
Regulatory Guide

Regulatory Guide for Operational Safety for Nuclear Facilities

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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 in the Operating Licence and 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 meanings set forth below. Other capitalised terms used but not defined herein shall have the meaning ascribed to them in Article 1 of the UAE Nuclear Law of 2009.

Accident Conditions	Deviations from Normal Operation more severe than Anticipated Operational Occurrences, including DBAs and Severe Accidents.
Accident Management	The taking of a set of actions during the evolution of a beyond DBA: <ul style="list-style-type: none">- 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 (AOO)	An operational process deviating from Normal Operation which is expected to occur at least once during the operating lifetime of a Nuclear Facility but which, in view of appropriate Design provisions, does not cause any significant damage to Items Important to Safety or lead to Accident Conditions.
Beyond Design Basis Accident (BDBA)	Postulated accident with accident conditions more severe than those of a design basis accident. Severe Accidents are a subset of Beyond Design Basic Accidents which involve significant core degradation.
Design Basis Accident (DBA)	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.
Event	In the context of the reporting and analysis of Events, an Event is any occurrence unintended by the operator, including 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 and radiation safety, nuclear security, and safeguards.

Equipment Operator (EO)	An Operator who works in a Nuclear Facility, normally outside the control room, under the direction of Reactor Operators and Senior Reactor Operators.
Item Important to Safety	<p>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:</p> <ul style="list-style-type: none">• Those SSCs whose malfunction or failure could lead to undue radiation exposure of site personnel or members of the public;• Those SSCs that prevent Anticipated Operation Occurrences from leading to Accident Conditions; and• Those features that are provided to mitigate the consequences of malfunction or failure of SSCs.
Licence Condition Normal Operation	<p>A binding requirement in a Licence issued by the Authority.</p> <p>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 refueling.</p>
Operating Licence	The Licence issued by the Authority allowing the Licensee permission to operate a Nuclear Facility.
Operating Personnel	The Senior Reactor Operators, the Reactor Operators, or the Equipment Operators at a Nuclear Facility.
Operational Limits and Conditions (OLC)	A set of rules setting forth parameter limits, the functional capability and the performance levels of equipment and personnel approved by the Authority for safe operation of an authorised Nuclear Facility.
Operational States	States defined under Normal Operation and Anticipated Operational Occurrences
Performance Indicator	Characteristic of a process that can be observed, measured or trended to infer or directly indicate the current and future performance of the process, with particular emphasis on satisfactory 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 for mitigating the consequences of Accidents should they occur.
Reactor Operator (RO)	A control room operator who normally manipulates the Nuclear Facility controls, particularly the controls affecting reactor reactivity, under the supervision of the SRO.
Root Cause	The fundamental cause of an initiating event, 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 (SAR)	The detailed demonstration of the Safety, security and safeguards of a Nuclear Facility presented in the form of an integrated report that presents the necessary and sufficient 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 (PIE) to ensure that the limits specified in the design basis for Anticipated Operational Occurrences and DBAs are not exceeded.
Senior Reactor Operator (SRO)	A senior control room operator who oversees and directs the activities of Reactor Operators and Equipment Operators.
Severe Accident	Accident Conditions more severe than a DBA and involving significant core degradation.
Structures, Systems and Components (SSCs)	A general term encompassing all the elements of a Nuclear Facility or Activity which contributes 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.

Requirement

Article (2)

FANR Regulation FANR-REG-16, Operational Safety including Commissioning, establishes the requirements that must be satisfied to ensure the safe operation of a Nuclear Facility; specifically for Commissioning and Operations, as well as the preparation for Decommissioning. The Law requires that any applicant/licensee, who proposes to operate a Nuclear Facility, request and receive an Operating Licence from the Authority.

The Operating Licence establishes the authorised activities for the operation of a Nuclear Facility and related regulated activities. It also establishes Conditions, which must be complied with, for operation of the Nuclear Facility.

Purpose

Article (3)

This Regulatory Guide provides acceptable methods and guidance for implementing the requirements specified in FANR-REG-16, Operational Safety including Commissioning, and the Operating Licence for a Nuclear Facility, including routine and event reporting requirements.

Scope

Article (4)

This regulatory guide applies to Licensees seeking adherence to the requirements of: FANR-REG-16, Operational Safety including Commissioning, to safely operate a Nuclear Facility, and to the Operating Licence requirements. These Operating Licence requirements include Schedule 1 (Activities Authorized), Schedule 2 (Licence Conditions), and Schedule 3 (Application Documents). The guide also provides guidance for routine and event reporting requirements.

Structure

Article (5)

This regulatory guide is structured as follows:

Article (6) provides guidance for FANR-REG-16, Operational Safety including Commissioning, by article.

Article (7) provides guidance for the requirements of the Operating Licence, including each Licence Condition.

Schedule 3 provides a summary of routine and Event reporting requirements.

The documents listed as references describe acceptable methods and guidance for implementing the requirements of FANR-REG-16, Operational Safety including Commissioning, and the Operating Licence. Nuclear Regulatory Commission (NRC) document revisions correspond to those used in the Final SAR (FSAR), unless otherwise noted. Revisions of other references are current as of this Regulatory Guide's approval date.

FANR-REG-16 Guidance

Article (6)

FANR-REG-16, Operational Safety including Commissioning, 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 this Regulation and Regulatory Guide, means all activities involved in preparing the Nuclear Facility for Operations subsequent to issuance of the Licensee's first operating Licence. Subsequent to this issuance, the Regulation is applicable to all Licensee Commissioning activities (as defined in the Law) on any subsequent Nuclear Facility. The regulation covers testing, inspection, Maintenance and modifications made through the lifetime of the Nuclear Facility, including preparation for Decommissioning. The Regulation ceases to apply once the

Nuclear Facility is defueled in preparation for Decommissioning.

REG-16 article 3 “Responsibility for Safety”

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

International Atomic Energy Agency (IAEA) document GSR Part 2, Leadership and Management for Safety, Chapter 2, provides further guidance on Responsibility for Safety

REG-16 article 4 “Management System”

Per FANR-REG-01, Management Systems for Nuclear Facilities, the Licensee is required to not only establish an Integrated Management System (IMS) but to implement, assess and continually improve it. The IMS identifies and integrates all statutory and regulatory requirements that apply to the Regulated Activities and Nuclear Facilities of the Licensee. Its purpose is to bring together these requirements in a coherent manner to provide adequate assurance that all these requirements are satisfied in an integrated manner that ensures that health, environmental, security, quality and economic requirements are not considered separately from Safety requirements, to help preclude their possible negative impact on Safety.

The Licensee is expected to manage all activities using the IMS. Creation of IMS documentation but managing Nuclear Facility operations through other vehicles not part of the IMS contravenes the intent of FANR-REG-01, Management Systems for Nuclear Facilities, and FANR-REG-16, Operational Safety including Commissioning.

FANR-RG-002, Application of Management Systems for Nuclear Facilities, provides additional guidance.

REG-16 article 5 “Structure and Functions of the Organisation”

The structure and function of the Licensee organisation should be clearly described in writing and implemented before commissioning. The following paragraphs (para) and reference documents provide implementation guidance.

Para 5.1 Responsibilities and Functions

IAEA NS-G-2.4, The Operating Organisation for Nuclear Power Plants, provides detailed guidance regarding the functions and responsibilities of the operating organisation in general, in para 3.1 to 3.9, and for management, in para 3.10 to 3.18. The Licensee should ensure these are clearly documented, along with internal and external lines of communication.

Para 5.2 Organisational Structure

IAEA NS-G-2.4, The Operating Organisation for Nuclear Power Plants, Section 2 Structure of the Operating Organisation, para 2.9 to 2.19

FANR-RG-029, Significance Evaluations for Modifications for Nuclear Facilities during Operation,

Section 9, once approved

REG-16 article 6 “Staffing and Resources of the Organisation”

For the safe operation of the Nuclear Facility, the Licensee is required to staff the Nuclear Facility with competent managers and sufficient qualified personnel. The following paragraphs and reference documents provide implementation guidance.

Para 6.1 Sustaining Safety Expertise

- IAEA NS-G-2.4 The Operating Organisation for Nuclear Power Plants, para 6.11 to 6.15

Para 6.2 Qualified and Sufficient Numbers of Staff and Management

- IAEA NS-G-2.4 The Operating Organisation for Nuclear Power Plants, para 6.11 to 6.15
- FANR-RG-035, Emergency Preparedness for Nuclear Facilities (once approved)

Para 6.3 Shift Operations Personnel

- IAEA NS-G-2.4 The Operating Organisation for Nuclear Power Plants Section 6, Operations by Shift Crews, Para 6.28 to 6.35, and for Human Factors, para 6.61.
- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 4, Shift Arrangements para 4.1 to 4.7

Para 6.4 Staff Health Policy/Fitness for Duty

- IAEA NS-G-2.4 The Operating Organisation for Nuclear Power Plants, Para 3.1 and 3.2 (3)
- NEI 06-11, Rev 2, Managing Personnel Fatigue at Nuclear Power Reactor Sites, provides guidance on fatigue management for specific classes of personnel at nuclear facilities
- IAEA NS-G-2.8 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, para 2.10-2.11, 2.13 and 3.12
- ANSI/ANS-3.4-1996 “Medical Certification and monitoring of personnel requiring operator licenses for nuclear power plants

Para 6.5 Shared and Off-site Resources

- IAEA NS-G-2.4 The Operating Organisation for Nuclear Power Plants, Section 2, Organisational Plan, para 2.10 - 2.13 and 4.5 - 4.10 provides guidance for off-site resources.

REG-16 article 7 “Safety Policy”

The Licensee is required to establish and implement operational policies that give Safety the highest priority. The following paragraphs and reference documents provide implementation guidance.

Para 7.1 Safety as Highest Priority

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 2, Operating Policy, para 2.6
- IAEA NS-G-2.4 The Operating Organisation for Nuclear Power Plants, Chapter 5, Safety

Management

Para 7.2 Senior Management Leadership of Safety

- IAEA NS-G-2.4 The Operating Organisation for Nuclear Power Plants, para 5.1-5.9

Para 7.3 Communicating Safety Policy to Contractors

- IAEA NS-G-2.4 The Operating Organisation for Nuclear Power Plants, Para 5.4-5.5, 5.8

Para 7.4 Continuous Improvement in Operational Safety

- IAEA NS-G-2.4 The Operating Organisation for Nuclear Power Plants, para 5.11 and 5.17-5.22
- IAEA GS-G-3.5 The Management System for Nuclear Installations Section 2, Safety Culture, para 2.6-2.31

REG-16 article 8 “Operational Limits and Conditions”

The Licensee is required to ensure that the Nuclear Facility is operated in accordance with the Nuclear Facility’s established Operating Limits and Conditions (OLCs) approved by the Authority. The following paragraphs and reference documents provide implementation guidance.

Para 8.1 Operation in accordance with OLCs

- IAEA NS-G-2.2, Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, para 3.1-3.4, 6.1-6.9, 10.1 – 10.6

Para 8.2 RO and SRO Cognizance of OLCs

- FANR-RG-017, Certification of Reactor Operators and Senior Reactor Operators at Nuclear Facilities

Para 8.3 OLC Review and Revision

- IAEA NS-G-2.2, Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, para 3.13-3.16, 10.6

Para 8.4 OLC Components

- IAEA NS-G-2.2, Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, para 3.5-3.6
- USNRC RG-1.70, Rev 3 , Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, Section 16 Technical Specifications
- USNRC NUREG 1432 Rev 1, Standard Technical Specifications — Combustion Engineering Plants

Para 8.5 Required Training and Awareness of OLCs

- FANR-RG-017, Certification of Reactor Operators and Senior Reactor Operators at Nuclear Facilities, Article 4

- IAEA NS-G-2.2, Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, para 3.4-3.7

Para 8.6 OLC Surveillance

- IAEA NSG 2.2, Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, Section 7, Surveillance Requirements
- USNRC NUREG 1432 Rev 1 Standard Technical Specifications — Combustion Engineering Plants, Part 5 Program and manuals, Para 5.5.20 Surveillance Frequency Control Program

Para 8.7 Actions Upon Deviation from OLCs

When plant parameters deviate from the OLCs, the Nuclear Facility is required to 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 per requirements, including those in Licence Condition 6 (Reporting), in accordance with the LC 6 guidance herein. The Licensee should clearly specify in writing the responsibilities and lines of communications to be used in responding to OLC deviations.

IAEA NS-G-2.2, Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, para 3.7, 6.5, and 10.3

Para 8.8 Intentionally Exceeding OLC Parameters and Reporting

Although the OLCs are not to be intentionally exceeded, the Licensee may take reasonable action that departs from the OLCs 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 OLCs, that can provide adequate or equivalent protection, is available. Regardless of the reason, any intentional exceeding of the OLCs, not approved in advance by the Authority, should be promptly reported to the Authority in accordance with the regulatory guidance in this document for Licence Condition 6, and the plant maintained in a shutdown condition until approval to return to Mode 1 is received from the Authority.

REG-16 article 9 “Qualification and Training of Personnel”

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 equivalency from prior experience. FANR-RG-017, Certification of Reactor Operators and Senior Reactor Operators at Nuclear Facilities, provides guidance for RO/SRO and EO training and qualification. The following paragraphs and reference documents provide implementation guidance for all other personnel.

Para 9.1 Clearly Defined Requirements

- IAEA NS-G-2.8 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, excluding section 7
- IAEA Technical Report Series No. 380, Nuclear Power Plant Personnel Training and its evaluation, 1996

Para 9.2 Suitably Qualified Personnel Selection and Training Qualification

- IAEA NS-G-2.8 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, excluding section 7
- IAEA Technical Report Series No. 380, Nuclear Power Plant Personnel Training and its evaluation, 1996

Para 9.3 Management Responsibility for Qualification and Competence

- IAEA NS-G-2.8 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, excluding section 7
- IAEA Technical Report Series No. 380, Nuclear Power Plant Personnel Training and its evaluation, 1996

Para 9.4 Training Programme

- IAEA NS-G-2.8 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, excluding section 7
- IAEA Technical Report Series No. 380, Nuclear Power Plant Personnel Training and its evaluation, 1996

Para 9.5 Systematic Approach to Training Performance Based Programmes

- IAEA Technical Report Series No. 380, Nuclear Power Plant Personnel Training and its evaluation, 1996
- IAEA NS-G-2.8 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, excluding section 7, para 4.3-4.14

Note: The term “if necessary” in para 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.

Para 9.6 Training Programme Review, Assessment and Updating

- IAEA NS-G-2.8 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, excluding section 7
- IAEA Technical Report Series No. 380, Nuclear Power Plant Personnel Training and its evaluation, 1996

Para 9.7 Incorporation of Operating Experience

- IAEA NS-G-2.8 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, excluding section 7

Para 9.8 Training Instructor Requirements

- IAEA NS-G-2.8 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, excluding section 7
- IAEA Technical Report Series No. 380, Nuclear Power Plant Personnel Training and its evaluation, 1996

Para 9.9 Adequate Training Facilities

- IAEA NS-G-2.8 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, excluding section 7

REG-16 article 10 “Performance of Important-to-Safety Activities”

The Licensee is required to ensure that Safety related activities are adequately analysed and controlled to ensure that the risks associated with harmful effects of Ionizing Radiation are kept as low as reasonably achievable. The following paragraphs and reference documents provide implementation guidance.

Para 10.1 Assessing Radiation Risk of Safety-related Activities

- IAEA NS-G-2.14, Conduct of Operations at Nuclear Power Plants, para 7.1 and 7.12
- FANR-RG-033, Radiation Protection in Nuclear Facilities (once approved)

Para 10.2 Avoiding Undesirable Frequent Activation of Safety Systems

- IAEA NS-G-2.14, Conduct of Operations at Nuclear Power Plants, Para 1.2 and 5.22
- IEA NS-G-2.2, Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, Section 6 para 6.1-6.9, Limits and Conditions for Normal Operation

Para 10.3 Justification and Procedural Requirement for Activities Important to Safety

- IAEA NS-G-2.4 The Operating Organisation for Nuclear Power Plants, Section 5, para 5.12-5.16, Performance of Safety Related Activities
- IAEA NS-G-2.14, Conduct of Operations at Nuclear Power Plants, para 7.1, 7.15-7.17, Control of Special Tests and non-routine activities

Para 10.4 Use of Written Procedures

No additional guidance deemed necessary for this paragraph

Para 10.5 Human Performance Environment and Tools

- NS-G-2.4 The Operating Organisation for Nuclear Power Plants, Section 6 Human Factors para 6.61
- NEI 06-11, Rev 2, Managing Personnel Fatigue at Nuclear Power Reactor Sites

Para 10.6 Safety Attitudes and Expectations

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Para 2.6

- NS-G-2.4 The Operating Organisation for Nuclear Power Plants, Section 5 Safety Policy, para 5.7-5.9
- IAEA GS-G-3.5, The Management System for Nuclear Installations, Section 2 Safety Culture, para 2.6-2.21

Para 10.7 Reactor Restart After Event

No additional guidance deemed necessary for this paragraph

Para 10.8 PRA for Decision-Making Purposes

- FANR-RG-004, Evaluation Criteria For Probabilistic Safety Targets And Design Requirements

REG-16 article 11 “Monitoring and Review of Safety Performance”

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 and reference documents provide implementation guidance.

Para 11.1 Audit and Review of Safety Policy Implementation

- IAEA NS-G-2.4 The Operating Organisation for Nuclear Power Plants, Section 5 (para 5.1-5.11) provides guidance for safety management development

Para 11.2 Safety Performance Monitoring

- IAEA GS-G-3.5 The Management System for Nuclear Installations, Section 6 provides guidance for monitoring and review of safety performance
- IAEA NS-G-2.4 The Operating Organisation for Nuclear Power Plants, Section 5 (para 5.17-5.22) provides guidance for monitoring and review of safety performance

Para 11.3 Quality Assurance Function Independence and Authority

- American Society of Mechanical Engineers (ASME) Nuclear Quality Assurance (NQA) document NQA-1-1994 Basic Requirement 1, Organisation

REG-16 article 12 “Control of Nuclear Facility Configuration”

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 and reference documents provide implementation guidance.

Para 12.1 Nuclear Facility Configuration Management System

- IAEA GS-G-3.5 The Management System for Nuclear Installations, para 5.141-5.147
- IAEA Safety Reports Series No. 65, “Application Of Configuration Management In Nuclear Power

Plants”

Para 12.2 Controlling Nuclear Facility Configuration

- IAEA GS-G-3.5 The Management System for Nuclear Installations, para 5.141-5.147
- IAEA Safety Reports Series No. 65, “Application Of Configuration Management In Nuclear Power Plants”

REG-16 article 13 “Management of Modifications”

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 SSCs, OLCs, 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 and reference documents provide implementation guidance.

Para 13.1 Implementation of a Modification Programme

- IAEA NS-G-2.3, Modifications to Nuclear Power Plants
- FANR-RG-029, Significance Evaluations for Modifications for Nuclear Facilities during Operation, once approved

Para 13.2 Modification Control Considerations

- IAEA NS-G-2.3, Modifications to Nuclear Power Plants, Sections 3 (Roles and Responsibilities), Section 4 (Modifications Relating to Plant Configuration) and Section 5 (Modifications to Management Systems)

Para 13.3 Temporary Modifications

- IAEA NS-G-2.3 Modifications to Nuclear Power Plants, Section 6 (Temporary Modifications),

Para 13.4 Training and Documentation of Modifications

- IAEA NS-G-2.3 Modifications to Nuclear Power Plants, Section 7 (Implementation of modifications relating to plant configuration), Section 8 (Implementation of Organizational Changes), Section 9 (Quality Assurance), Section 10 (Training) and Section 11 (Management of Documentation)

REG-16 article 14 “Periodic Safety Review”

Periodic Safety Reviews of the Nuclear Facility by the Licensee are required, starting from the beginning of plant Operation, and then every 10 years throughout the Nuclear Facility’s operating lifetime. The start of plant Operation, for purposes of this requirement, will be the date the Unit enters commercial operation. The following paragraphs and reference documents provide implementation guidance.

Para 14.1 Periodic Safety Review Every 10 Years

- IAEA Specific Safety Guide SSG-25, Periodic Safety Review for Nuclear Power Plants

Para 14.2 Cumulative Effects of Ageing and Modifications

- IAEA Specific Safety Guide SSG-25, Periodic Safety Review for Nuclear Power Plants

Para 14.3 Scope and Approval

The Licensee should identify and come to an agreement on the scope of the PSR with the Authority, well in advance of the expected submittal.

- IAEA Specific Safety Guide SSG-25, Periodic Safety Review for Nuclear Power Plants

Para 14.4 Report Submission to Authority for Review and Approval

- IAEA Specific Safety Guide SSG-25, Periodic Safety Review for Nuclear Power Plants

REG-16 article 15 “Equipment Qualification”

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 and reference documents provide implementation guidance.

Para 15.1 Establishing Equipment Qualification Concepts, Scope and Process

- IAEA Safety Reports Series No. 3 - Equipment Qualification In Operational Nuclear Power Plants: Upgrading, Preserving and Reviewing
- IAEA NS-G-2.12, Ageing Management for Nuclear Power Plants, Section 7, Equipment Qualification (7.2-7.8)
- NRC RG 1.89, Rev 1: Equipment Qualification of Certain Electrical Equipment Important to Safety
- NRC RG 1.209: Equipment Qualification of Safety Related Computer-Based I&C of Nuclear Power Plants

REG-16 article 16 “Ageing Management”

The Licensee is required to establish and implement a comprehensive programme for ensuring the long-term safe Operation of the Nuclear Facility, including implementation of an effective ageing management programme. The following paragraphs and reference documents provide implementation guidance.

Para 16.1 Comprehensive Programme for Long-Term Safe Operation

- IAEA SSG-48, Aging Management and Development of a program for Long Term Operation of Nuclear Power Plants

Para 16.2 Ageing Management Programme

- IAEA SSG-48, Aging Management and Development of a program for Long Term Operation of Nuclear Power Plants

Para 16.3 Erosion and Corrosion Monitoring Programme

- IAEA SSG-48, Aging Management and Development of a program for Long Term Operation of

Nuclear Power Plants

Para 16.4 Programme to Account for Cyclical and Transient Occurrences

- IAEA SSG-48, Aging Management and Development of a program for Long Term Operation of Nuclear Power Plants

REG-16 article 17 “Interfaces among Safety, Security and Safeguards”

The Licensee is required to ensure close cooperation between Nuclear Safety, Nuclear Security, and Safeguards. Mechanisms must be established to resolve potential conflicts and to manage their interfaces. The following reference document provides implementation guidance.

- USNRC RG-5.74, Rev. 1, Managing the Safety/Security Interface

REG-16 article 18 “Emergency Preparedness”

The Licensee is required to develop an Emergency Plan for preparedness for, and response to, a nuclear or radiological Emergency in accordance with the Authority’s requirements. The following paragraphs and reference documents provide implementation guidance.

- FANR-RG-034, Regulatory Guide for Preparation, Conduct, and Evaluation of Drills and Exercises for Nuclear Facilities, once approved
- FANR-RG-035, Regulatory Guide for Emergency Preparedness for Nuclear Facilities, once approved

REG-16 article 19 “Accident Management Programme”

The Licensee is required to establish an Accident Management programme for the Nuclear Facilities, with preparatory measures and guidelines for dealing with a DBA and beyond DBAs, including Severe Accidents. The following paragraphs and reference documents provide implementation guidance.

Para 19.1 Establishing the Accident Management Programme

- IAEA SSG 54, Accident Management Programmes for Nuclear Power Plants
- IAEA Safety Report No. 32, Implementation of Accident Management Programmes in Nuclear Power Plants

Para 19.2 Multi-Unit Site Accidents

- IAEA SSG 54, Accident Management Programmes for Nuclear Power Plants
- IAEA Safety Report No. 32, Implementation of Accident Management Programmes in Nuclear Power Plants

Para 19.3 Instructions, Technical and Administrative Measures

- IAEA SSG 54, Accident Management Programmes for Nuclear Power Plants
- IAEA Safety Report No. 32, Implementation of Accident Management Programmes in Nuclear Power Plants

Para 19.4 Accident Management Contingency Measures

- IAEA SSG 54, Accident Management Programmes for Nuclear Power Plants
- IAEA Safety Report No. 32, Implementation of Accident Management Programmes in Nuclear Power Plants

Para 19.5 Organisational Arrangements

- IAEA SSG 54, Accident Management Programmes for Nuclear Power Plants
- IAEA Safety Report No. 32, Implementation of Accident Management Programmes in Nuclear Power Plants

Para 19.6 Accident Management Training

- IAEA SSG 54, Accident Management Programmes for Nuclear Power Plants
- IAEA Safety Report No. 32, Implementation of Accident Management Programmes in Nuclear Power Plants

Para 19.7 Consideration of Adverse and Degraded Conditions

- IAEA SSG 54, Accident Management Programmes for Nuclear Power Plants
- IAEA Safety Report No. 32, Implementation of Accident Management Programmes in Nuclear Power Plants

Para 19.8 Accident Management Systems and Technical Support

- IAEA SSG 54, Accident Management Programmes for Nuclear Power Plants
- IAEA Safety Report No. 32, Implementation of Accident Management Programmes in Nuclear Power Plants

REG-16 article 20 “Radiation Protection”

The Licensee is required to establish and implement a Radiation Protection programme in accordance with the Authority’s requirements. The following reference document(s) provide implementation guidance.

FANR-RG-033, Radiation Protection for Nuclear Facilities, once approved

REG-16 article 21 “Management of Radioactive Waste”

The Licensee is required to establish and implement a programme for the management of Radioactive Waste in accordance with the Authority’s requirements. The following reference document provides implementation guidance.

FANR-RG-018, Pre-disposal Management of Radioactive Waste

REG-16 article 22 “Fire Safety”

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 SSCs. The following paragraphs and reference documents provide implementation guidance.

Para 22.1 Fire Protection Plan Requirements

- USNRC RG 1.189, Fire Protection for Nuclear Power Plants

Para 22.2 Radioactive Release from Fire Considerations

- USNRC RG 1.189, Fire Protection for Nuclear Power Plants

Para 22.3 Procedures, Staffing, Drills and Exercises

- USNRC RG 1.189, Fire Protection for Nuclear Power Plants

REG-16 article 23 “Feedback of Operating Experience”

The Licensee is required to establish an operating experience programme to learn from events at the Nuclear Facility, and events in nuclear and other industries worldwide. The following reference document provides implementation guidance.

- IAEA SSG-50, Operating Experience Feedback for Nuclear Installations

REG-16 article 24 “Commissioning Programme”

The Licensee is required to implement a Commissioning programme for the Nuclear Facility that covers the full range of Nuclear Facility conditions required in the SAR Chapter 14. The following paragraphs and reference documents provide implementation guidance.

Para 24.1 Implementation and Considerations for Commissioning Programmes

- USNRC RG 1.68, Rev 2, Initial Test Programs for Water-cooled Nuclear Power Plants
- IAEA SSG-28, Commissioning for Nuclear Power Plants

Para 24.2 Conduct and Review of Commissioning Tests

- USNRC RG 1.68, Rev 2, Initial Test Programs for Water-cooled Nuclear Power Plants
- IAEA SSG-28, Commissioning for Nuclear Power Plants

Para 24.3 Sufficiency of Testing Demonstrates SAR and Design Requirements

- USNRC RG 1.68, Rev 2, Initial Test Programs for Water-cooled Nuclear Power Plants
- IAEA SSG-28, Commissioning for Nuclear Power Plants

Para 24.4 Validating Operating and Maintenance Procedures

- USNRC RG 1.68, Rev 2, Initial Test Programs for Water-cooled Nuclear Power Plants
- IAEA SSG-28, Commissioning for Nuclear Power Plants

Para 24.5 Personnel Requirements for Commissioning Tests

- FANR RG-017, Article 6.6a
- NEI 06-13A Rev 2, Template for an Industry Training Program Description, Appendix A
- IAEA NG-T-2.2, Commissioning Of Nuclear Power Plants: Training And Human Resource

Considerations

Para 24.6 Comprehensive Test Sufficiency for System Operating Reference Data

- USNRC RG 1.68, Rev 2, Initial Test Programs for Water-cooled Nuclear Power Plants
- IAEA SSG-28, Commissioning for Nuclear Power Plants

Para 24.7 Work, Modification and Configuration Control Requirements

- IAEA Safety Guide NS-G-2.14, Article 7 Work Control and Authorization
- IAEA GS-G-3.5 The Management System for Nuclear Installations
 - Modifications para 5.62-5.72,
 - Configuration Management para 5.141-5.147
- IAEA NS-G-2.3 Modifications to Nuclear Power Plants, Section 4, Modifications relating to plant configuration
- Work Control, Modifications and Configuration Management are also discussed under Article 12 and 13 of this RG

Para 24.8 Interfaces and Communication Lines

- IAEA SSG-28. Commissioning for Nuclear Power Plants, para 3.36-3.49

Para 24.9 Protecting Nuclear Facility Equipment During Commissioning

No guidance considered necessary for this paragraph

Para 24.10 Comparing As-Built Construction and Performance with Design Parameters

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 SSCs for which the as-built differs significantly from the original design parameters, to determine if performance has been impacted by the changes.

- IAEA GS-G-3.5 The Management System for Nuclear Installations, para 5.85, Design Change and para 5.141-5.147, Configuration Management

REG-16 article 25 “Procedures”

All important-to-safety activities are required to be controlled by validated, approved and appropriately detailed procedures, instructions and drawings to ensure Nuclear Facility operation within established OLCs. The following paragraphs and reference documents provide implementation guidance.

Para 25.1 Procedures, Instructions and Drawings Requirement

- ANSI/ANS 3.2-2012, American National Standard Managerial, Administrative, and Quality Assurance Controls for the Operational Phase of Nuclear Power Plants, Section 3.5
- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants

- USNRC NUREG/CR-6634: Computer-Based Procedure Systems: Technical Basis and Human Factors Review

Para 25.2 Procedure Content and Detail

No guidance considered necessary for this paragraph

Para 25.3 AOO and DBA Procedures

- ANSI/ANS-3.2-2012, American National Standard Managerial, Administrative, and Quality Assurance Controls for the Operational Phase of Nuclear Power Plants, Appendix A, for SAMG
- IAEA NS G 2.15 Severe Accident Management Programmes for Nuclear Power Plants, para 3.32 – 3.57
- IAEA Safety Report No. 48, “Development and Review of Plant Specific Emergency Operating Procedures

Para 25.4 Development, Review and Revision of Procedures

- ANSI/ANS-3.2-2012, Managerial, Administrative, and Quality Assurance Controls for the Operational Phase Of Nuclear Power Plants, Section 3.5-3.6

Para 25.5 Operator Aids Programme

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, para 6.15-6.19

Para 25.6 Minimising Temporary Operator Aids

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, para 6.15-6.19

REG-16 article 26 “Control Rooms and Control Equipment”

The Licensee is required to ensure that the operation control rooms and control equipment are maintained in a suitable condition. The following paragraphs and reference documents provide implementation guidance.

Para 26.1 Habitability and Condition of Control Rooms and Equipment

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 6 Operations equipment and operator aids, condition of control rooms and panels, para 6.1-6.10

Para 26.2 Important to Safety Operational Panels Outside Control Room Requirements

- ANSI/ANS-3.2-2012 Managerial, Administrative, And Quality Assurance Controls For The Operational Phase Of Nuclear Power Plants; Inspection, Test and Operating Status, Section 3.14

Para 26.3 Control Room Alarms and Information Display

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 6 Operations equipment and operator aids, condition of control rooms and panels, para 6.1-6.10

REG-16 article 27 “Material Condition and House-Keeping”

The Licensee is required to develop and implement programmes to maintain a high standard of material conditions, housekeeping and cleanliness in all working areas. The following paragraphs and reference documents provide implementation guidance.

Para 27.1 Operational Areas Maintenance

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Para 6.20 - 6.26
- USNRC RG 1.33 QA Program Requirements – Operations, Rev 3
- ASME NQA-1 1994 QA Requirements for Nuclear Facility Applications, Subpart 2.3, QA Requirements for Housekeeping

Para 27.2 Foreign Material Exclusion Programme

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Para 6.20 - 6.26
- ASME NQA-1 1994 QA Requirements for Nuclear Facility Applications, Subpart 2.3, QA Requirements for Housekeeping

Para 27.3 Accurate Identification and Labeling

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Para 6.24 - 6.26
- ASME NQA-1-94, Basic Requirement (8), Identification and Control of Items.

REG-16 article 28 “Chemistry Programme”

The Licensee is required to establish and implement a chemistry programme to provide the necessary support for chemistry and radiochemistry. The following paragraphs and reference documents provide implementation guidance.

Para 28.1 Implementation of Chemistry Programme

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 5 Control of Plant Chemistry (para 5.44-5.47 and 2.27)
- IAEA SSG 13 Chemistry Programme for Water Cooled Nuclear Power Plants, Chemistry Programme, Chapter 2 (Functions, Responsibilities and Interfaces), Chapter 3 (Chemistry Programme), Chapter 4 (Chemistry Control) para 4.1 – 4.13, 4.26-4.31, 4.42-4.49, Chapter 5 (Chemistry Aspects of Radiation Exposure Optimization), and Chapter 8 (Training and Qualification)

Para 28.2 Chemistry Surveillance

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 5 Control of Plant Chemistry (para 5.44-5.47 and 2.27)
- IAEA SSG 13 Chemistry Programme for Water Cooled Nuclear Power Plants, Chemistry Programme, Chapter 6 (Chemistry Surveillance), para 6.1-6.7

Para 28.3 Chemistry Monitoring and Data Acquisition Systems

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 5 Control of Plant Chemistry (para 5.44-5.47 and 2.27)
- IAEA SSG 13 Chemistry Programme for Water Cooled Nuclear Power Plants, Chemistry Programme, Chapter 6 (Chemistry Surveillance), para 6.8-6.16, 6.20-6.29, 6.41-6.44, Chapter 7 (Management of Chemistry Data)

Para 28.4 Laboratory Monitoring Requirements

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 5 Control of Plant Chemistry (para 5.44-5.47 and 2.27)
- IAEA SSG 13 Chemistry Programme for Water Cooled Nuclear Power Plants, Chemistry Programme, Chapter 6 (Chemistry Surveillance), para 6.17-6.19, 6.30-6.40

Para 28.5 Inventory and Use of Chemicals Control

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 5 Control of Plant Chemistry (para 5.44-5.47 and 2.27)
- IAEA SSG 13 Chemistry Programme for Water Cooled Nuclear Power Plants, Chemistry Programme Chapter 9 (Quality Control of Chemicals and Other Substances)

REG-16 article 29 “Core Management and Nuclear Fuel Handling”

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 and reference documents provide implementation guidance.

Para 29.1 Nuclear Fuel Design Criteria, Enrichment and Manufacturing Requirements

- IAEA Safety Guide NS-G-2.5 “Core Management and Fuel Handling for Nuclear Power Plants”

Para 29.2 Specifications and Procedures

- IAEA Safety Guide NS-G-2.5 “Core Management and Fuel Handling for Nuclear Power Plants”
- The nuclear material accountancy and control/safeguards system should be in operation and in accordance with FANR-REG-10 and conditions of the relevant licenses granted by the Authority. Since the Nuclear Facility is subject to international agreements and an IAEA safeguards verification regime that involve safeguards containment and surveillance equipment, it is vital to ensure all commissioning and operational activity involving nuclear material, as well as changes to the Nuclear Facility design or anticipated/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 Nuclear Facility 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.
- For nuclear fuel reload testing, ANSI/ANS-19.6.1-1997 Reload Startup Physics Tests for Pressurized Water Reactors

Para 29.3 Safe Reactivity Management Programme

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Control of Reactivity Related Operations (5.21-5.25)

Para 29.4 Core Monitoring Programme

- ANSI/ANS 19.6-1-1997, Reload Startup Physics Tests for Pressurized Water Reactors
- IAEA NS-G-2.5, Core Management & Fuel Handling of Nuclear Power Plants

Para 29.5 Reactivity Manipulations

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Control of Reactivity Related Operations (5.21-5.25)

Para 29.6 Reactor Operating Procedures Cautions and Limitations

- IAEA NS-G-2.5, Core Management & Fuel Handling of Nuclear Power Plants, Section 2.14

Para 29.7 Radiochemistry Data Monitoring and Trending

- IAEA NS-G-2.5, Core Management & Fuel Handling of Nuclear Power Plants, Para 2.27 and 2.9-2.31
- IAEA SSG13 Chemistry Programme for Water Cooled Nuclear Power Plants, Radiochemistry (6.20-6.29)

Para 29.8 Identifying Changes to Coolant Activity

- IAEA NS-G-2.5, Core Management & Fuel Handling of Nuclear Power Plants, Para 2.27 and 2.9-2.31
- IAEA SSG13 Chemistry Programme for Water Cooled Nuclear Power Plants, Radiochemistry (6.20-6.29)

Para 29.9 SRO Requirement for Fuel Handling

No guidance considered necessary for this paragraph

REG-16 article 30 “Maintenance, Testing, Surveillance and Inspection Programmes”

The Licensee is required to ensure that effective programmes for Maintenance, testing, surveillance and Inspection are established and implemented. The following paragraphs and reference documents provide implementation guidance.

All Para

- Refer to detailed guidance in this document under Licence Condition 10 “Safety Systems Inspection and Testing” for inspection and testing related items.

Para 30.1 Maintenance, Testing, Surveillance and Inspection Programme Requirements

- IAEA NS-G-2.6, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants (Refer to specific guidance on License Condition 10 for inspection and testing)

- IAEA GS-G-3.5 The Management System for Nuclear Installations, Process Model, Core Processes Para 5.6
- USNRC RG 1.160 Rev 2, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

Para 30.2 Recording, Storing and Analyzing Data

- IAEA NS-G-2.6, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants
- IAEA GS-G-3.5 The Management System for Nuclear Installations, Process Model, Core Processes Para 5.6
- USNRC RG 1.160 Rev 2, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

Para 30.3 Maintenance, Testing, Surveillance and Inspection Frequency

- IAEA NS-G-2.6, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants
- IAEA GS-G-3.5 The Management System for Nuclear Installations, Process Model, Core Processes Para 5.6
- USNRC RG 1.160 Rev 2, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

Para 30.4 Identifying Maintenance Failure Scenarios

- IAEA NS-G-2.6, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants
- IAEA GS-G-3.5 The Management System for Nuclear Installations, Process Model, Core Processes Para 5.6
- USNRC RG 1.160 Rev 2, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

Para 30.5 Significant Changes to Maintenance, Testing, Surveillance and Inspection Approaches

- FANR-RG-029 Significance Evaluations for Modifications for Nuclear Facilities during Operation
- IAEA NS-G-2.6, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants
- IAEA GS-G-3.5 The Management System for Nuclear Installations, Process Model, Core Processes Para 5.6
- USNRC RG 1.160 Rev 2, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

Para 30.6 Work Planning and Control System

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 7 Work Control and Authorization
- IAEA NS-G-2.6, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants
- IAEA GS-G-3.5 The Management System for Nuclear Installations, Process Model, Core Processes Para 5.6
- USNRC RG 1.160 Rev 2, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

Para 30.7 Work and Equipment Control and Tagging System

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 7 Work Control and Authorization
- IAEA NS-G-2.6, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants
- IAEA GS-G-3.5 The Management System for Nuclear Installations, Process Model, Core Processes Para 5.6

- USNRC RG 1.160 Rev 2, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

Para 30.8 SRO Authorisation for Work Control

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 7 Work Control and Authorization
- IAEA NS-G-2.6, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants
- IAEA GS-G-3.5 The Management System for Nuclear Installations, Process Model, Core Processes Para 5.6
- USNRC RG 1.160 Rev 2, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

Para 30.9 Coordination between different Maintenance Groups, Operations

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 7 Work Control and Authorization
- IAEA NS-G-2.6, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants
- IAEA GS-G-3.5 The Management System for Nuclear Installations, Process Model, Core Processes Para 5.6
- USNRC RG 1.160 Rev 2, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- IAEA GS-G-3.5 The Management System for Nuclear Installations, Measuring and Testing Equipment (para 5.24-5.30)

Para 30.10, Management System for Controlling Weaknesses

- IAEA GS-G-3.5 The Management System for Nuclear Installations, Non-Conformances and Corrective and Preventive Actions (6.42-6.69)

Para 30.11 Defense-in-Depth Maintenance Work

- IAEA NS-G-2.6, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants
- IAEA GS-G-3.5 The Management System for Nuclear Installations, Process Model, Core Processes Para 5.6
- USNRC RG 1.160 Rev 2, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

Para 30.12 SSC Corrective Maintenance

- IAEA NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 7 Work Control and Authorization
- IAEA NS-G-2.6, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants
- IAEA GS-G-3.5 The Management System for Nuclear Installations, Process Model, Core Processes Para 5.6
- USNRC RG 1.160 Rev 2, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

Para 30.13 Identification and Calibration Requirements for Tools and Equipment

- IAEA GS-G-3.5 The Management System for Nuclear Installations, Measuring and Testing Equipment (para 5.24-5.30)
- IAEA NS-G-2.6, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants
- IAEA GS-G-3.5 The Management System for Nuclear Installations, Process Model, Core Processes Para 5.6

- USNRC RG 1.160 Rev 2, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- ASME NQA-I-94 standard, Basic Requirement 12, Control of Measuring and Test Equipment.

REG-16 article 31 “Outage Management”

The Licensee is required to implement arrangements to ensure the effective performance, planning and control of work activities during outages. The following paragraphs and reference documents provide implementation guidance.

Para 31.1 Outage Performance, Planning and Control Requirements

- IAEA Safety Guide NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 7 Work Control and Authorization – Control of Outages (para 7.18-7.20)
- IAEA NS-G-2.6 “Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants” has a section titled Outage Management (par 5.20-5.22)

Para 31.2 Priority of Safety Issues and Configuration Management

- IAEA Safety Guide NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 7 Work Control and Authorization (specifically but not exclusively para 7.2)

Para 31.3 Outage Interfaces

- IAEA Safety Guide NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 7 Work Control and Authorization (specifically but not exclusively para 7.4)
- IAEA NS-G-2.6 “Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants” has a section titled Outage Management (par 5.20-5.22)

Para 31.4 Optimisation of Radiation Protection and Waste Reduction

- IAEA Safety Guide NS-G-2.14 Conduct of Operations at Nuclear Power Plants, Section 7 Work Control and Authorization (specifically but not exclusively para 7.12)
- IAEA NS-G-2.7 Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants
- FANR-RG-033, Radiation Protection for Nuclear Facilities, once approved
- FANR-RG-018, Pre-disposal Management of Radioactive Waste

Para 31.5 Review for Lessons Learned

No guidance considered necessary for this paragraph

REG-16 article 32 “Preparation for Decommissioning”

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 paragraphs and reference documents provide implementation guidance.

- IAEA SSG-47, Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities

Operating Licence Guidance

Article (7)

Schedule 1 Regulated Activities Authorized

No additional guidance is considered necessary for this Schedule.

Schedule 2 Licence Conditions

Licence Condition 1 “Law, Regulations, Licence and the Licensee’s Submissions”

No additional guidance is considered necessary for this licence condition.

Licence Condition 2 “Safeguards and nuclear import/export obligations”

No additional guidance is considered necessary for this licence condition except for LC 2 e), which follows:

To obtain a permit prior to each import, export or re-export of any Nuclear Material and Regulated Items, the Licensee should first register in the Authority’s Nu-tech portal, which is available on the Authority’s website at iservices.fanr.gov.ae. The instruction manual for the Nu-Tech portal registration can be found in and downloaded from the Nu-tech portal.

Government to Government Assurance (G2GA)

Government to Government Assurance is required for the import, export and re-export of Nuclear Material and Nuclear Related Items as defined in FANR-REG-09. G2GA reflects the assurances that condition of supply, imposed by the Supplier State, will be met by the Recipient State. In case of import, those conditions which are mandatory for the Licensee to follow will be communicated to the Licensee by the Authority.

The Licensee is requested to provide the following information in order to allow the Authority to manage the relevant G2GA:

1. Item(s) description and code (in accordance with IAEA INFCIRC/254/Part 1):
2. Quantity:
3. Country of Origin:
4. Exporting country:
5. Supplier:
6. Manufacturer (if applicable):

Licence Condition 3 “Transfer of Licence”

No additional guidance is considered necessary for this licence condition.

Licence Condition 4 “Modifications”

Licence Condition 4 (LC4) a) 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

which may have an impact on the Licensee's liability for nuclear damage or financial security.

In evaluating the significance of modifications, the Licensee shall use the guidance found in FANR-RG-029, Significance Evaluations for Modifications for Nuclear Facilities, which provides guidance for modifications during Operations.

Licence Condition 4 (LC4) requires licensees to maintain records of all changes made in accordance with FANR-REG-16, Operational Safety including Commissioning, Article 13 (Management of Modifications). Moreover, for those modifications the Licensee deems as not requiring Authority approval, LC4 requires that these records include a written evaluation that provides the basis for the determination that the change did not require prior Authority approval.

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 consultation with the preparer. The documentation should identify the scope of the review, and any assumptions, engineering analyses or judgments that were used.

The documentation of evaluations for temporary modifications should meet the same criteria regarding reviewability as for permanent changes. Summaries of evaluations for temporary modifications should be included in the periodic FSAR revision in accordance with LC 5.

Licence Condition 5 "Update of documents supporting the operation of Barakah NPP Unit 1"

This Licence Condition requires the licensee to periodically update the Final Safety Analysis Report to ensure the information provided is the latest material available. The intent of the update is to reflect changes such as:

- New / revised regulatory requirements
- Effect of changes to the Nuclear Facility and procedures
- Analyses of new Safety, security, or safeguards issues requested by the Authority

Licence Condition 5a requires that the licensee submit to the Authority a full revision of the updated Final Safety Analysis Report within 6 months of each refueling outage completion. A brief description of each change in these documents should also be provided. These descriptions should also include a summary of any supporting evaluation, for those changes implemented without prior Authority approval.

Licence Condition 5b requires that the Licensee annually provide to the Authority the additional documents, as listed.

Licence Condition 6 "Reporting"

6(a) Regular Reporting

Licence Condition 6.a requires, in addition to the reports required for submission by relevant regulations, the reporting of Nuclear Facility plant performance and operating data, as well as a physical protection report, on a quarterly basis. The performance and operating reports should consist of Nuclear and Radiological Safety indicator information.

These reporting arrangements do not supersede any other reporting requirements or guidance

identified in the Authority's regulations and regulatory guides.

Quarterly report data is based on the World Association of Nuclear Operators (WANO) performance indicators and the International Atomic Energy Association (IAEA) Power Reactor Information System (PRIS).

The World Association of Nuclear Operators (WANO) has an agreed and defined set of performance indicators used globally by commercial nuclear licensees. WANO indicators consist of 5 key, and 8 non-key, indicators. All WANO indicators are listed below but key indicator 3 and non-key indicators 6 and 8 are related to industrial safety, which is not regulated by the Authority. Therefore inclusion of these three indicators is optional. The remaining 10 indicators should be reported. Detailed definitions of these 10 indicators are provided in WANO guidance and in Appendix 1.

Key WANO Indicators:

1. Forced Loss Rate (FLR)
2. Collective Radiation Exposure (CRE)
3. Total Industrial Safety Accidents (TISA) – optional
4. Safety System Performance Indicator (SSPI)
5. Unplanned Total Scrams per 7000 hours critical (US7)

Non-Key WANO Indicators:

1. Unplanned Automatic (UA7) Scrams per 7,000 Hours Critical
2. Fuel Reliability (FRI)
3. Grid-Related Loss Factor (GRLF)
4. Unplanned Capability Loss Factor (UCLF)
5. Chemistry Performance (CPI)
6. Industrial Safety Accident Rate (ISA) – optional
7. Unit Capability Factor (UCF)
8. Contractor Industrial Safety Accident Rate (CISA) – optional

The frequency of reporting for the WANO indicators is designed to coincide with the indicator update frequency already employed by the Licensee to discharge WANO reporting responsibilities.

The IAEA Power Reactor Information System (PRIS) Reporting includes information to support the Authority's international reporting commitments to the IAEA's PRIS. The information should be based on the specifications for information to support these commitments, as detailed in Appendix 2.

The frequency for reporting PRIS information falls into one of two categories. PRIS performance indicators should be reported quarterly by the Licensee. 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 is provided in Appendix 2.

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

1. A summary of the nuclear security events during the period (Article 13(4) of FANR-RG-026);

2. any compensatory measures taken during the period (Article (21) of FANR-REG-08 Version 1;
3. any changes to a previously approved Physical Protection Plan during the period, if the change was conducted without FANR approval (Article (4) of FANR-RG-032); and
4. the significant results of security exercises and drills carried out during the period (Article (10) of FANR-RG-026).

Operating and Performance reports should be sent to the Authority via:

1. Letter, addressed to the Director of NSD, with copies to the NSD Licensing Manager, via normal communication channels
2. Database(s) made available to the Authority by the Licensee.

Physical Protection reports should be sent via letter to the Director of Nuclear Security at the Authority, with copies to the NSD Licensing Manager, via normal communication channels.

6 (b) Event Reporting

Licence Condition 6.b requires the reporting of Events related to Safety, Nuclear Security and safeguards during Operations. This regulatory guide provides guidance for Safety and safeguard-related events vis-a-vis 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 FANR Nuclear Security regulatory guides.

The LC 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 flowcharts and example forms, as well as explaining the expected report content.

As specified in the Operating Licence, the Authority requires holders of an Operating Licence 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 summarizes the reporting requirements and guidance, and gives guidance on reporting timescales. Appendix 4 is an example form for notification of Events and Appendix 5 provides an example form for Event Reports. The Licensee is free to create its own forms as long as the required information is included.

A summary of reporting requirements and timescales is given in Appendix 3. The timescales indicated are those following the discovery of the Event and have the following meaning:

1. **Immediate Notification:** The Licensee is required to notify the Authority within one hour of the declaration of any of the Emergency Classes specified in the licensee's approved Emergency Plan. Although the Licence Condition allows up to one hour, the expectation, when the Event is an Emergency, is for a notification to be sent to the Authority within 15 min. If the notice is electronic, it should then be followed up by a telephone call to the Authority within 10 minutes of sending the notification to verify receipt, and to allow the Authority to verify the authenticity of the person submitting the report. Written updates are then required every hour during the course of the Emergency. Once the Emergency is over, with concurrence from all applicable parties, the Licensee will send an Emergency event termination notification.

2. **Prompt Notification:** The Licensee is required to notify the Authority of any Event not identified in paragraph (1) above having the potential to affect Nuclear Security within four (4) hours of its finding of each item, as described in Licence Condition 6.b) 2.

The Licensee is required to notify the Authority of any Event not identified in paragraph (1) above having the potential to affect Safety or safeguards within twelve (12) hours of its finding of each item, as described in Licence Condition 6.b) 2.

3. **Follow up Reporting:** For prompt notifications, the Licensee is required to submit to the Authority an initial assessment and finding report within 48 hours. The report shall include the date, description and cause of the violation, Accident, incident, circumstance or event. For safeguard- related issues, 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 action taken, and sufficient information to permit review and evaluation of such corrective action. (See detailed description below for Event Reports.)

4. Event Reports should include the following elements:

- a) General Data: Information including the title of the report, plant name/unit, plant type, date and the time of the Event.
- b) Summary: A concise description of the Event, its Safety, Nuclear Security or safeguards relevance, its causes, the lessons learned and the corrective actions taken.
- c) 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 personnel.
- d) Consequences: Information on real or potential consequences. General statements such as “no impact on Nuclear Safety, personnel Safety, Radiation Safety, or power production” should be avoided.
- e) 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). In addition, any initial and relevant historical conditions, as well as any unusual circumstances, should be included.
 - The statement on Event cause(s) should include a clear, concise statement of the root causes and casual factors including technical, human and organizational factors.
 - The statement on lessons learned should describe what the Licensee has learned from the Event, and why it is relevant for Nuclear and 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.

f) Corrective Actions: Description of any applicable immediate and long-term corrective and preventive actions, with scheduled dates for completion, should be provided.

g) Event categorisation codes: The Event should be categorised according to the coding provided in the IAEA Manual for IRS Coding.

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. .

For reporting logistics, use the following guidance:

1. Any notification should be made to the Authority Duty Officer using the contact information provided in Appendices 4 and 5.
2. If the Event is an Emergency, a verbal notification is required within 15 min, with 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.

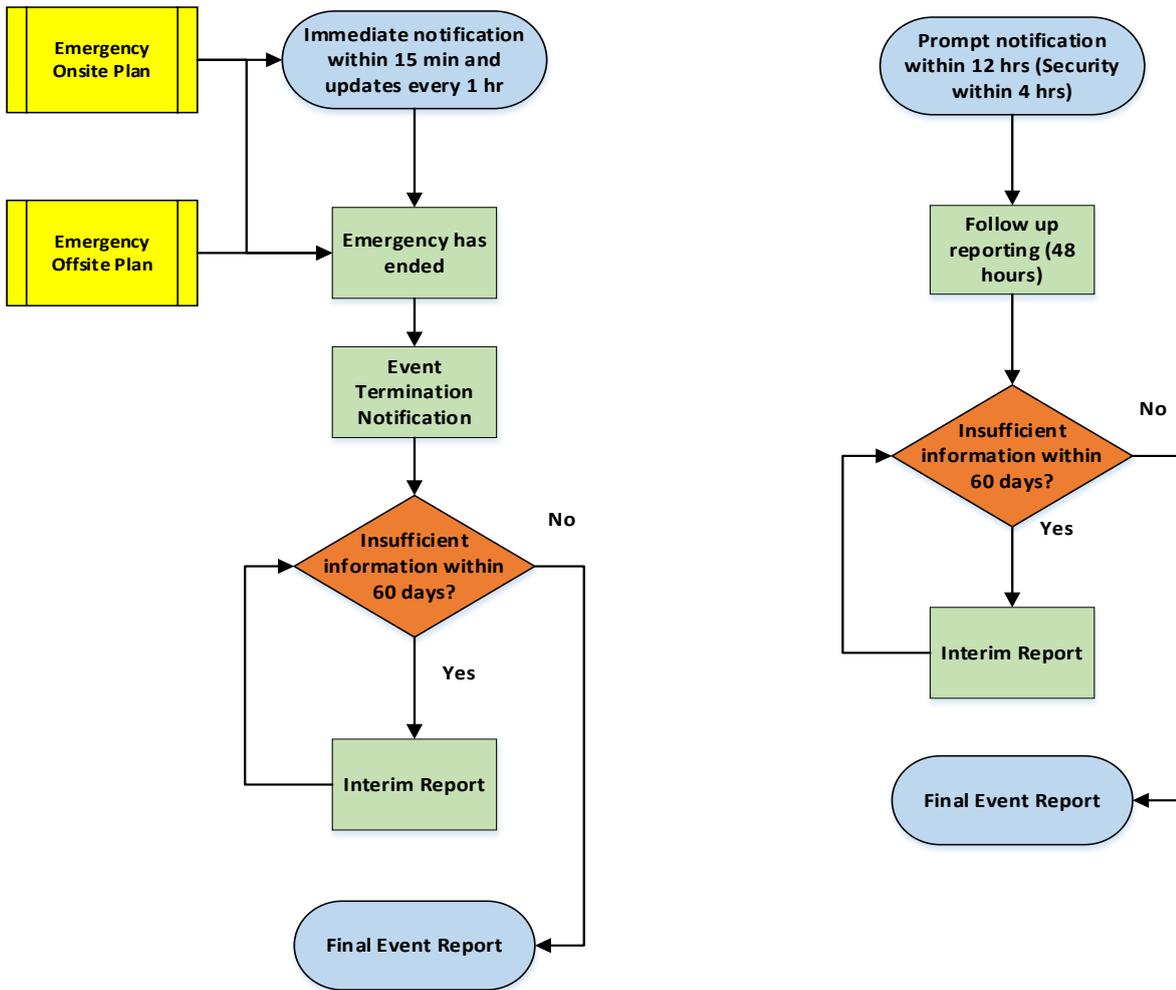


Figure 1: Guideline for Event Reporting

Licence Condition 7 “Access to facilities and documents, and assistance”

No additional guidance is considered necessary for this licence condition

Licence Condition 8 “Records”

No additional guidance is considered necessary for this licence condition

Licence Condition 9 “Operating Limits and Conditions”

The Licensee is required to comply with the operating limits and conditions specified in technical specifications and “Operating Limits and Conditions for SSCs credited in Severe Accidents” in the Application Documents. For purposes of this regulatory guide, technical specifications and Operating Limits and Conditions for SSCs credited in Severe Accidents are hereinafter referred to as Operating Limits and Conditions (OLC).

LC 9(a) Guidance

Any modification to the Operating Limits and Conditions (OLCs), are subject to assessment and approval by the Authority.

1. The OLC modifications should be determined with due account taken of the uncertainties in the process of safety analysis. The justification for each of the OLC modifications should be substantiated by means of a written indication of the reason for its adoption and any relevant background information. The Licensee should include the following (without limitation) in the OLC modification application:
 - a. Description of proposed OLC modification
 - b. Justification for proposed OLC modification
 - c. Markup of proposed OLC modification
 - d. Replacement of modified pages of the OLC affected by the proposed modification
2. Each OLC modification should have associated surveillance requirements that support the operating personnel in ensuring compliance with the Operating Limits and Conditions.
3. Modifications to the Operating Limits and Conditions should be meaningful to the responsible operating personnel and be defined by measurable or directly identifiable parameter values. Where directly identifiable values cannot be used, then 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.
4. When it is necessary to modify Operating Limits and Conditions on a temporary basis, particular care should be taken to ensure that the effects of the change are analysed. The modified state, 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 OLC.
5. Clear presentation and avoidance of ambiguity are important contributors to reliability in the use of modifications to Operating Limits and Conditions, and therefore advice on human factors should be sought at an early stage in the development of the documentation in which the OLC modifications will be presented to the operating personnel. The meaning of terms should be explained to help prevent misinterpretation.
6. Methods of configuration management should be used when modifying OLCs, to ensure that other documents remain consistent with the modified OLCs. In particular, there should be a mechanism to track from the safety analysis, through the OLCs, to the implementing procedures, in order to aid configuration control and to avoid the accidental deletion or retention of an OLC or its accidental application.

LC 9(b) Guidance

The Licensee should establish an OLC Bases Control Program. This program should provide a means for processing changes to the Bases. The OLC Bases Control Program should control the content of the OLC Bases, ensure the Bases are maintained consistent with the FSAR, and ensure compliance with Authority regulations.

LC 9(c) Guidance

Temporary deviation from an OLC may be authorised by the Authority in exceptional circumstances after written application by the Licensee and written approval by the Authority. The Licensee should include the following (without limitation) in the deviation from OLC request:

1. Description of the OLC and reason for deviation
2. Time duration of deviation from the OLC
3. Compensatory actions and measures taken and planned
4. Safety basis for the deviation from the OLC
5. Current plant mode and status/equipment out of-service

LC 9(d) Guidance

The Licensee may only return to power operations (MODE 1) after obtaining written approval from the Authority, following a refueling outage. (This includes both scheduled and forced (unplanned) outages which involve activities related to fuel in the reactor vessel.) The Licensee should report, following such an outage, that the Licensee has verified all structures, systems and components are within the OLC requirements, and are fully functional and operable.

LC 9(e) Guidance

IAEA NS-G-2.2 Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, para 4.1-4.5 (Safety Limits)

In case any Safety Limit is exceeded, the operator is required to shut down the reactor in accordance with the OLCs and report the details, causal analysis of the event, and action taken to the Authority. Exceeding the Safety Limits is considered an event and should therefore be subject to the reporting requirements in LC 6(b). The Licensee may only return to power operations (MODE 1), following a situation where any Safety Limit was exceeded, after obtaining written approval from the Authority.

Licence Condition 10 “Inspection and Testing”

This LC requires the Licensee to develop, maintain and utilise an Inspection and Test program for Items Important to Safety. Such a program refers, but is not limited to, the activities related to non-destructive testing, pressure testing, leak testing, repair and replacement, 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 aging, during the lifetime of the Nuclear Facility. It includes pre-service inspection (PSI) performed prior to operation of the nuclear power plant.

LC 10(a) Guidance

1. The scope of this LC clause includes "in-service inspection and testing" of the safety class SSCs designed, manufactured, constructed, and installed according to the provisions of ASME B&PV Code Sec III / KEPIC MN. Safety class SSCs also include those SSCs not under the scope of ASME B&PV Code Sec III / KEPIC MN but identified as safety class by design specifications and / or SAR.

2. For In-Service Inspection (ISI) and Testing of ASME/KEPIC code SSCs, the licensee must apply provisions of ASME B&PV Code Section XI (including the referenced codes and standards). For SSCs 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 Authority 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.
3. In applying provisions of (2) above, the Licensee must apply requirements of USNRC 10 CFR 50.55a (Codes and Standards). Licensee should apply additional requirements stipulated in ROK NSSC Notice No.2012-10 - "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", Notice No.2012-23, "Regulation on In-Service Test of Safety-related Pumps and Valves". The licensee should apply provisions of USNRC NUREG 1482, "In-service Testing of Pumps and Valves and In-service Examination and Testing of Dynamic Restraints (Snubbers) at Nuclear Power Plants". Resolution of any conflicting / overlapping requirements between USNRC rules and ROK NSSC notices are subject to the Authority's review and acceptance.
4. Because the publication date for the USNRC documents can change, the Licensee is to use the effective publication date closest to a date one year prior to the commencement of the inspection interval - for both USNRC 10 CFR 50.55a (Codes and Standards) and USNRC NUREG 1482, "In-service Testing of Pumps and Valves and In-service Examination and Testing of Dynamic Restraints (Snubbers) at Nuclear Power Plants". If the publication date of a USNRC document is less than one year from the commencement of the inspection interval, the licensee may still use it, but is not required to.

For example, if the ISI/IST program is scheduled to commence on 10 Jan 2021, and the most recent versions of a USNRC document are 25 Feb 2020, 10 Feb 2019, and 20 March 2018, then the Licensee can use the 25 Feb 2020 version, but is not required to. If the Licensee chooses not to use the 25 Feb 2020 version, then the Licensee is required to use the version published 10 Feb 2019, since it is the closest to the one year requirement. The Licensee is prohibited from using the USNRC document version published 20 March 2018.

Review/update date specified at respective USNRC webpages should be considered as the publication dates for the 10 CFR 50.55a and NUREG 1482. Effective publication date for ASME Code edition and addenda identified in USNRC 10 CFR 50.55a, acceptable to the Authority, are those closest to a date one year prior to commencement of the inspection interval. Acceptable publication dates for other codes and standards shall be consistent with referencing ASME code editions and addenda.

5. Effective publication dates for ROK NSSC notices must be the same as those applicable for the Barakah Nuclear Power Plant (BNPP) reference plant Shin Kori Unit 3. It is to be noted that the ROK NSSC notice numbers change with revisions. Care should be exercised in

applying the correct ROK NSSC notices.

6. For interpretations related to nuclear codes, ASME interpretations have precedence.

LC 10(b) Guidance

The scope of this LC clause includes inspection and test program for items important to safety not under ASME/KEPIC code safety classification. The licensee must develop and apply an inspection and test program for non-code (i.e. not in scope of ASME/KEPIC codes) items important to safety. The inspection and test requirements must be commensurate with safety significance of the SSCs.

LC 10(c) Guidance

LC 10(c) is applicable to all the items covered under LC 10 (a) and LC 10 (b)

LC 10(c) (i) Guidance

For this section of the LC, the Licensee should submit a long term inspection and testing program, for all important to safety SSCs, to the Authority at least three (3) 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 test program. For non-ASME code items important to safety, such inspection intervals should be commensurate with their safety significance. For example, if the licensee chooses ten (10) years as inspection interval, then for each such interval a long-term inspection and testing program should be submitted to the Authority. The long term inspection programs submitted to the Authority should broadly follow the format specified in ROK NSSC Notice No.2012-10 "Regulation on In-Service Inspection of Nuclear Reactor Facilities".

LC 10(c) (ii) Guidance

Submit changes/revisions to the long-term inspection and testing program, along with justification for such changes, and alternate inspections and tests to the Authority. Such changes/revisions should be submitted at least 3 months prior to their implementation.

Changes made due to impractical situations or emergent issues identified during implementation of the long term inspection and testing program (during outages, for example) are not intended to be under scope of LC 10 c) (ii). See guidance under LC 10 (iii) and LC 10 (iv).

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.

LC 10(c) (iii) Guidance

Submit to the Authority detailed outage scope inspection and testing program for each refueling outage at least three (3) months before implementing such program. Any changes

in the refueling outage inspection and testing program 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 refueling outage inspection and testing. See LC 10 (c) (iv) below for guidance on refueling outage inspection and testing summary report. All such changes, if applicable, should be incorporated in the subsequent revision of the long term inspection program.

LC 10(c) (iv) Guidance

Submit to the Authority a summary report of the outage scope 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):

1. Inspection and evaluation results for each system, structure and component;
2. non-conformances to the applicable codes and standards and associated corrective actions;
3. corrective actions for ISI indications exceeding the applicable acceptance criteria;
4. actions for non-completed portions of the inspections, if any; and
5. changes to the already submitted refuelling outage inspection and testing program due to emergent issues, along with the reasons of such changes; and, alternate inspections and tests in lieu of originally identified inspection and tests (if applicable).

LC 10(c) (v) Guidance

Upon completion of an inspection interval period, (e.g. 10 year interval), the licensee should submit an integrated inspection and testing report covering all the planned, and completed, inspections and tests during the inspection interval, within six (6) months of the end of 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.

LC 10(c) (vi) Guidance

No additional guidance is deemed necessary for this paragraph.

LC 10(c) (vii) Guidance

Performance Demonstration of Non-Destructive Examination (NDE):

(a) Among NDE methods performed during in-service inspection, the installer or operator should conduct the performance demonstration of ultrasonic testing (UT) for the items important to safety and eddy current testing (ECT) for steam generator tubes, as applicable, per ASME BPVC Section XI.

(b) The technical standards of the UT performance demonstration should be as per guidance LC 10 (a) (2) and guidance LC 10 (a) (3). The cut-off date of the technical standards should comply with guidance LC 10 (a) (4) and guidance LC 10 (a) (5).

(c) The test specimen for UT performance demonstration should be selected among those representing characteristics of size, materials, configuration, etc. of the specific SSC to be examined. In case of ECT for steam generator tubes, the performance demonstration should be supplemented for each nuclear power plant unit by using data characteristics specific to the unit.

(d) The operator should submit the report containing the following to the Authority three (3) months prior to application of performance demonstration. When the operator needs to change the performance demonstration requirements or to use another performance demonstration system, a report should be submitted three (3) months prior to the application:

- i) Name and address of the organization carrying out performance demonstration;
- ii) applicable technical standards for performance demonstration and their edition;
- iii) test specimen or test data of performance demonstration;
- iv) evaluation of performance demonstration;
- v) quality assurance of performance demonstration;
- vi) security related to performance demonstration;
- vii) operation of performance demonstration system; and
- viii) other related items.

(e) The Authority may require additional information if it is deemed that the report submitted for (d) above is not satisfactory and/or not sufficient.

(f) The organization carrying out performance demonstration must report every year the status of the demonstration to the Authority. The Authority may audit the performance demonstration activities.

LC 10(d) Guidance

The scope of this LC clause includes material surveillance for the Reactor Pressure Vessel. For this LC item, the licensee should meet the requirements equivalent to those specified in the ROK NSSC Notice No.2012-08 (Material Surveillance Criteria for Reactor Pressure Vessel). Effective publication dates for ROK NSSC notices should be the same as those applicable for the BNPP reference plant Shin Kori Unit 3. It should be noted that the ROK NSSC notice numbers change with revisions.

Licence Condition 11 “Refueling Outages”

No additional guidance is deemed necessary for this LC.

Licence Condition 12 “Limited Scope Periodic Safety Review”

This Licence Condition requires the conduct of a limited scope periodic Safety review (PSR) covering the first five (5) years OF BNPP Unit 1 operations. The starting point of this five (5) year period is the beginning of commercial operations for Barakah NPP Unit 1. Per the Licence Condition, the review report is to be submitted to the Authority within one year of completion of this five (5) year period..

The review should focus on the lessons learned from initial operations, including those related to the implications of site-specific conditions on safe operations of Barakah NPP Unit 1. The submittal of the limited scope PSR does not affect the requirement for submittal of the first full periodic safety review, which is to be submitted within 10 years of the commercial operating date of Unit 1, and every 10 years thereafter, as per FANR-REG-16.

See regulatory guidance in this document on FANR-REG-16 Article (14), Periodic Safety Review, for guidance on content structure and scope. The Licensee should come to an agreement with the Authority on the structure and content of the Limited Scope PSR. As stated, a full PSR 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 SSG-25 (Periodic Safety Review) provides further guidance on the approach, structure, review and post-review activities to consider in the limited scope PSR.

Licence Condition 13 “Possession and use of Radioactive Material and radiation generators”

No additional guidance is deemed necessary for this Licence Condition.

Licence Condition 14 “Corporate Governance”

No additional guidance is deemed necessary for this Licence Condition.

Schedule 3 - Application Documents

FANR-NSD-NAWAH-COR-00059-2019 Application Documents and Regulatory Commitments letter provides guidance for this licence condition.

The Operating Licence uses the practice of establishing “Application Documents” as one basis of compliance. The Authority determines the scope of “Application Documents” supporting the Operating Licence and is not bounded by Licensee statements in submittals that describe the extent of materials that do or do not constitute “Application Documents”. As a general principle, all information contained in formal correspondence (or incorporated by reference), including attachments and enclosures submitted by the applicant in support of the Operating Licence Application (OLA) review, are considered by the Authority as “Application Documents”.

The same logic applies to “Regulatory Commitments”, as stated in Licensee letters. The term “Regulatory Commitment” is not defined in the Authority’s legal or regulatory framework and the Authority does not endorse any other guidance in this area. All statements and descriptions of actions in Licensee letters are considered germane to the OLA, regardless of Licensee statements to the contrary. Specifically, the Authority will evaluate inspection finding closeouts, as well as statements in RAIs, without regard to Licensee characterization of an item as a “Regulatory Commitment” or not.

Schedules 4, 5 and 6

No additional guidance is deemed necessary for these schedules.

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, 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 utility business.	Quarterly
Safety System Performance Indicator (SSPI)	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. NOTE: 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%.	Quarterly
Unplanned Total Scrams per 7000 hours critical (US7)	This indicator is the sum of the number of unplanned automatic scrams (reactor protection	Quarterly

	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.	
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 offsite 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 the relative effectiveness of plant operational chemistry control.	Quarterly

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
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Appendix 2: Power Reactor Information System (PRIS)

Indicator	Description	Frequency
Power Reactor Information System (PRIS)	<p>1. Information on Barakah NPP operational performance;</p> <p>2. Information on any amendments to the Barakah NPP baseline safety-related design.</p> <p>The Authority, via its PRIS National Officer, updates PRIS as necessary to support the maintenance of up to date information relating to UAE commercial nuclear power plants. Information required to be provided is given on the IAEA PRIS website, https://www.iaea.org/pris/.</p> <p>In addition, details specifying the information to be provided is given in the PRIS User Manual and its supporting reference identified in Article (6) above and given in:</p> <p>(a) http://www-pub.iaea.org/books/IAEABooks/10876/PRIS-WEDAS-User-s-Manual-to-the-Web-Enabled-Data-Acquisition-System-for-PRIS and its supporting reference:</p> <p>(b) http://www-pub.iaea.org/mtcd/publications/pdf/te_1544_web.pdf</p>	<p>1. Quarterly</p> <p>2. As amendments occur</p>

Appendix 3: Licence Condition and Safety Regulation reporting requirements

References	Title	Relevant Article	Text	Timescales
Operating Licence (OL)	Event Reporting	6. (b)	<p>b. 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 having 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>	<p>Immediate notification</p> <p>12hrs (prompt notification)</p> <p>48 hours initial report</p> <p>60 days (Event Report (ER))</p>
REG-11	Regulation for Radiation Protection and Predisposal Radioactive Waste Management	(24) 4.	4. Report within 24 hours to the Authority any Discharges exceeding the limits of Discharge in accordance with the approved Safety Case.	<p>12 hrs (prompt notification)</p> <p>60 days (Event Report)</p>
		(24)5.	5. Report within 24 hours to the Authority any direct external exposure levels exceeding the levels in the approved Safety Case (i.e., the Dose Constraint for Occupational Exposure in accordance with FANR-REG-04, Article (5), item 3).	<p>12 hrs (prompt notification)</p> <p>60 days (Event Report)</p>

	in Nuclear Facilities	(24) 6.	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)
REG-12	Regulation for Emergency Preparedness for Nuclear Facilities	(2) "... and implement notification procedures."	<ul style="list-style-type: none"> • Emergency Classification Level (ECL) has been declared • ECL change • Protective Action Recommendation (PAR) has been made • PAR has been changed • Emergency Termination 	Immediate notification (15 minutes) Hourly updates after Immediate Notification until end of Emergency Termination Notification after consultation with Authority and Off-site entities 60days (Event Report)
REG-16	Operational Safety including Commissioning	(8) 7.	7. The Nuclear Facility shall be returned to a safe Operational State when parameters deviate from the operational limits and conditions (OLCs). 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.	8. 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.	12 hrs (prompt notification) 48 hours initial report 60 days (Event Report)
RG-002 (RG for FANR-REG-01, Application of Management Systems)	Application of Management Systems for Nuclear Facilities	(2) 7. Identifies IAEA safety standard NS-G-2.11 Section 10.8 as acceptable to meet requirements of REG-01. *Note: NS-G-2.11 provides guidance on Event Reporting criteria	The key criteria for Events that should be reported to the regulatory body should include the following: (1) A plant shutdown as required by the operational limits and conditions; (2) An operation or condition prohibited by the operational limits and conditions; (3) Any Event or abnormal condition that resulted in the condition of the nuclear installation, including its principal safety barriers, being seriously degraded; (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; (5) Any Event or abnormal condition that resulted in the manual or automatic operation of the reactor protection system or of engineered safety features; (6) Any Event in which a single cause or condition caused a significant loss of operability in a Safety	Within one (1) 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 12 hrs (prompt notification) 48 hours initial report 60 days (Event Report)

			<p>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, fabrication or operation that has resulted in, or that 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 refueling (e.g. the dropping of a fuel assembly);</p> <p>(12) Any Event that results in the death of or serious injury to Personnel on the site.</p>	
RG-006 (RG for FANR-REG-13, Safe Transport of Radioactive Materials)	Transportation Safety Guide	(4) 7.	<p>7. 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 050-641-6533.</p>	<p>Immediately (within 1 hour) for potential contamination or overexposure of personnel</p> <p>60 days (Event Report)</p>
		(4) 8.	<p>8. Undeliverable Packages</p> <p>As the licensed Carrier, the package is your responsibility until it is accepted by the Receiver 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>
		(5) 3.	<p>3. Package Acceptance</p> <p>If: The documents are not in order;</p>	<p>Immediately (within 1 hour) for leaking / damaged package or potential</p>

			<p>Your unloading instructions from the Shipper are not clear or if you cannot carry them out; The measured Transport Index is significantly greater than the Transport Index on the label; It is evident that the package is damaged or leaking; or You suspect that the package may have leaked or been damaged,</p> <p>Then: Do not unload or otherwise touch or move the package and to contact the Shipper for further directions. 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 at 02-651-6666 between 9:00 AM and 4:00 PM, Sunday through Thursday, or 050-641-6533 outside these hours.</p>	<p>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>
RG-017	Certification of Reactor Operators and Senior Reactor Operators at Nuclear Facilities	(11) 2.	<p>2. The Facility Licensee should notify the Authority of a decision to permanently remove an RO/SRO from Active status or a decision to remove an Active RO/SRO 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.</p>	<p>30 days (Letter to Authority NSD Director)</p>

Appendix 4 - Notification of Event

Please complete this or an equivalent form and inform the Authority's Emergency Duty Officer by email (RN.ER@fanr.gov.ae) and by referring to the contact information provided at 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	
Licensee/Facility:	
Unit No.:	Unit 1 <input type="checkbox"/> Unit 2 <input type="checkbox"/> Unit 3 <input type="checkbox"/> Unit 4 <input type="checkbox"/> Other _____ <input type="checkbox"/>
Notification No.:	
Licence No.:	
Notification:	Date:
	Time:
Event:	Date:
	Time:
Event Description:	
Preliminary List of affected SSCs:	

Interim measures taken by the Licensee:	
Submitted By:	
Contact Details:	
Office Phone No.:	
Mobile Phone No.:	
E-mail Address:	
Licensee Contact for this Report:	
Name:	
Telephone No.:	
Job Title:	
E-mail Address:	

Appendix 5 – Event Report

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

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

Description: Include systems affected, effect of Event or condition on the plant, action taken or planned.
Consequences: Actual & potential consequences of Event, barriers broken and human performance. For reoccurring Events or conditions, explain why previous corrective actions were ineffective.
Analysis/Comment: Identification of investigative actions taken & direct causes, root causes and causal factors including technical, human and organizational factors.
Corrective actions: Describe immediate corrective actions, interim corrective actions and corrective actions to prevent recurrence.
Event Coding
Reporting category Plant status prior to Event Failed/affected systems Ailed affected components Cause of Event Effects on operation Characteristics of Event/issue Nature of failure/error Recovery actions
References