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## Regulatory Guide

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# Regulatory Guide for Preparation, Conduct, and Evaluation of Drills and Exercises for Nuclear Facilities (FANR-RG-034)

## Version I

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Federal Authority for Nuclear Regulation (FANR)  
P.O. Box 112021, Abu Dhabi, United Arab Emirates  
[regulation@fanr.gov.ae](mailto:regulation@fanr.gov.ae)

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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 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 the purpose 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 Federal Law by Decree No. 6 of 2009 Concerning the Peaceful Uses of Nuclear Energy and in Article (1) of both FANR Regulation for Emergency Preparedness for Nuclear Facilities (FANR-REG-12) and FANR Regulation for Requirements for Off-site Emergency Plans for Nuclear Facilities (FANR-REG-15).

<b>Controller</b>	An individual who is responsible for managing the scenario, providing simulated data to the participants, and responding to participant requests. The Controller ensures the continuity of the scenario and is the only person allowed to change events.
<b>Drill</b>	An activity that develops a skill or capability or tests a single Emergency procedure or task. The drill may test an individual's skill, the proficiency of a team, or the adequacy of procedures, equipment or facilities.
<b>Exercise</b>	An event conducted jointly with the Licensee and the Off-site site organisation to evaluate major portions of Emergency response capabilities.
<b>Exercise Management Committee</b>	A group of individuals responsible for all aspects of an exercise, including exercise planning, conduct and evaluation. The committee determines exercise capabilities, tasks and objectives. It tailors the scenario to the entity's needs, and develops documents used in exercise simulation, control and evaluation.
<b>Extended Planning Distance</b>	The area around a facility for which Emergency arrangements are made to conduct monitoring following the declaration of a General Emergency and to identify areas warranting Emergency Response actions to be taken off-site within a period following a significant radioactive release that would allow the risk of stochastic effects among members of the public to be effectively reduced.

<b>Extent of Play Agreement</b>	A document that customises the default performance expectations found in the assessment area demonstration criteria. The Extent of Play Agreement may include identification of the demonstration criteria that will or will not be evaluated during the Exercise, entities responsible for demonstrating specific criteria, equipment, personnel to be deployed, facilities to be activated, etc.
<b>Ingestion and Commodities Planning Distance</b>	An area around a Nuclear Facility for which Emergency arrangements are made to take effective Emergency Response actions following the declaration of a General Emergency in order to reduce the risk of stochastic effects among members of the public and to mitigate non-radiological consequences as a result of the distribution, sale and consumption of food, milk, and drinking water and the use of commodities other than food that may have contamination from a significant radioactive release.
<b>Master Scenario Events List</b>	A chronological timeline of expected actions and scripted events that Controllers inject into Exercise play to generate or prompt player activities.
<b>Off-site Response Organisation</b>	An organisation responsible to protect the health and safety of the public Off-site.
<b>Out-of-sequence Activities</b>	Activities not conducted in conjunction with the Exercise scenario timeline.

### **Purpose Article (2)**

1. This regulatory guide provides acceptable methods and guidance to the Licensee conducting activities involving Emergency Preparedness Drills and Exercises for a Nuclear Facility. It complements the following requirements:
  - Regulation for Emergency Preparedness for Nuclear Facilities (FANR-REG-12)
  - Requirements for Off-site Emergency Plans for Nuclear Facilities (FANR-REG-15)
2. This regulatory guide addresses the following requirements of FANR-REG-12 and FANR-REG-15:
  - a) Emergency Preparedness Drills and Exercise includes:
    - Conducting periodic Drills of its On-site Emergency Plan. (FANR-REG-12 (Article 23) paragraph 6)
    - Conducting Exercises involving full participation of all On-site and Off-site Response Organisations at least once every two years. (FANR-REG-12 Article 23 paragraph 8)
    - Drills and Exercises include a broad range of postulated scenarios including malicious acts, and shall cover all functional requirements stipulated in the regulation over a period of eight

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years. (FANR-REG-12 Article 23 paragraph 9)

- The Licensee reviews the results of Drills and Exercises, and implements appropriate re-training and corrections to the On-site Emergency Plan. (FANR-REG-12 Articles 23 paragraph 10)
- The Licensee incorporates lessons learned from Drills and Exercises. (FANR-REG-12 Article 24 paragraph 2)

b) Off-site Emergency Plan includes:

- Arrangements for the conduct of Drills and Exercises at regular intervals for the functions to be carried out under the Off-site Emergency Plan including the testing of organisational interfaces, (FANR-REG-15 Article 7 paragraph 2)
- An Exercise of the full Off-site Emergency Plan, together with the On-site Emergency Plan, is required prior to the receipt of Nuclear Fuel at a Nuclear Facility and then at least every two years thereafter. (FANR-REG-15 Article 7 paragraph 2)

3. The scope of this regulatory guide is limited to Emergency Preparedness Drills and Exercises. This regulatory guide does not provide detailed guidance on Hostile Events or Cyber scenarios. However, it does include guidance on the cycle of Exercises on Hostile Events and coordination with the Emergency Plan. Articles 10 and 11 of FANR Regulatory Guide on Response and Contingency Plans of Nuclear Facilities (FANR-RG-026) provide guidance on how to respond to a Nuclear Security Event as defined in FANR-RG-026. FANR Regulatory Guide on Cyber Security (FANR-RG-011) provides further guidance on a cyber-attack.

4. The following documents serve as the primary sources for this regulatory guide:

- a) Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, NUREG-0654 FEMA-REP-1
- b) Interim Staff Guidance Emergency Planning for Nuclear Power Plants, NSIR/DRP-ISG-01
- c) Preparedness and Response for a Nuclear or Radiological Emergency, IAEA GSR Part 7
- d) Emergency Response Planning and Preparedness for Nuclear Power Reactors, NRC RG 1.101
- e) Program Manual: Radiological Emergency Preparedness, FEMA P-1028
- f) Preparation, Conduct and Evaluation of Exercises to Test Preparedness for a Nuclear or Radiological Emergency, IAEA EPR Exercise 2005
- g) Conducting a Hostile Action-Based Emergency Response Drill, NEI 06-04

### **Introduction Article (3)**

1. Periodic Exercises should be conducted to evaluate the most crucial parts of Emergency Preparedness for response to a nuclear Emergency. Periodic Drills should be conducted to develop and maintain key skills of the Emergency Plan and procedures. Deficiencies identified as a result of

Exercises or Drills should be corrected.

2. A full-scale Exercise of the On-site and Off-site Emergency Plans should be conducted and evaluated at least once every two years. The Biennial Exercise should be carried out four times over the course of eight years.
3. The eight-year cycle applies to the Off-site and On-site Emergency Plan including all units under the On-site Emergency Plan.

### **Drill and Exercise Types** **Article (4)**

1. Exercises are conducted jointly with the Licensee and the Off-site Response Organisations (OROs) to evaluate major portions of preparedness for response to a nuclear Emergency. The types of Exercise are as follows:
  - a) Full-scale Exercises: these types of exercises involve all entities in real-time with hands-on response activities including all specified demonstration criteria. The full-scale Exercise validates the adequacy of the On-site and Off-site plans and procedures. These type of exercises may include limited Out-of-sequence activities.
  - b) Functional Exercises: these types of exercises engage organisations to test their abilities to respond to the scenario, but participation does not require all the entities involved in a full-scale exercise. Functional Exercises simulate some response capabilities or demonstrate them Out-of-sequence from the scenario, and the Exercise may not require participation of all Off-site Response Organisations that would respond in a real nuclear Emergency. Processes that require multiple elements in play for decision-making on and implementation of Protective Action may be demonstrated in a functional Exercise that includes full participation to the extent necessary to achieve the Exercise goal.
  - c) Tabletop Exercises: these types of exercises are discussion-based and may test single or multiple scenarios and outcomes. Off-site Response Organisations may use tabletop Exercises to assess key elements in decision-making, assessment, and public and media communication and implementation. Tabletop Exercises may be used as a separate training or planning event. The suitability of a tabletop Exercise might vary depending on the number of participating Off-site Response Organisations needed to meet the Exercise objectives.
  - d) Field Exercises: these types of exercises involve the deployment of Emergency Response teams and personnel on or around the site. Field exercises evaluate the integrated performance of survey teams, police, traffic control, rescue, medical first aid and firefighting teams.
  - e) Remedial Exercise: these types of exercises test the corrective actions for deficiencies from the full-scale Exercise that are considered significant enough to potentially impact public health and safety.
2. Drills are conducted periodically to develop and maintain key skills of the Emergency Plan and procedures. Drills do not require full participation or full activation of all Emergency Response facilities. Supervised instruction during Drills is permitted, and Drills may focus on specific objectives.

## Drill and Exercise Scenarios Article (5)

1. Drill and Exercise scenarios should encompass a wide spectrum of events and conditions to avoid anticipatory responses resulting from participant pre-conditioning. The following Exercise scenario variations should be carried out in an exercise evaluated by the Authority during the eight-year Exercise cycle:

a) Hostile Event against a nuclear power plant

This scenario should be used in at least one Exercise in the eight-year Exercise cycle. The exercise for a Hostile Event must be a Full-Scale Exercise that demonstrates the integrated capabilities of the On-site and Off-site Emergency Plans.

b) An initial classification of (or rapid escalation to) a Site Area Emergency or General Emergency

There are at least three classes of Emergencies that provide a basis for determining the level of response actions to a potential or actual Emergency at a nuclear power plant. The emergency classification levels are: Unusual Event, Alert, Site Area Emergency, and General Emergency. The approach to Exercise design routinely begins at an Unusual Event or Alert, and progresses gradually through each level culminating at a General Emergency. As participants of an exercise are pre-conditioned to expect this sequential and gradual escalation in the Emergency classification level over a compressed period, they may anticipate and make decisions based on the Exercise scenario and elapsed scenario time rather than focusing on the unfolding scenario Emergency conditions. In a real event, the conditions at the nuclear power plant may rapidly deteriorate and result in an initial declaration of a Site Area Emergency or skip an Emergency classification level altogether.

Skipping or rapidly escalating some Emergency classification levels can make scenarios more realistic and challenging. At least one Drill or Exercise in the eight-year Exercise cycle should involve an initial classification at a Site Area Emergency or rapid escalation from an Unusual Event or an Alert to a Site Area Emergency. This is intended to establish a minimum demonstration frequency only. The Licensee and Off-site Response Organisations should discuss rapid escalation or skipping of some Emergency classification levels as part of each Exercise's extent of play negotiations based on specific site needs and plan requirements. This scenario will vary depending on the On-site and Off-site plans/procedures.

c) No (or minimal) radiological release or an unplanned minimal radiological release that requires the site to declare a Site Area Emergency, but does not require the declaration of a General Emergency

The scenario for a simulated nuclear power plant Accident should be developed jointly by the Licensee and Off-site Response Organisations. The scenario includes meteorological and radiological data such as characteristics of the release, projected Dose, Dose rates, and activity concentration in the environment. The radiological data should be supported by and compatible with plant conditions and the associated potential for releases or simulated releases. When

preparing the scenario, account should be taken for the fact that the Exercise scenarios may be essentially repeated without significant variation in magnitude of release. This could result in decision-makers facing essentially the same set of conditions each time. This can lead to either: (1) mechanical decisions based on the previous Exercises rather than thoughtful risk analysis; or (2) some decisions that are not being tested. Not having every Licensee's Exercise result in a radiological release will help avoid anticipatory responses. The Licensee should use this variable in at least one Exercise per eight-year Exercise cycle. Off-site Response Organisations are encouraged (but not required) to participate in this Exercise with the Licensee. If Off-site Response Organisations elect to participate in a joint Exercise with no or minimal release, part of the planning for the Exercise will include identifying demonstration criteria that will not be evaluated during the Exercise, and determining appropriate alternative demonstration and evaluation venues so that the Off-site Response Organisations can meet their evaluation requirements, which are to be carried out every other year.

d) Ingestion pathway and relocation/ re-entry/ return exercise

At least one Exercise in every eight-year Exercise cycle should include a post-plume phase ingestion pathway requiring Protective Actions beyond the 16-km Urgent Protective Action planning zone and into the Extended Planning Distance and Ingestion and Commodities Planning Distance. Ingestion pathway strategies should involve sample plan development, analysis of laboratory results from samples, assessment of the impact on food and agricultural products, protective decisions for relocation, trade restriction, and food/ crop restriction. Decisions on controlled re-entry, relocation and return of individuals are coordinated with the relevant organisations before being implemented.

e) Multi-unit Exercise

For multi-unit sites, this scenario should be used in at least one Exercise in the eight-year Exercise cycle. During the first eight-year cycle and prior to the loading of Nuclear Fuel for the second unit, an Exercise with this scenario should be conducted. The multi-unit Exercise should demonstrate the response to events occurring simultaneously at multiple units on the site including radiological assessments carried out for radioactive releases from multiple units.

2. The following Drill and Exercise scenario variations should be carried out during the eight-year Exercise cycle:

a) Off-hours and unannounced Drill

Provisions should be made to start a Drill between 6pm and 4am at least once in every eight-year joint Exercise cycle. At least one Drill or Exercise should be unannounced during the eight-year Exercise cycle. Drills should be conducted during different times of the year (e.g. on weekends, public holidays, holy month of Ramadan).

b) Accident mitigation strategies Drill or Exercise



At least one Drill or Exercise during the eight-year cycle should demonstrate the use of equipment including mobile equipment, procedures and strategies intended to maintain or restore core cooling, containment and Spent Nuclear Fuel pool cooling capabilities under the circumstances associated with loss of large areas of the plant due to fire or explosions. The strategies should include firefighting, operations to mitigate Nuclear Fuel damage, and actions to minimise radiological release.

c) Emergency medical Drill

An Emergency medical Drill involving a simulated contaminated individual and provisions for participation by support services (i.e. an ambulance and Off-site medical treatment facility) should be conducted annually.

d) Health physics Drill

Post-accident sampling capabilities including analysis of in-plant liquid samples with simulated or actual elevated radiation levels should be conducted annually.

e) Radiological monitoring Drill

Radiological monitoring Drills (both On-site and Off-site) should be conducted annually. These Drills should include direct radiation measurements in the environment, collection and analysis of all sample media (e.g. water, vegetation, soil, and air), and provisions for communications and record-keeping.

f) Communication Drill

Communications with the Off-site Response Organisations within the Urgent Protective Action planning zone should be tested monthly. Communications with the Authority and the National Emergency, Crisis and Disasters Management Authority (NCEMA) within the Extended Planning Distance should be tested quarterly. Communications, including Notification systems between the Licensee's Emergency Response facilities and the Off-site Response Organisations Emergency operations centers and field assessment teams should be tested annually. Communication Drills should also include how messages content can be understood by the receiving organisation.

### Biennial Exercise Article (6)

1. A basic principle of Emergency Preparedness is that the Licensee and Off-site Response Organisations conduct Exercises to develop and maintain key skills in order to protect public health and safety in the unlikely event of a nuclear Emergency. The Licensee and Off-site Response Organisations should demonstrate their ability to implement Emergency Plans and evaluate Emergency Response actions during evaluated biennial Exercises. The timeframe milestones for the biennial Exercise is outlined in Annex A.
2. The Emergency Response Organisation and Off-site Response Organisations should demonstrate

their ability in each biennial Exercise using a full-scale Exercise during the first eight-year exercise cycle. Thereafter, each eight-year exercise cycle will require at least three full-scale Exercises with the option of a functional Exercise for the fourth Exercise. It is important to note that not all required capabilities may be carried out and evaluated during a functional Exercise. Appropriate alternative evaluation methods need to be identified and agreed upon to satisfy performance and evaluation of all biennial capability requirements. Alternative evaluation methods that could be considered include:

- a) Additional functional Exercises;
  - b) Expansion of the Exercise scenario;
  - c) Out-of-sequence Activities; and
  - d) Approval from the Authority of other alternative evaluation methods upon consultation with NCEMA.
3. The development of the biennial Exercise scenario should include (but not be limited to) the following:
- a) The basic objective(s) of each Exercise and appropriate evaluation criteria;
  - b) The Exercise scope including the date(s), period, place(s), and participating organisations;
  - c) The simulated events;
  - d) A schedule of real and simulated initiating events;
  - e) A narrative describing the conduct of the Exercise to include such things as simulated casualties, Off-site fire department assistance, rescue of personnel, use of protective clothing, deployment of radiological monitoring teams, and public information activities; and
  - f) A description of the arrangements for and advance materials to be provided to official observers.
4. Biennial Exercise scenarios should provide the Emergency Response organisation and Off-site Response Organisations with the opportunity to demonstrate proficiency in the key skills necessary to implement the principal functional areas of Emergency Response. Key skills should include specific response capabilities that may be assigned in a site-specific manner such as:
- a) Timely classification of events;
  - b) Timely notification of respective Off-site Response Organisations;
  - c) Assessment of radiological releases On-site and Off-site;
  - d) Development of Protective Action recommendations;
  - e) Development of Protective Action decisions;
  - f) Dissemination of information to the public via media channels;
  - g) Engineering assessment, repair plan development, and repair of critical equipment under

- Emergency conditions;
- h) Implementation of mitigating action;
  - i) Protection of workers during Emergency Response including medical care;
  - j) Response to operational transients while implementing the Emergency Plan; and
  - k) Coordination between the Licensee and Off-site Response Organisations.
5. A Master Scenario Event List should be developed to provide a chronological timeline of expected actions and scripted events the Licensee and Off-site Controllers inject into Exercise play to generate or prompt player activity. The Master Scenario Event List should include (but not be limited to) the following:
- a) Designated scenario time;
  - b) Event synopsis;
  - c) Special inject delivery instructions, if applicable;
  - d) Tasks and objectives to be demonstrated; and
  - e) Expected actions.
6. An Exercise plan otherwise known as an 'ExPlan' should be developed to provide general information that enables the Emergency Response Organisation and Off-site Response Organisation participants to understand their roles and responsibilities in exercise planning, execution and evaluation. The ExPlan is intended for use by Exercise participants, Controllers, evaluators, exercise leads/ the director/ manager and observers, and therefore does not contain detailed scenario information. The ExPlan is published and distributed to players and observers prior to the start of the Exercise. Players and observers review all elements of the ExPlan prior to Exercise participation. The ExPlan should include (but not be limited to) the following:
- a) General summary of the Exercise (no detailed scenario information);
  - b) Exercise plan objectives and scope; and
  - c) Roles and responsibilities for participants, the Controller, evaluator, exercise leads/ the director/ manager and observer.
7. Exercise evaluation guides should be developed to support the Exercise evaluation process by providing the Licensee and Off-site evaluators with consistent standards for observation, analysis and Exercise report development. The exercise evaluation guides should include (but not be limited to) the following:
- a) Core capabilities: the distinct critical elements necessary to achieve a specific mission area e.g. prevention.
  - b) Capability target(s): the performance threshold for each core capability stating the exact amount of capability that players aim to achieve.
  - c) Critical tasks: the distinct elements required to carry out a core capability assessment to describe how the capability will be met. Critical tasks generally include the activities, resources and

responsibilities required to fulfil capability targets.

- d) Performance ratings: the summary description of performance against target levels. Performance ratings include both target ratings describing how Exercise participants performed relative to each capability target, and core capability ratings describing overall performance relative to the entire core capability.
8. Demonstration of Emergency Response capabilities may be performed Out-of-sequence: members of the exercise management committee should agree upon off-site Out-of-sequence Activities, and be identified in the Extent of Play Agreement. Out-of-sequence Activities should be scheduled no more than 60 days prior to (or 30 days after) the biennial Exercise.
9. The Exercise Management Committee should be established to support the design and development of the biennial Exercise.
- a) The Exercise Management Committee should include representatives from the Licensee, Off-site Response Organisations, and NCEMA. As members of the Exercise Management Committee may have access to scenario-related information, these representatives on the Exercise Management Committee will treat all information as confidential. They may participate substantially in the design of the Exercise but must agree not to divulge confidential information about the exercise to potential players or others involved in the Exercise.
- b) The Exercise Management Committee should hold one or more planning meetings as needed to determine the Exercise scope, design, scenario and logistics.
10. The initial planning meeting lays the foundation for Exercise development and should occur at least six months before the Exercise.
- a) The initial planning meeting includes (but is not limited to) the following:
- Demonstration criteria to be evaluated;
  - Core capability;
  - Scenario type and variables;
  - Out-of-sequence demonstrations and potential Exercise schedule;
  - Roles and responsibilities for Exercise document preparation; and
  - Schedule for upcoming planning meetings.
- b) Following the initial planning meeting and lead up to the mid-term planning meeting, the Exercise Management Committee will develop the following:
- Final list of demonstration criteria/ core capability to be evaluated;
  - Draft Master Scenario Events List;
  - Draft ExPlan;
  - Draft exercise evaluation guides; and
  - Draft Extent of Play Agreement.

11. The mid-term planning meeting should occur three months before the Exercise.
- a) The mid-term planning meeting items to address and complete include (but are not limited to) the following:
- Negotiate and finalise the Extent of Play Agreement;
  - Review the draft ExPlan and incorporate the finalise Extent of Play Agreement;
  - Review general scenario concepts;
  - Review draft Master Scenario Events List;
  - Review draft exercise evaluation guides;
  - Prepare the Out-of-sequence Activities schedule;
  - Prepare the Exercise events schedule; and
  - Discuss and resolve planning and logistical issues.
- b) The Exercise Management Committee may decide to hold more than one meeting prior to the final planning meeting to prepare all the items typically covered in the mid-term planning meeting.
- c) The Exercise Management Committee fully reviews, finalises and distributes the following documents before the final planning meeting:
- Master Scenario Events List
  - ExPlan
  - Exercise evaluation guides
12. During the final planning meeting there will be a comprehensive review of all finalised Exercise documents; all outstanding items will be identified and resolved. The final planning meeting should occur no later than 35 days before the Exercise.
- a) During the final planning meeting, the Exercise Management Committee will do the following:
- Approve all documentation related to the Exercise;
  - Finalise the logistics of the Exercise;
  - Finalise tasks given to the Controller and the evaluator; and
  - Resolve outstanding items.

### **Drill and Exercise Analysis and Assessment Article (7)**

1. The Licensee and Off-site Response Organisations should evaluate their Drills and Exercises against pre-established objectives of Emergency Response to demonstrate that identification, notification, activation and response actions can be carried out effectively. Emergency Response is analysed in order to identify actions to be taken in areas in which improvements are necessary. Arrangements should be made to maintain, review and update Emergency Plans, procedures and

other processes to incorporate lessons learnt from the different types of Drills and Exercises.

2. The following assessment areas of the Drills and Exercises reflect the guidance on the activities the Licensee is expected to be able to perform to maintain reasonable assurance that the health and safety of the workers, public and environment can be protected in the event of an accident at a nuclear power plant:

a) Assessment area: Emergency operations management.

i. Mobilisation

- The Licensee should have the capability to alert, notify and mobilise Emergency personnel, and activate staff Emergency Response facilities.
- The assessment may be accomplished during a biennial Exercise, an actual event, Out-of-sequence evaluation or by means of Drills conducted at any time.
- Responsible Emergency Response personnel should demonstrate the capability to receive notification of an event from the Licensee, verify the notification, and contact, alert and mobilise key Emergency personnel in a timely manner, and demonstrate the ability to maintain and staff 24-hour operations. Twenty-four hour operations can be demonstrated during the Exercise via rosters or shift changes or otherwise in an actual activation.
- Emergency Response facilities should be evaluated for this criterion during the first biennial Exercise after any new or substantial changes in structure, equipment, or mission that affect key capabilities, as outlined in respective Emergency Plans/procedures. A substantial change is one that has a direct effect or impact on Emergency response operations in those Emergency Response facilities. Examples of substantial changes include modifying the size or configuration of an Emergency operations centre, adding more function to a centre, or changing the equipment available for use in a centre.

ii. Emergency Response facilities

- The Licensee should have Emergency Response facilities to support Emergency Response.
- The assessment may be accomplished during a biennial Exercise, an actual event, or an evaluation on the Out-of-sequence Activities.
- The Licensee should demonstrate the availability of Emergency Response facilities to support the accomplishment of Emergency operations (this includes all alternate and back-up Emergency Response facilities). Evaluations are typically carried out for Emergency Response facilities. Some of the areas evaluated within the Emergency Response facilities are adequate space, furnishings, lighting, restrooms, ventilation, access to back-up power, and/ or an alternate facility if required to support operations.

iii. Direction and control

- The Licensee should have the capability to control their overall response to an Emergency.
  - The assessment may be accomplished in a biennial Exercise or in a tabletop Exercise.
  - Leadership personnel should demonstrate the ability to carry out the essential management functions of the response effort e.g. keeping staff informed through periodic briefings and/ or other means, coordinating with Off-site Response Organisations, and ensuring the completion of requirements and requests. Leadership should demonstrate the ability to prioritise resource tasking and replace/ supplement resources e.g. through memoranda of understanding (MOUs) or other agreements when faced with competing demands for finite resources. Any individuals identified through letters of agreement should be on the mobilisation list so they may be contacted during an incident, if needed.
- iv. Communications equipment
- The Licensee should establish and operate reliable primary and back-up communication systems to ensure communications with key Emergency personnel at the National Operations Centre, the Licensee's offices and its Emergency response facilities, the Emergency Operations Center, and with field monitoring teams.
  - The assessment may be accomplished initially in a baseline evaluation and subsequently in periodic testing and Drills. System familiarity and use should be demonstrated as applicable in biennial or tabletop Exercise, or if their use would be required during an actual event.
  - The Licensee should demonstrate that a primary system and at least one back-up system for fixed facilities is fully functional at all times. Communications systems should be maintained and tested on a recurring basis throughout the assessment period, and the system status be made available to all operators. Periodic test results and corrective actions should be maintained on a real-time basis. If a communications system is not functional, but Exercise performance is not affected, no Exercise issue will be assessed.
  - Communications equipment and procedures for facilities and field units should be used as needed for the transmission and receipt of Exercise messages. All facilities, field monitoring teams, and the incident command centre should have the capability to access at least one communication system that is independent of the commercial telephone system. The responsible Licensee should demonstrate the capability to manage the communication systems and ensure that all message traffic is handled without delay or disruption to Emergency operations. The Licensee should ensure that a coordinated communication link for fixed and mobile medical support facilities exists. Exercise scenarios may require the failure of a communication system and use of an alternate system as negotiated in the Extent of Play Agreement.

- v. Equipment and supplies to support operations
- The Licensee should have Emergency equipment and supplies adequate to support the Emergency response.
  - The assessment may be accomplished through a baseline evaluation and subsequent periodic inspections.
  - Particular equipment and supplies of the Emergency Response facilities should be sufficient and consistent with that facility's assigned role in the Licensee's Emergency operations plans.
  - Specific equipment and supplies demonstrated under this criterion should include iodine thyroid blocking inventories, dosimetry and monitoring equipment.
- b) Assessment area: Protective Action decision-making
- vi. Emergency Worker Exposure Control
- The Licensee should have the capability to assess and control the radiation exposure for Emergency Workers and should have a decision chain in place as specified in plans/ procedures to authorise Emergency Worker Dose values to be exceeded for specific missions.
  - The assessment may be accomplished in a biennial Exercise or in a tabletop Exercise.
  - The Licensee authorised to send Emergency Workers into the plume exposure pathway should demonstrate a capability to comply with Emergency Worker pre-authorised exposure levels based on their Emergency Plans/ procedures.
  - The Licensee should also demonstrate the capability to make decisions concerning the authorisation of exposure levels in excess of the pre-authorised levels and the number of Emergency Workers receiving radiation Doses above pre-authorised levels.
  - The demonstration should include the provision of dosimeters and iodine thyroid blocking pills in a timely manner to Emergency Workers dispatched On-site to support plant incident assessment and mitigating actions in accordance with respective plans/ procedures.
- vii. Radiological assessment and Protective Action recommendations and decisions
- The Licensee should have the capability to independently project integrated Dose from projected or actual Dose rates and compare these estimates to the applicable generic criteria levels.
  - The assessment may be accomplished in a biennial Exercise or in a tabletop Exercise.
  - The Licensee should demonstrate a reliable capability to independently validate



Dose projections. The types of calculations to be demonstrated depend on the data available from the scenario. The need for assessments to support the Protective Action recommendations should be appropriate to the scenario. In all cases, the calculation of the projected Dose should be demonstrated. Projected Doses should be related to quantities and units of the generic criteria to which they will be compared. Protective Action recommendations should be promptly shared with decision-makers in a pre-arranged format.

- The Licensee should have the capability to choose the most appropriate Protective Action in a given Emergency.
- The Licensee should have the capability to make both initial and subsequent Protective Action recommendations. The Licensee should demonstrate the capability to make initial Protective Action recommendations in a timely manner appropriate to the incident and based on an assessment of plant status and potential radioactive release or before any actual radioactive release and other available information related to the incident. Dose assessment personnel may provide additional Protective Action recommendations based on the subsequent Dose projections, field monitoring data, or information on plant conditions.

viii. Assessment area: implementation of Protective Action

Implementation of Emergency Worker exposure control

- The Licensee should have the capability to provide for the following:
  - distribution, use, collection and processing of direct-reading dosimetry and the storage of permanent record dosimetry readings
  - reading of direct-reading dosimetry by Emergency Workers at appropriate frequencies
  - up-keep of radiation Dose records for each Emergency Worker
  - an authorisation procedure for Emergency Workers to incur radiation exposures in excess of the Protective Action guides, and the capability to provide iodine thyroid blocking for Emergency Workers whilst applying the 'as low as is reasonably achievable' principle as appropriate
- The assessment may be accomplished in a biennial Exercise. Other means may include Drills, seminars or training activities that would fully demonstrate technical proficiency.
- The Licensee should demonstrate the capability to provide Emergency Workers (including support members) with the appropriate direct-reading and permanent record dosimetry, dosimeter chargers, iodine thyroid blocking pills, and instructions on the use of these items. For evaluation purposes, appropriate direct-reading dosimetry is defined as dosimetry that allows an individual to read the administrative reporting limits at a pre-established level. The established level is low enough to consider subsequent calculation of total effective Dose and maximum exposure

values for those Emergency Workers involved in life-saving and other Emergency activities mentioned in the Licensee's plans/ procedures.

#### Decision to implement iodine thyroid blocking

- The Licensee should have the capability to provide Emergency Workers with potassium iodide for iodine thyroid blocking purposes.
- The assessment may be accomplished in a biennial Exercise. Other means may include Drills, seminars or training activities that would fully demonstrate technical proficiency.
- The Licensee should demonstrate the capability to make iodine thyroid blocking available to Emergency Workers. The Licensee should demonstrate the capability to distribute potassium iodide consistent with decisions made. The Licensee should have the capability to develop and maintain lists of Emergency Workers who have ingested potassium iodide as an iodine thyroid blocking measure including documentation of the date(s) and time(s) they were instructed to ingest potassium iodide. Ingestion of potassium iodide recommended by the designated Licensee is voluntary. There should be no ingestion of potassium iodide for evaluation purposes. The Licensee should demonstrate the capability to formulate and disseminate instructions on the use of iodine thyroid blocking for those advised to have it.

#### Assessment area: field measurements and analyses

- Field measurements and analyses
  - The Licensee should have the capability to deploy field monitoring teams with the equipment, methods and expertise necessary to determine the location of airborne radiation and particulate deposition on the ground from an airborne plume.
  - The assessment may be accomplished during an exercise carried out every other year or other exercise that would fully demonstrate technical proficiency.
  - The Licensee should demonstrate the capability to brief field monitoring teams on predicted plume location and direction, plume travel speed, and exposure control procedures before deployment. Field measurements are needed to help characterise the release and support the adequacy of implemented Protective Actions, or to be a factor in modifying or issuing new Protective Action recommendations. Teams should be directed to take measurements at such locations and times as necessary to provide sufficient information to characterise the plume and its impacts.
- Field sampling
  - The Licensee should have the capability to assess the actual or potential magnitude and locations of radiological hazards to determine the ingestion exposure pathway and to support relocation, re-entry and return decisions. This area focuses on collecting environmental samples for laboratory analyses, which

are essential for decision-making on protecting the public from contaminated food and water, and measuring the direct radiation from deposited materials.

- The assessment may be accomplished during an exercise carried out every other year or other exercises that would fully demonstrate technical proficiency.
- The Licensee's field monitoring teams should demonstrate the capability to take measurements and samples at such times and locations as directed to enable an adequate assessment of the ingestion pathway, and to support re-entry, relocation and return decisions.
- The field monitoring teams and/ or other sampling personnel should secure ingestion pathway samples from agricultural products and water. Samples in support of relocation and return should be secured from soil, vegetation and other surfaces in areas that received radioactive ground deposition.
- Laboratory operations
  - The Licensee should have the capability to perform laboratory analyses of radioactivity in different environmental samples to support Protective Action recommendations.
  - The assessment may be accomplished during an exercise carried out every other year or other exercises that would fully demonstrate technical proficiency.
  - The laboratory staff should demonstrate the capability to follow appropriate procedures as applicable for receiving samples including logging information, preventing contamination of the laboratory, preventing build-up of background radiation due to stored samples, preventing cross-contamination of samples, preserving samples that may spoil (e.g. milk), and keeping track of sample identity. The laboratory staff should demonstrate the capability to prepare samples to conduct measurements.
  - The laboratory should be appropriately equipped to provide (upon request) the timely analyses of media of sufficient quality and sensitivity to support assessments. The laboratory instrument calibrations should be traceable to standards provided by the National Institute of Standards and Technology. Laboratory methods used to analyse typical radionuclides released in a reactor incident should be as described in the plans/ procedures.

#### IX. Assessment area: Emergency notification and public information

- Emergency information and instructions for the public and the media
  - The Licensee should have the capability to disseminate to the public appropriate Emergency information and instructions including any recommended Protective Actions.
  - The assessment may be accomplished during an exercise carried out every other year or other exercise, or through the operational testing of equipment.

- The Licensee personnel/ representatives should demonstrate actions to provide Emergency information and instructions to the public and media in a timely manner following the initial Alert and notification according to the applicable procedures.
- X. Remedial exercises may be required if the Emergency Plan is not adequately tested during the exercise carried out every other year such that the Authority (upon consultation with NCEMA) has no reasonable assurance that adequate protective measures can and will be taken in the event of a nuclear Emergency. A remedial exercise may be required if:
- Confidentiality is compromised to an extent that the exercise no longer affords the opportunity to assess the performance of the Emergency Response Organisation and/ or the Off-site Response Organisations, and to identify necessary corrective actions;
  - The scenario does not provide the opportunity to demonstrate key skills;
  - The scenario is not implemented in such a way that provides the opportunity for demonstration of key skills; or
  - The performance of the Emergency Response Organisation and/ or the Off-site Response Organisations does not provide the Authority and NCEMA with a basis to determine that key skills have been maintained.
- XI. For the purpose of demonstrating the corrective actions taken, remedial exercises should be carried out within 120 days after the exercise carried out every other year.

### **Drill and Exercise Evaluation Article (8)**

1. The Licensee should evaluate each exercise to identify weaknesses and opportunities for improvement. Identified weaknesses should be entered into the appropriate site to initiate corrective action.
2. An evaluation should be scheduled at the conclusion of the exercise to evaluate the ability of organisations to respond as detailed in the plan.
3. The evaluation should be conducted as soon as practicable after the exercise, and an official evaluation report should be drawn from the result.

### **Drill and Exercise Records and Documentation Article (9)**

1. Procedures should include requirements for recording exercise Emergency Response data and information important for the analysis of the Emergency Response.

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2. The data and information should include the implementation and completion or termination of Emergency Response actions, logging assessment data, reports on personnel accountability, and maintenance of required records and logs.
3. The Licensee should retain exercise records for at least 10 years.

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### Annex A – Timeframe Milestone for the Biennial Exercise

Calendar Days Before/ After Exercise	Action step	Responsible Organisation*
365	Establish or confirm next exercise date	Licensee, Abu Dhabi Police, FANR, NCEMA
200	Identify Exercise Management Committee Members	Licensee, Abu Dhabi Police, NCEMA
180	Conduct initial planning meeting	Licensee, Abu Dhabi Police, FANR, NCEMA
100	Submit the following draft documents to the Authority and NCEMA prior to the mid-term planning meeting: <ul style="list-style-type: none"> <li>• Master Scenario Events List</li> <li>• Exercise plan (known as the ExPlan)</li> <li>• Exercise evaluation guides</li> <li>• Extent of Play Agreement</li> </ul>	Licensee
90	Conduct mid-term planning meeting	Licensee, Abu Dhabi Police, FANR, NCEMA
60	Submit draft exercise scenario to FANR, incident commander and NCEMA for review	Licensee
45	FANR, incident commander and NCEMA provides comments to the Licensee on the draft exercise scenario	FANR, NCEMA
40	Conduct meeting for discussion of the draft exercise scenario	Licensee, Abu Dhabi Police, FANR, NCEMA
40	Submit the following finalised documents to FANR and NCEMA prior to the final planning meeting: <ul style="list-style-type: none"> <li>• Master Scenario Events List</li> <li>• Exercise Plan (known as the ExPlan)</li> <li>• Exercise Evaluation Guides</li> </ul>	Licensee

Calendar Days Before/ After Exercise	Action step	Responsible Organisation*
35	Conduct final planning meeting	Licensee, Abu Dhabi Police, FANR, NCEMA
30	Submit finalised exercise scenario to FANR and NCEMA	Licensee
Exercise Day (ED)	Conduct exercise	Licensee, Abu Dhabi Police, FANR, NCEMA
ED +30	Licensee exercise report sent to FANR	Licensee
ED +30	NCEMA exercise evaluation report sent to FANR	NCEMA
ED +60	FANR's exercise inspection report sent to the Licensee	FANR

\* FANR's responsibility in the exercise carried out every other year is to observe and inspect the process. FANR may provide feedback but will not participate in the development of the exercise content.