplanned Automatic (UA7) Scrams per 7,000 Hours Critical
- II. Fuel Reliability (FRI)
- III. Grid-Related Loss Factor (GRLF)
- IV. Unplanned Capability Loss Factor (UCLF)
- V. Chemistry Performance (CPI)
- VI. Industrial Safety Accident Rate (ISA) – optional
- VII. Unit Capability Factor (UCF)
- VIII. Contractor Industrial Safety Accident Rate (CISA) – optional

2.6.1.6 The frequency of reporting of the WANO's indicators is designed to coincide with the indicator update frequency already used by the Licensee to discharge the WANO's reporting requirements.

2.6.1.7 The Authority's international reporting commitments require information be reported to the IAEA's PRIS. The information should be based on the specifications for information to support these commitments as detailed in Appendix 2 of this regulatory guide.

2.6.1.8 The frequency for reporting information to PRIS, falls into one of two categories. PRIS performance indicators should be reported quarterly by the Licensee to the Authority. PRIS baseline Safety-related Design information should be reported to the Authority any time that baseline information changes due to modifications or due to Safety-related evaluations. The description and means of reporting can be found in Appendix 2 of this regulatory guide.

2.6.1.9 For Physical Protection reporting, a quarterly report should be submitted, which contains the following information:

- a) A summary of the Nuclear Security events during the period as per Article 13(4) of FANR Regulatory Guide on Response and Contingency Plans of Nuclear Facilities (FANR-RG-026).
- b) Any compensatory measures taken during the period as per Article (21) of FANR Regulation on the Physical Protection for Nuclear Materials and Nuclear Facilities (FANR-REG-08) Version 1.

- c) Any changes to a previously approved Physical Protection plan during the period, if the change was conducted without the Authority's approval, as per Article (4) of FANR Regulatory Guide on the Development and Modifications of Physical Protection for Nuclear Materials and Nuclear Facilities FANR-RG-032).
- d) The significant results of security exercises and drills carried out during the period as per Article (10) of FANR-RG-026.

2.6.1.10 Operating and performance reports should be sent to the Authority as follows:

- a) In a letter addressed to the Director of the Nuclear Safety Department of the Authority with copies to the Authority's Licensing Manager.
- b) Via a database(s), which the Licensee makes available to the Authority.

2.6.1.11 Physical Protection reports should be sent by letter to the Authority's Director of Nuclear Security with copies to the Authority's Licensing Manager.

## 2.6.2 Guidance on clause (b) on Event Reporting

2.6.2.1 Clause (b) of Licence Condition 6 requires the reporting of Events related to Safety, Nuclear Security and safeguards during Operation. This regulatory guide provides guidance for Safety and safeguards-related events with regard to the Operating Licence. It does not conflict with (or eliminate) reporting requirements for Safety or safeguards events covered under relevant regulations and other regulatory guides. Nuclear Security guidance is provided in the relevant regulatory guides.

2.6.2.2 The Licence Condition provides general timelines and types of reports for events based on Event classification. The guidance expands on this to explain the timescales and the reporting requirements using flow charts and forms as well as explaining the expected report content.

2.6.2.3 As specified in the Operating Licence, the Authority requires the Licensee to report Events that occur at their licensed Nuclear Facilities. Figure 1 is a flow chart, which provides a guideline on the order the Event has to be reported. Appendix 3 summarises the reporting requirements and gives guidance on reporting timescales. Appendix 4 is a sample form for notification of Events, and Appendix 5 provides a sample form for Event reports. The Licensee is free to create its own forms as long as the required information is included.

**2.6.2.4** a) While the Authority's requirements identify specific situations that require reporting, the Licensee should consider how it will respond to other situations that may negatively impact Nuclear Security, safeguards or Safety. To this end, the Licensee should develop an internal process for systematic evaluation, by subject matter experts, of situations which may arise that are not specifically identified in FANR requirements but could negatively impact Nuclear Security, safeguards or Safety, the Licensee will send the applicable parties an Emergency Event termination notification.

**b) Prompt Notification:** The Licensee is required to notify the Authority within four hours of the discovery of any Event not identified in clause (a) above that has the potential to affect Nuclear Security, (clause (b)2 of Licence Condition 6). The Licensee is required to notify the Authority within twelve hours of the discovery of any situation as described in clause (b)2 (ii) of Licence Condition 6.

- c) **Follow-up Reporting:** For prompt notifications, the Licensee is required to submit to the Authority an initial assessment and findings report within 48 hours. The report shall include the date, description and cause of the violation, Accident, incident, circumstance or Event. For safeguards-related issues, the Licensee is required to include an estimate of any nuclear material lost.

The Licensee is also required to submit to the Authority a written report within 60 days for both immediate and prompt notifications. The report should include a description of the reportable violation, Accident, Event(s) or condition(s), an analysis of the Safety implications and the corrective actions taken, and sufficient information to permit review and evaluation of such corrective actions. See the detailed description below for Event reports.

- d) Event reports should include the following elements:
- i. General data: information including the title of the report, nuclear power plant name/ unit, nuclear power plant type, date and the time of the Event.
  - ii. Summary: a concise description of the Event, its Safety, Nuclear Security or safeguards relevance, its causes, the lessons learned and the corrective actions taken.
  - iii. Description: information on what happened before and during the Event, context of the Event, technical aspects, operability, plant features, human and organisational data (factors/ aspects/ deficiencies) necessary to understand the Event, the Event sequence, degradations or malfunctions of Structures, Systems and Components, and actions from the staff.
  - iv. Consequences: information on real or potential consequences. General statements such as, 'no impact on Nuclear Safety, staff Safety, Radiation Safety, or power production' should be avoided.
  - v. Analysis/ comments: identify the type of Event and include the causes and lessons learned as well as the description of the Event and its known root causes. For preliminary reports, the analysis section should contain as a minimum the direct cause of the Event and, if known, the probable cause(s). Any initial and relevant historical conditions as well as any unusual circumstances should also be included.
    - I. The statement on Event cause(s) should include a clear, concise statement of the root causes and causal factors including technical, human and organisational factors.
    - II. The statement on lessons learned should describe what the Licensee has learned from the Event, and why it is relevant for Nuclear Safety, Radiation Safety, Nuclear Security, or safeguards. The Licensee should ensure the addition of a concise statement(s) about the importance of the Event in terms of Operating Experience and how it could benefit other Nuclear Facilities.
- e) Corrective actions: a description should be provided of any applicable immediate and long-term corrective and preventive actions with scheduled dates for completion.
- f) Event categorisation codes: the Event should be categorised according to the coding provided

in the International Atomic Energy Agency’s Manual for IRS Coding.

2.6.2.5 If sufficient information is not available to document a final Event report 60 days after the Event occurs, an interim Event Report should be filed with the Authority, which includes all available information in the same format as the Event Report. The interim report should indicate when the final Event report will be submitted.

2.6.2.6 Use the following guidance for reporting logistics:

- a) All notifications should be made to the Duty Officer at the Authority using the contact information provided in Appendix 4 and Appendix 5 of this regulatory guide.
- b) If the Event is an Emergency, a verbal notification is required within 15 minutes plus written updates every hour. It should then be followed up by a telephone call to the Authority within 10 minutes of sending the report to verify receipt, and to allow the Authority to verify the authenticity of the person submitting the report.

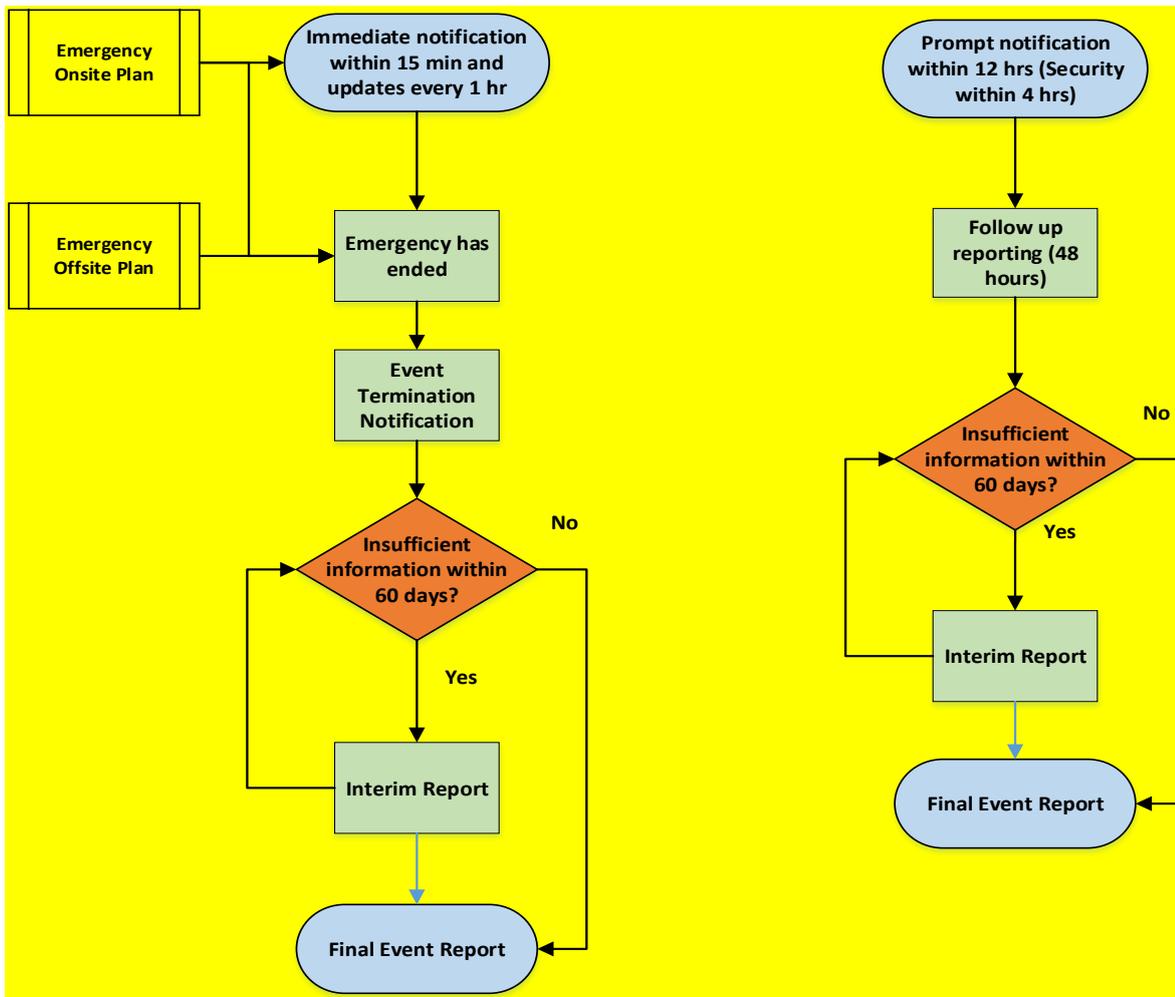


Figure 1: Guideline for Event Reporting

## **2.7 Licence Condition 7 on Access to Facilities and Documents, and Assistance**

2.7.1 No additional guidance is considered necessary for Licence Condition 7.

## **2.8 Licence Condition 8 on Records**

2.8.1 No additional guidance is considered necessary for Licence Condition 8.

## **2.9 Licence Condition 9 on Operating Limits and Conditions**

2.9.1 The Licensee is required to comply with the Operating Limits and Conditions in technical specifications and in the 'Operating Limits and Conditions for Structures, Systems and Components credited in Severe Accidents' section in the application Documents. For the purpose of this regulatory guide, 'technical specifications and Operating Limits and Conditions for Structures, Systems and Components credited in Severe Accidents' are hereinafter referred to as 'Operating Limits and Conditions'.

### **2.9.1.1 Guidance on clause (a) of Licence Condition 9**

2.9.2.1 Any modification to the Operational Limits and Conditions are subject to assessment and approval by the Authority.

2.9.2.2 The Operational Limits and Conditions' modifications should be determined with due account taken of the uncertainties in the process of Safety analysis. The justification for each of the Operational Limits and Conditions' modifications should be substantiated by means of a written indication of the reason for its adoption and any relevant background information. The Licensee should at least include the following elements in the Operational Limits and Conditions' modifications application:

- a) Description of the proposed Operational Limits and Conditions' modification.
- b) Justification for the proposed Operational Limits and Conditions' modification.
- c) Mark-up of the proposed Operational Limits and Conditions' modification.
- d) Replacement of modified pages of the Operational Limits and Conditions' affected by the proposed modification.

2.9.2.3 Each Operational Limits and Conditions' modification should have associated surveillance requirements that support the operating personnel to ensure compliance with the Operational Limits and Conditions.

2.9.2.4 Modifications to the Operational Limits and Conditions should be meaningful to the responsible operating staff and be defined by measurable or directly identifiable parameter values. Where directly identifiable values cannot be used, tables, diagrams or computing techniques should indicate the relationship of a limiting parameter with reactor power or another measurable parameter, as appropriate. The limit or condition should be stated in such a way that it is clear whether a breach has or has not occurred in any situation.

2.9.2.5 When it is necessary to modify Operational Limits and Conditions on a temporary basis, particular care should be taken to ensure that the effects of the change are analysed. The modified arrangement (although temporary) necessitates at least the same level of assessment and approval as a permanent modification. When a reasonable alternative approach is available, this

should be preferred to a temporary modification of an Operational Limits and Condition.

2.9.2.6 Clarity and thus the avoidance of ambiguity are important contributors to reliability in the use of modifications to Operational Limits and Conditions. Therefore, advice on human factors should be sought at an early stage in the development of the documentation in which the Operational Limits and Conditions' modifications will be presented to the operations personnel. The meaning of terms should be explained to help prevent misinterpretation.

2.9.2.7 Methods of configuration management should be used when modifying Operational Limits and Conditions to ensure that other documents remain consistent with the modified Operational Limits and Conditions. In particular, there should be a tracking mechanism from the Safety analysis to the Operational Limits and Conditions, and the implementing procedures in order to aid configuration control and avoid the accidental deletion or retention of an Operational Limit and Condition, or its accidental application.

### **2.9.3 Guidance on clause (b) of Licence Condition 9**

2.9.3.1 The Licensee should establish a means by which the Operational Limits and Conditions bases are controlled. The approach taken should provide a means for processing changes to the bases, control the content of the Operational Limits and Conditions' bases, ensure that the bases are consistent with the Final Safety Analysis Report, and ensure compliance with the Authority's regulations.

### **2.9.4 Guidance on clause (c) of Licence Condition 9**

2.9.4.1 A temporary deviation from an Operational Limit and Condition may be authorised by the Authority in exceptional circumstances after the Licensee has submitted an application for a temporary deviation to the Authority and obtained its written approval. The Licensee should include the following (without limitation) in the application to the Authority of a deviation from an Operational Limit and Condition:

- a) Description of the Operational Limit and Condition, and reason for deviation.
- b) Duration of the deviation from the Operational Limit and Condition.
- c) Compensatory actions and measures taken and planned.
- d) Safety basis for the deviation from the Operational Limit and Condition.
- e) Current plant mode as defined in the Operational Limits and Conditions, and status of the Structures, Systems and Components which are out of service.

### **2.9.5 Guidance on clause (d) of Licence Condition 9**

2.9.5.1 The Licensee may only return the nuclear power plant to power operations (MODE 1) following a refuelling outage after obtaining written approval from the Authority. This includes both scheduled and forced (i.e. unplanned) outages, which involve activities related to fuel in the reactor vessel. Following such an outage, the Licensee should report that the Licensee has verified all SSCs in "Operating Limits and Conditions for SSCs credited in Severe Accidents" are fully functional.

### **2.9.6 Guidance on clause (e) of Licence Condition 9**

2.9.6.1 Section 4.1 to 4.5 of IAEA Safety Standard on Operational Limits and Conditions and Operating

Procedures for Nuclear Power Plants, Safety Guide No. NS-G-2.2 should be used as implementation guidance for clause (e) of Licence Condition 9.

2.9.6.2 In cases where a Safety Limit is exceeded, the Operator is required to shut down the reactor in accordance with the Operational Limits and Conditions, and report to the Authority the details, causal analysis of the Event, and action taken. Exceeding the Safety Limits is considered an Event and should therefore be subject to the reporting requirements in clause (b) of Licence Condition 6. The Licensee may only return the Nuclear Facility to power operations (MODE 1) following a situation where a Safety Limit was exceeded once the Licensee has obtained written approval from the Authority.

## **2.10 Guidance on Licence Condition 10**

2.10.1 Licence Condition 10 requires the Licensee to develop, maintain and use an Inspection and testing programme for Items Important to Safety. Such a programme refers in part to the activities related to non-destructive testing, pressure testing, leak testing, repair and replacement, and performance testing and assessment of unanticipated operating events of Safety-related facilities. These are performed by the Licensee or its authorised representatives in order to monitor and assess the degradation of performance and materials of Safety-related facilities due to ageing during the lifetime of the Nuclear Facility. It includes pre-service Inspection performed prior to the Operation of the nuclear power plant.

### **2.10.2 Guidance on clause (a) of Licence Condition 10**

2.10.2.1 The scope of clause (a) of Licence Condition 10 includes the in-service Inspection and testing of the Safety class Structures, Systems and Components designed, manufactured, constructed, and installed according to the provisions of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code Section III/ Korea Electric Power Industry Code (KEPIC) MN. Safety class Structures, Systems and Components also include those Structures, Systems and Components which are not under the scope of the ASME B&PV Code Section III/ KEPIC MN but identified as a Safety class by Design specifications and/ or the Safety Analysis Report.

2.10.2.2 For in-service Inspection and testing of the ASME/ KEPIC code Structures, Systems and Components, the Licensee must apply provisions of ASME B&PV Code Section XI (including the referenced codes and standards). For Structures, Systems and Components not covered under ASME B&PV Code Section XI, the Licensee must apply provisions of ASME Code for Operation and Maintenance of Nuclear Power Plants (including the referenced codes and standards), as applicable. For all applied codes, the limitations, supplementary provisions, code edition, and addenda require the Authority's review and acceptance. Application of any code cases are subject to the Authority's review and acceptance. Resolution of any conflicting / overlapping requirements in different codes/ standards are subject to the Authority's review and acceptance.

2.10.2.3 In applying the provisions of paragraph 2.10.2.2 above, the Licensee must apply the requirements of US Nuclear Regulatory Commission's Title 10 of the Code of Federal Regulations 50.55a on Codes and Standards. The Licensee should apply additional requirements stipulated in the Republic of Korea's Nuclear Safety and Security Commission's Notice No. 2012-10 on the Regulation on In-Service Inspection of Nuclear Reactor Facilities, Notice No. 2012-13 "Guidelines

for Application of Korea Electric Power Industry Code (KEPIC) as Technical Standards of Nuclear Reactor Facilities”, and Notice No. 2012-23 on the Regulation on In-Service Test of the Safety-related Pump and Valve. The Licensee should apply provisions of US Nuclear Regulatory Commission’s NUREG 1482 on the Inservice Testing of Pumps and Valves and Inservice Examination and Testing of Dynamic Restraints (Snubbers) at Nuclear Power Plants. Resolution of any conflicting or overlapping requirements between the US Nuclear Regulatory Commission’s rules and the Republic of Korea’s Nuclear Safety and Security Commission’s notices are subject to the Authority’s review and acceptance. (The US NRC uses the term “Inservice” while the Korea NSSC spells the same term as In-service. They have the same meaning.)

- 2.10.2.4 As the publication date for the US Nuclear Regulatory Commission’s documents can change, the Licensee is to use the date closest to the date the publication came into effect one year prior to the commencement of the Inspection interval for both the US Nuclear Regulatory Commission’s Title 10 of the Code of Federal Regulations 50.55a on Codes and Standards and the US Nuclear Regulatory Commission’s NUREG 1482 on the Inservice Testing of Pumps and Valves and Inservice Examination and Testing of Dynamic Restraints (Snubbers) at Nuclear Power Plants. If the publication date of a US Nuclear Regulatory Commission document is less than one year from the commencement of the Inspection interval, the Licensee may still use it but is not required to.
- 2.10.2.5 For example, if the in-service Inspection/ in-service testing programme is scheduled to commence on 10 January 2021, and the most recent versions of a US Nuclear Regulatory Commission’s document are 25 February 2020, 10 February 2019 and 20 March 2018, then the Licensee can use the 25 February 2020 version but is not required to. If the Licensee chooses not to use the 25 February 2020 version, then the Licensee is required to use the version published on 10 February 2019 since it is the closest to the one-year prior requirement. The Licensee is prohibited from using the US Nuclear Regulatory Commission’s document published on 20 March 2018.
- 2.10.2.6 The review/ update date specified on the relevant US Nuclear Regulatory Commission’s web pages should be considered as the publication dates for the US Nuclear Regulatory Commission’s Title 10 of the Code of Federal Regulations 50.55a on Codes and Standards and the US Nuclear Regulatory Commission’s NUREG 1482 on the Inservice Testing of Pumps and Valves and Inservice Examination and Testing of Dynamic Restraints (Snubbers) at Nuclear Power Plants. The publication dates for the ASME code edition and addenda identified in US Nuclear Regulatory Commission’s Title 10 of the Code of Federal Regulations 50.55a on Codes and Standards, which is acceptable to the Authority, are those closest to the one-year prior date of the commencement of the Inspection interval. Acceptable publication dates for other codes and standards shall be consistent with the referencing for the ASME code editions and addenda.
- 2.10.2.7 The publication dates that the Republic of Korea’s Nuclear Safety and Security Commission’s notices came into effect must be the same as those applicable for Shin Kori Unit 3, the reference plant for the Barakah Nuclear Power Plant. The Republic of Korea’s Nuclear Safety and Security Commission’s notice numbers change with revisions. Thus, care should be exercised when applying the notices.
- 2.10.2.8 For interpretations related to nuclear codes, ASME interpretations have precedence.

### **2.10.3 Guidance on clause (b) of Licence Condition 10**

2.10.3.1 The scope of clause (b) of Licence Condition 10 includes the Inspection and test programme for Items Important to Safety not under the American Society of Mechanical Engineers (ASME)/ Korea Electric Power Industry Code (KEPIC) code Safety classification. The Licensee must develop and apply an Inspection and test programme for non-code (i.e. not in the scope of ASME/KEPIC codes) Items Important to Safety. The Inspection and test requirements must be commensurate with Safety significance of the Structures, Systems and Components.

### **2.10.4 Guidance on clause (c) of Licence Condition 10**

2.10.4.1 Clause (c) of Licence Condition 10 is applicable to all the items covered in both clause (a) and clause (b) of the said Licence Condition.

#### **2.10.4.2 Guidance on clause (c) (i) of Licence Condition 10**

2.10.4.2.1 For this section of the Licence Condition, the Licensee must submit to the Authority a long-term Inspection and testing programme for all important to Safety Structures, Systems and Components at least three months' prior to implementation for each Inspection interval. The Inspection intervals are required to be in compliance with codes and standards applicable for the Inspection and testing programme. For non-ASME code Items Important to Safety, such Inspection intervals should be commensurate with their Safety significance. For example, if the Licensee chooses a ten-year interval period for Inspection, then for each such interval a long-term Inspection and testing programme should be submitted to the Authority. The long-term Inspection programmes submitted to the Authority should broadly follow the format specified in Republic of Korea's Nuclear Safety and Security Commission's Notice No. 2012-10 on the Regulation on the Inservice Inspection of Nuclear Reactor Facilities.

#### **2.10.4.3 Guidance on clause (c) (ii) of Licence Condition 10**

2.10.4.3.1 The Licensee must submit to the Authority changes/ revisions to the long-term Inspection and testing programme along with the justification for such changes, and alternate Inspections and tests. Such changes/ revisions should be submitted to the Authority at least three months prior to their implementation.

2.10.4.3.2 Changes made due to impractical situations or emergent issues identified during the implementation of the long-term Inspection and testing programme (during outages, for example) are not intended to be under the scope of clause (c) (ii) of Licence Condition 10. See guidance under clause (c) (iii) and (c) (iv) of Licence Condition 10.

2.10.4.3.3 The Authority will evaluate the alternate Inspection and testing proposals and may impose alternative requirements in lieu of the originally-identified requirement or the proposed alternative/alleviation request.

#### **2.10.4.4 Guidance on clause (c) (iii) of Licence Condition 10**

2.10.4.4.1 The Licensee must submit to the Authority a detailed outage scope for the Inspection and testing programme for each refuelling outage at least three months before implementing such

programme. Any changes in the refuelling outage for the Inspection and testing programme due to impractical situations or emergent issues along with the reasons of such changes and alternate Inspections and tests in lieu of originally-identified Inspection and tests (if applicable) should be submitted along with the summary report of refuelling outage Inspection and testing. See clause (c) (iv) of Licence Condition 10 below for guidance on the refuelling outage Inspection and testing summary report. All such changes, if applicable, should be incorporated in the subsequent revision of the long-term inspection programme.

#### **2.10.4.5 Guidance on clause (c) (iv) of Licence Condition 10**

2.10.4.5.1 The Licensee must submit to the Authority a summary report of the outage scope for the Inspection and testing results within three months of completion of Inspection and testing for each refuelling outage including the results of the Inspection and testing conducted during the preceding operating period, if any. The report should contain (but not be limited to):

- a) Inspection and evaluation results for each System, Structure and Component.
- b) Non-conformances to the applicable codes and standards, and associated corrective actions.
- c) Corrective actions for in-service Inspections' indications exceeding the applicable acceptance criteria.
- d) Actions for non-completed parts of the Inspections, if any.
- e) Changes to the already submitted refuelling outage for the Inspection and testing programme due to emergent issues along with the reasons for such changes, and alternate Inspections and tests in lieu of originally-identified Inspection and tests (if applicable).

#### **2.10.4.6 Guidance on clause (c) (v) of Licence Condition 10**

2.10.4.6.1 Upon completion of an Inspection interval period (e.g. a 10-year interval), the Licensee shall submit to the Authority, within six months of the end of the Inspection interval, an integrated Inspection and testing report covering all the Inspections and tests planned and completed during the Inspection interval. The report should highlight and explain the non-completion of any planned Inspection or test along with the plan for completion of these incomplete Inspections and tests.

#### **2.10.4.7 Guidance on clause (c) (vi) of Licence Condition 10**

2.10.4.7.1 No additional guidance is deemed necessary for clause (c)(vi) of Licence Condition 10.

#### **2.10.4.8 Guidance on clause (c) (vii) of Licence Condition 10**

##### **2.10.4.8.1 Performance demonstration of non-destructive examination:**

2.10.4.8.1.1 Among non-destructive examination methods performed during in-service Inspection, the Licensee should conduct the performance demonstration of ultrasonic testing for the Items Important to Safety and eddy current testing for steam generator tubes, as applicable, as per section XI of the American Society of Mechanical Engineers' Boiler and Pressure Vessel Code.

2.10.4.8.1.2 The technical standards of the ultrasonic testing performance demonstration should be as per the guidance for clauses (a)(2) and (a)(3) of Licence Condition 10. The cut-off date of the technical standards should comply with the guidance for clauses (a)(4) and (a)(5) of Licence

#### Condition 10.

2.10.4.8.1.3 The test specimen for ultrasonic testing performance demonstration should be selected among those representing characteristics of size, materials, configuration, etc. of the specific Structure, System and Component to be examined. In case of eddy current testing for steam generator tubes, the performance demonstration should be supplemented for each nuclear power plant unit by using data characteristics specific to the unit.

2.10.4.8.1.4 The Licensee should submit the performance demonstration report to the Authority three months prior to the application of performance demonstration. When the Licensee needs to change the performance demonstration requirements or to use another performance demonstration system, a report should be submitted three months prior to the application. The report should include the following:

- a) Name and address of the organisation carrying out the performance demonstration.
- b) Applicable technical standards for performance demonstration and their edition.
- c) Test specimen or test data of performance demonstration.
- d) Evaluation of performance demonstration.
- e) Quality Assurance of performance demonstration.
- f) Security-related to performance demonstration.
- g) Operation of the performance demonstration system.
- h) Other related items.

2.10.4.8.1.5 The Authority may require additional information if it is deemed that the information submitted for point 2.10.11.5 above is not satisfactory and/ or not sufficient.

2.10.4.8.1.6 The organisation carrying out performance demonstration must report every year the status of the performance demonstrations to the Authority. The Authority may audit the performance demonstration activities.

#### **2.10.5 Guidance on clause (d) of Licence Condition 10**

2.10.5.1 The scope of clause (d) of Licence Condition 10 includes material surveillance for the reactor pressure vessel. For clause (d) of Licence Condition 10, the Licensee should meet the requirements equivalent to those specified in the Republic of Korea's Nuclear Safety and Security Commission's Notice No. 2012-08 on Material Surveillance Criteria for Reactor Pressure Vessel. Effective publication dates for the Republic of Korea's Nuclear Safety and Security Commission's notices should be the same as those applicable for Shin Kori Unit 3, the reference plant for the Barakah Nuclear Power Plant. The Republic of Korea's Nuclear Safety and Security Commission's notice numbers change with the revisions - thus care should be exercised when applying the notices.

#### **2.11 Licence Condition 11 on "Refuelling Outages**

2.11.1 No additional guidance is deemed necessary for Licence Condition 11.

#### **2.12 Licence Condition 12 on Limited Scope Periodic Safety Review**

- 2.12.1 Licence Condition 12 requires the conduct of a limited scope periodic Safety review covering the first five years of Operations of the unit covered by the Operating Licence at the Barakah Nuclear Power Plant. The starting point of this five-year period is the beginning of commercial Operation. As per Licence Condition 12, the review report is to be submitted to the Authority within one year of completion of this five-year period.
- 2.12.2 The review should focus on the lessons learned from initial Operation including those related to the implications of site-specific conditions on safe Operation of the unit covered by the Operating Licence. The submission of the limited scope periodic Safety review does not affect the requirement for the submission of the first full periodic safety review, which is to be submitted within 10 years of the commercial operating date, and every 10 years thereafter, as per FANR Regulation on Operational Safety including Commissioning (FANR-REG-16).
- 2.12.3 See Article (6)13 in this regulatory guide for implementation guidance on Article (14) of FANR-REG-16. The Licensee should come to an agreement with the Authority on the structure and content of the limited scope periodic Safety review. As stated, a full periodic Safety review is not required for the first five years' of commercial Operation but all elements as outlined in the guidance should be addressed while the lessons learned since initial Operations should be fully discussed and reported. IAEA Safety Standard on the Periodic Safety Review for Nuclear Power Plants, Specific Safety Guide No. SSG-25 provides further guidance on the approach, structure, review and post-review activities to consider in the limited scope periodic Safety review.

### **2.13 Licence Condition 13 on Possession and Use of Radioactive Material and Radiation Generators**

- 2.13.1 No additional guidance is deemed necessary for Licence Condition 13.

### **2.14 Licence Condition 14 on Corporate Governance**

- 2.14.1 No additional guidance is deemed necessary for Licence Condition 14.

## **3. Schedule 3 on Application Documents and Commitments**

- 3.1 The Operating Licence uses the practice of having 'Application Documents' as one basis of compliance. The Authority determines the scope of such 'Application Documents' to support the Operating Licence and is not bound by the applicant's statements in submissions that describe the extent of material that do or do not constitute the 'Application Documents'. As a general principle, all information contained in formal correspondence (or incorporated by reference) including attachments submitted by the applicant in support of the Operating Licence application review are considered by the Authority to be 'Application Documents'.
- 3.2 The same logic applies to 'commitments' associated with the Operating Licence Issuance. All statements and descriptions of actions in the applicant's correspondence are considered germane to the Operating Licence application regardless of the applicant's statements to the contrary. Specifically, the Authority will evaluate Inspection findings' 'close-outs' as well as statements in requests for additional information without regard to the applicant's characterisation of an item as a 'commitment' or not.

**4. Schedule 4 on Interpretation**

4.1 No additional guidance is deemed necessary for Schedule 4.

### Appendix 1: WANO Performance Indicators

Indicator	Description	Frequency
Forced Loss Rate (FLR)	This indicator is the ratio of all unplanned forced energy losses to the reference energy generation minus energy generation losses corresponding to planned outages and any unplanned outage extensions during a given period of time; it is expressed as a percentage. Unplanned energy losses are either unplanned forced energy losses or unplanned outage extensions of planned outage energy losses. Planned energy losses are those corresponding to outages or power reductions, which were planned and scheduled at least four weeks in advance.	Quarterly
Collective Radiation Exposure (CRE)	This indicator is the total external and internal whole body exposure determined by primary dosimeter, and internal exposure calculations. It includes all measured exposure reported for station personnel, contractors, and personnel visiting the site or station on official business.	Quarterly
Safety System Performance Indicator (SSPI)	<p>This indicator monitors the readiness of important Safety systems to perform certain functions in response to off-normal events or Accidents. It also indirectly monitors the effectiveness of operations and Maintenance practices in managing the unavailability of Safety system components. A low value for the Safety system performance indicator indicates a greater margin of Safety for preventing reactor core damage. The SP1, SP2 and SP5 headings identify the specific safety systems monitored by the indicator. SP1 usually refers to the high pressure Safety injection system and SP2 is usually the auxiliary feedwater system or other similar system. SP5 refers to the Emergency power system. Other systems monitored vary according to reactor type.</p> <p><b>NB:</b> Given the SSPI industry target definition for SSPI, the lower graph shows the percentage of units that have met all the individual targets for the different Safety systems (SP1, SP2 and SP5). For this percentage, the industry objective is 100%.</p>	Quarterly

Unplanned Total Scrams per 7,000 hours critical (US7)	This indicator is the sum of the number of unplanned automatic scrams (reactor protection system logic actuations) and unplanned manual scrams for approximately one year (7,000 hours) of operation. Full worldwide data collection for the US7 indicator did not begin until 2013.	Quarterly
Unplanned Automatic (UA7) Scrams per 7,000 Hours Critical	This indicator is defined as the number of unplanned automatic scrams (reactor protection system logic actuations) that occur per 7,000 hours of critical operation (which is approximately one year of operation). It provides an indication of success in improving plant Safety by reducing the number of undesirable and unplanned thermal-hydraulic and reactivity transients	Quarterly
Fuel Reliability (FRI)	For this indicator, fuel reliability is inferred from fission product activities present in the reactor coolant. Due to design differences, this indicator is calculated differently for different reactor types. Overall, the purpose of this indicator is to monitor industry progress in achieving and maintaining high fuel integrity, and to foster a healthy respect for preservation of fuel integrity. Failed fuel represents a breach in the initial barrier preventing off-site release of fission products has a detrimental effect on operating cost and performance, and increases the radiological hazard to plant workers.	Quarterly
Grid-Related Loss Factor (GRLF)	This is the percentage of maximum energy generation that a plant could not supply due to grid issues not under station management control.	Quarterly
Unplanned Capability Loss Factor (UCLF)	This is the percentage of maximum energy generation that a plant is not capable of supplying to the electrical grid because of unplanned energy losses (such as unplanned shutdowns or outage extensions) which are not under management control. A low value indicates important unit equipment is well maintained and reliably operated and there are few outage extensions.	Quarterly
Chemistry Performance (CPI)	The purpose of this indicator is to monitor operational chemistry control effectiveness. It combines several key chemistry parameters into a single indicator that can be used as an overview of	Quarterly

	the relative effectiveness of plant operational chemistry control.	
Unit Capability Factor (UCF)	This is the percentage of maximum energy generation that a unit is capable of supplying to the electrical grid limited only by factors within the control of station management. A high unit capability factor indicates effective station programmes and practices to minimise unplanned energy losses and to optimise planned outages.	Quarterly

**Appendix 2: Power Reactor Information System (PRIS)**

Indicator	Description	Frequency
Power Reactor Information System (PRIS)	<p>a) Information on the operational performance of the Barakah Nuclear Power Plant.</p> <p>b) Information on any amendments to the baseline Safety-related Design of the Barakah Nuclear Power Plant.</p> <p>The Authority, via its PRIS National Officer, will update the PRIS as necessary to keep information up-to-date on the UAE's commercial nuclear power plant(s). Information that must be provided can be found on the IAEA's website as follows: <a href="https://www.iaea.org/pris/">https://www.iaea.org/pris/</a></p> <p>Details of the information to be provided can be found in the PRIS user manual, in Article (6) above, and in the references below.</p> <p>(a) <a href="http://www-pub.iaea.org/books/IAEABooks/10876/PRIS-WEDAS-User-s-Manual-to-the-Web-Enabled-Data-Acquisition-System-for-PRIS">http://www-pub.iaea.org/books/IAEABooks/10876/PRIS-WEDAS-User-s-Manual-to-the-Web-Enabled-Data-Acquisition-System-for-PRIS</a></p> <p>(b) <a href="http://www-pub.iaea.org/mtcd/publications/pdf/te_1544_web.pdf">http://www-pub.iaea.org/mtcd/publications/pdf/te_1544_web.pdf</a></p>	<p>a) Quarterly</p> <p>b) As amendments occur</p>



### **Appendix 3: Licence Conditions and Safety Regulation reporting Requirements**

References	Title	Relevant Article	Text	Timescales
Operating Licence	Event Reporting	6(b)	<p>Reporting of Events:</p> <p>1) Immediate Notification</p> <p>The Licensee shall notify the Authority within one hour of the declaration of any of the Emergency Classes specified in the Licensee's approved Emergency Plan.</p> <p>2) Prompt Notification</p> <p>The Licensee shall notify the Authority of any Event not identified in paragraph (1) above, which has the potential to affect Safety or Safeguards within 12 hours of its finding of each item.</p> <p>3) Follow-up Reporting</p> <p>For the prompt notifications, the Licensee shall submit to the Authority a report within 48 hours. The report shall include the date, description and cause of the incident, circumstance or Event, and an estimate of any nuclear material lost.</p> <p>Unless specified otherwise by the Authority, the Licensee shall submit to the Authority a written final report within 60 days of each immediate or prompt notification referred to in Licence Condition 6.</p>	Immediate notification 12hrs (prompt notification) 48 hours initial report 60 days (Event report)
FANR-REG-11	Regulation for Radiation Protection and Predisposal Radioactive	(24)4	Report within 24 hours to the Authority any Discharges exceeding the limits of Discharge in accordance with the approved Safety Case.	12 hrs (prompt notification) 60 days (Event report)
		(24)5	Report within 24 hours to the Authority any direct external exposure levels exceeding the levels in the approved	12 hrs (prompt notification)

	Waste Management in Nuclear Facilities		Safety Case (i.e. the Dose Constraint for Occupational Exposure in accordance with Article (5)3 of FANR-REG-04).	60 days (Event Report)
		(24)6	Report within 24 hours to the Authority any significant increase in Dose rate or content of radionuclides in the environment that could be attributed to the Nuclear Facility.	12 hrs (prompt notification) 60 days (Event report)
FANR-REG-12	Regulation for Emergency Preparedness for Nuclear Facilities	(2) ‘... and implement notification procedures’	<ul style="list-style-type: none"> <li>• Emergency classification level has been declared</li> <li>• Emergency classification level change</li> <li>• Protective Action recommendation has been made</li> <li>• Protective Action recommendation has been changed</li> <li>• Termination of Emergency</li> </ul>	Immediate notification (15 minutes)  Hourly updates after immediate notification until end of Emergency  Notification of termination of Emergency after consultation with the Authority and off-site entities  60 days (Event report)
FANR-REG-16	Operational Safety including Commissioning	(8)7	The Nuclear Facility shall be returned to a safe Operational State when parameters deviate from the Operational Limits and Conditions. These deviations shall be documented and appropriate remedial actions shall be taken. The Licensee shall undertake a review and evaluation of the circumstances that led to this condition. The Authority shall be notified in accordance with the Authority’s requirements. Responsibilities and lines of communication for responding to such deviations shall be clearly specified in writing.	12 hrs (prompt notification)  48 hours initial report  60 days (Event report)

		(8)8	<p>The Licensee shall not intentionally exceed the Operational Limits and Conditions. A Licensee may take reasonable action that departs from the Operational Limits and Conditions in an Emergency when this action is immediately needed to protect public health and Safety, and the environment, and no action consistent with Licence Conditions or the Operational Limits and Conditions that can provide adequate or equivalent protection that is available. Any such situations shall be promptly reported to the Authority. Any other departures from the Operational Limits and Conditions shall be approved in advance by the Authority and be conducted with clear formal instructions including instructions for returning the Nuclear Facility to Normal Operation.</p>	<p>12 hrs (prompt notification)</p> <p>48 hours initial report</p> <p>60 days (Event report)</p>
FANR-RG-002	Application of Management Systems for Nuclear Facilities	<p>(2)7 Section 10.8 (Event reporting) of IAEA Safety Standard on A System for the Feedback of Experience from Events in Nuclear Installations, Safety Guide No. NS-G-2.11 as implementation guidance to meet the requirements of FANR-REG-01</p> <p>Note: NS-G-2.11 provides</p>	<p>The key criteria for Events that should be reported to the regulatory body include the following:</p> <ol style="list-style-type: none"> <li>(1) A plant shutdown as required by the Operational Limits and Conditions.</li> <li>(2) An operation or condition prohibited by the Operational Limits and Conditions.</li> <li>(3) Any Event or abnormal condition that resulted in the condition of the nuclear installation including its principal Safety barriers being seriously degraded.</li> <li>(4) Any natural phenomenon or other external condition that posed an actual threat to the Safety of the nuclear installation or that significantly hampered site personnel in the performance of duties necessary for safe Operation.</li> <li>(5) Any Event or abnormal condition that resulted in the manual or automatic Operation of the reactor protection system or of engineered Safety</li> </ol>	<p>Within one hour (immediate notification) for any natural phenomena or Event that posed an actual threat to the Safety of the nuclear installation, or that significantly hampered site personnel in the performance of duties necessary for safe Operation; or for any Event, which results in death or serious injury.</p> <p>12 hrs (prompt notification)</p> <p>48 hours initial report</p> <p>60 days (Event report)</p>

		guidance on Event Reporting criteria and report formatting	<p>features.</p> <p>(6) Any Event in which a single cause or condition caused a significant loss of operability in a Safety System.</p> <p>(8) Any Event that posed an actual threat to the safety of the nuclear installation or that significantly hampered site personnel in the performance of duties necessary for safe Operation including fires, releases of toxic gases and radioactive releases.</p> <p>(10) Any problem or defect in the Safety analysis, Design, construction or Operation that has resulted in (or could result in) an operating condition that had not previously been analysed or that could exceed Design basis conditions.</p> <p>(11) Any Safety significant Event during shutdown or refuelling (e.g. dropping a fuel assembly).</p> <p>(12) Any Event that results in the death of (or serious injury to) personnel on the site.</p>	
FANR-RG-006	Transportation Safety Guide	(4)7	<p>Emergency Preparedness</p> <p>In case of an Emergency, follow the Emergency instructions that you were given in the shipper's information for carriers. If you cannot follow the Emergency instructions for any reason, or if you have any reason to believe the Emergency may cause you or the public to be exposed to contamination or excessive radiation, notify the Authority immediately by calling 050 641 65 33.</p>	<p>Immediately (within 1 hour) for potential contamination or overexposure of personnel</p> <p>60 days (Event report)</p>

		<p>(4)8</p>	<p>Undeliverable packages</p> <p>As the licensed carrier, the package is your responsibility until it is accepted by the recipient or returned to the shipper. If you find that a package is undeliverable, place it in a safe location that is under your control, notify the shipper and the Authority as soon as possible, and ask for instructions.</p>	<p>12 hours' notification</p> <p>60 days (Event report)</p>
		<p>(5)3</p>	<p>Package acceptance</p> <p>Do not unload or otherwise touch or move the package, and contact the shipper for further directions under any of the following circumstance:</p> <p>The documents are not in order;</p> <p>Your unloading instructions from the shipper are not clear or you cannot carry them out;</p> <p>The measured transport index is significantly greater than the transport index on the label;</p> <p>It is evident that the package is damaged or leaking; or</p> <p>You suspect that the package may have leaked or been damaged.</p> <p>If you have any reason to believe that the package may cause you or the public to be exposed to contamination or excessive radiation, notify the Authority immediately on 02 651 6666 between 9am and 4pm Sunday to Thursday,</p>	<p>Immediately (within 1 hour) for a leaking/damaged package or potential contamination or overexposure of personnel</p> <p>12 hours' notification for other package acceptance issues</p> <p>60 days (Event report) for leaking/damaged package or potential contamination of personnel</p>

			or 050 641 6533.	
FANR-RG-017	Certification of Reactor Operators and Senior Reactor Operators at Nuclear Facilities	(11)2	The Facility Licensee should notify the Authority of a decision to permanently remove a Reactor Operator/ Senior Reactor Operator from active status or a decision to remove an active Reactor Operator/ Senior Reactor Operator from active status for an indeterminate period of time. This notification should be by letter to the Director of Nuclear Safety and should identify the individual and reasons for removal from active status. Such a letter should appropriately protect personal or medical information of individuals.	30 days (Letter to the Director of the Nuclear Safety Department at the Authority)

### Appendix 4: Notification of Event

Please complete this or an equivalent form and inform the Authority's Duty Officer by email ([RN.ER@fanr.gov.ae](mailto:RN.ER@fanr.gov.ae)) and by referring to the contact information provided on the Authority's website (<https://FANR.gov.ae/en/operations/emergency-preparedness>). Receipt of the notification should be verified by phone within 10 minutes of submitting the notification.

Notification of Event	
<b>Licensee/ Nuclear Facility:</b>	
<b>Unit No:</b>	Unit 1 <input type="checkbox"/> Unit 2 <input type="checkbox"/> Unit 3 <input type="checkbox"/> Unit 4 <input type="checkbox"/> Other _____ <input type="checkbox"/>
<b>Notification No:</b>	
<b>Licence No:</b>	
<b>Notification:</b>	<b>Date:</b>
	<b>Time:</b>
<b>Event:</b>	<b>Date:</b>
	<b>Time:</b>
<b>Event Description:</b>	

<b>Preliminary List of affected Structures, Systems and Components:</b>	
<b>Interim Measures taken by the Licensee:</b>	
<b>Submitted by:</b>	
<b>Contact Details:</b>	
<b>Office Phone No:</b>	
<b>Mobile Phone No:</b>	
<b>E-mail Address:</b>	
<b>Licensee Contact for this Report:</b>	
<b>Name:</b>	
<b>Telephone No:</b>	
<b>Job Title:</b>	
<b>E-mail Address:</b>	

### Appendix 5: Event Report

Please complete this or an equivalent form and inform the Authority's Duty Officer by email ([RN.ER@FANR.gov.ae](mailto:RN.ER@FANR.gov.ae)) and by referring to the contact information provided on the Authority's website (<https://FANR.gov.ae/en/operations/emergency-preparedness>).

Event Report	
<b>Licensee/ Nuclear Facility:</b>	
<b>Unit No:</b>	Unit 1 <input type="checkbox"/> Unit 2 <input type="checkbox"/> Unit 3 <input type="checkbox"/> Unit 4 <input type="checkbox"/> Other _____ <input type="checkbox"/>
<b>Title of Report:</b>	
<b>Report No:</b>	
<b>Report Type:</b>	Interim <input type="checkbox"/> Final Report <input type="checkbox"/> Follow-up <input type="checkbox"/>
<b>Notification of Event No:</b>	
<b>Event Date:</b>	
<b>Repeated Event:</b>	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, please provide reference to previous Event:
<b>Report Date:</b>	
<b>Summary: brief description of Event, regulatory &amp; Safety relevance etc.</b>	

<b>Description: include systems affected, effect of Event or condition on the plant/Nuclear Facility, action taken or planned.</b>
<b>Consequences: actual &amp; potential consequences of Event, barriers broken and human performance. For re-occurring Events or conditions, explain why previous corrective actions were ineffective.</b>
<b>Analysis/ comment: identification of investigative actions taken &amp; direct causes, root causes and causal factors including technical, human and organisational factors.</b>
<b>Corrective actions: describe immediate corrective actions, interim corrective actions and corrective actions to prevent recurrence.</b>
<b>Event coding</b>
<b>Reporting category</b> <b>Plant status prior to Event</b> <b>Failed/ affected systems</b> <b>Failed affected components</b> <b>Cause of Event</b> <b>Effects on operation</b> <b>Characteristics of Event/ issue</b> <b>Nature of failure/ error</b> <b>Recovery actions</b>
<b>References</b>