IAEA

Emergency Preparedness Review

EPREV

FOLLOW-UP TO THE PEER APPRAISAL OF THE ARRANGEMENTS IN THE UNITED ARAB EMIRATES REGARDING PREPAREDNESS AND RESPONSE FOR A NUCLEAR OR RADIOLOGICAL EMERGENCY

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International Atomic Energy Agency

FOREWORD

Within the United Nations system, the International Atomic Energy Agency (IAEA) has the statutory functions of establishing standards of safety for the protection of health against exposure to ionizing radiation and of providing for the application of these standards. In addition, under the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention), the IAEA has a function, if requested, to assist Member States in preparing emergency arrangements for responding to nuclear accidents and radiological emergencies.

In response to a request from the Government of the United Arab Emirates (UAE), the IAEA fielded an Emergency Preparedness Review (EPREV) mission in 2015 to conduct, in accordance with Article III of the IAEA Statute, a peer review of UAE's radiation emergency preparedness and response arrangements vis-à-vis the relevant IAEA standards. Subsequently, the UAE requested a follow-up mission to review the implementation of actions related to the findings of the 2015 EPREV mission. This report summarizes the activities of the EPREV follow-up mission conducted in September 2019.

The number of recommendations, suggestions and good practices is in no way a measure of the status of the emergency preparedness and response system. Comparisons of such numbers between EPREV reports from different countries should not be attempted.

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Executive Summary

At the request of the Government of the United Arab Emirates (UAE), an international team of experts conducted an EPREV follow-up mission from 8 to 12 September 2019. The purpose of the EPREV follow-up mission was to review the actions undertaken to address the recommendations and suggestions made during the EPREV mission fielded in the UAE in 2015. The review compared UAE emergency arrangements related to the findings of the 2015 EPREV mission against the IAEA safety standards for preparedness and response for a nuclear or radiological emergency. Although the mission was not a comprehensive review of the emergency arrangements in the country, this report also identifies findings that were noted as the result of documentation provided to review the actions taken in addressing the 2015 EPREV recommendations and suggestions.

The mission focused on preparedness for emergencies at facilities in Emergency Preparedness Category I (EPC I), as defined in IAEA Safety Standards Series No. GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency [1], which includes emergencies taking place at nuclear power plants (NPPs).

The team for the EPREV follow-up mission consisted of international EPR experts from five IAEA Member States as well as a team coordinator and deputy team coordinator from the IAEA Secretariat. The EPREV follow-up mission consisted of a review of reference materials provided by UAE and a number of site visits and interviews. During the follow-up mission, the EPREV team interacted with government officials and response organizations at all levels as well as with staff of the Barakah NPP.

The review team noted that UAE has made significant progress in developing and revising emergency arrangements for an emergency at Barakah NPP since the 2015 EPREV mission. The national commitment to emergency preparedness is evident in the ongoing efforts among response organizations in the country. In particular, the creation of the Joint Emergency Radiological Monitoring and Assessment Team (JERMAT), including the related drills and exercises, significantly improves the ability to conduct monitoring, sampling and assessment during an emergency response by coordinating the operation of technical resources and teams.

The team noted a number of good practices related to the EPR arrangements in the country. The ongoing commitment of all response organizations is apparent in the documentation of the frequent meetings held and the regular revision of plans and procedures through a formal quality management process. The team also noted the comprehensive drill and exercise programme to test the arrangements and the clear link between the evaluation reports and the revision of plans and procedures.

Additionally, the completion of a number of facilities and related logistical supplies and equipment since the 2015 EPREV mission helps to ensure that emergency response functions can be performed. The co-located off-site emergency operations center and Barakah NPP emergency operating facility allow for close coordination between the on-site and off-site officials during an emergency while maintaining their unique responsibilities. The state-of-the-art facilities at the Abu Dhabi National Oil Company (ADNOC) Ruwais Hospital provide for the prompt treatment of injured or contaminated persons during an emergency.

The review team also noted some areas that could benefit from further improvements. In particular, the UAE should continue its ongoing efforts to formally document and approve a national protection strategy for a nuclear or radiological emergency. While significant progress

has been made in this regard, it should be finalized in order to ensure that related plans and procedures can be updated for consistency. Additionally, the arrangements for protection of emergency workers and helpers, for managing radioactive waste in an emergency and for terminating an emergency should all be completed in line with the IAEA safety standards.

This report serves as the final record of the EPREV follow-up mission. The IAEA will continue to work with UAE to enhance its national EPR arrangements as appropriate.

1. INTRODUCTION

1.1. Objective and Scope

The purpose of this EPREV follow-up mission was to conduct a review of the actions taken to address the findings of the 2015 EPREV mission. The mission did not conduct a comprehensive review of UAE's nuclear emergency preparedness and response arrangements. However, during the course of the review, the review team did note some additional findings in documents that were developed or updated since the 2015 EPREV mission.

The EPREV follow-up mission focused on the arrangements for nuclear or radiological emergencies in Emergency Preparedness Category I (EPC I) as defined in IAEA Safety Standards Series No. GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency (hereafter: GSR Part 7) [1], which is consistent with the scope of the 2015 EPREV mission. The review was carried out by comparison of the revised emergency arrangements in the country against the IAEA safety standards for emergency preparedness and response.

It is expected that the EPREV follow-up mission will facilitate improvements in UAE's emergency preparedness and response arrangements, and those of other Member States, from the knowledge gained and experiences shared between UAE and the EPREV team and through the evaluation of the effectiveness of UAE's arrangements, capabilities and good practices.

1.2. Preparatory Work and Review Team

At the request of the Government of UAE, the IAEA conducted an EPREV mission to UAE from 21 to 31 March 2015. Following the mission, UAE undertook the development and implementation of a national action plan to revise and update emergency arrangements in line with the findings of the review team and to ensure that good practices were captured for sustainability.

Following the implementation of the national action plan, in March 2019, UAE requested an IAEA EPREV follow-up mission to conduct a peer review of the revised emergency arrangements. The preparatory meeting was held on June 26, 2019 via videoconference. During the preparatory meeting, an agreement was reached on the arrangements for the EPREV follow-up mission and the tentative composition of the EPREV review team of experts.

1.3. Reference for the Review

The primary reference for the review is GSR Part 7. In addition, IAEA Safety Guides GSG-2, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency [2]; GS-G-2.1, Arrangements for Preparedness for a Nuclear or Radiological Emergency [3]; and GSG-11, Arrangements for the Termination of a Nuclear or Radiological Emergency [4] were used as review criteria.

The terms used in this report are consistent with those found in the IAEA Safety Standards referred to in the above paragraph.

2. ACTIONS RELATED TO THE FINDINGS ON GENERAL REQUIREMENTS

2.1. Protection Strategy

2015 EPREV Recommendation 1
Observation: The protection strategy is defined in the onsite and offsite plans but they are not fully consistent. As part of this strategy, the process for formulating advice on decisions for protection actions is not clearly described in the plans. This includes how relevant information, including plant parameters and field data, are integrated and used in the decision-making.
Basis for recommendation: GSR Part 7 para. 4.27 states "The government shall ensure that, on the basis of the hazards identified and the potential consequences of a nuclear or radiological emergency, protection strategies are developed, justified and optimized at the emergency preparedness stage for taking protective actions and other response actions effectively in a nuclear or radiological emergency to achieve the goals of emergency response". GSR-Part 7 para. 4.30 states "The government shall ensure that interested parties are involved and consulted, as appropriate, in the development of the protection strategy". GSR Part 7, para. 5.36 states "For facilities in category I or II, arrangements shall be made for effectively making decisions on and taking urgent and early protective actions and other response actions off the site in order to achieve the goals of emergency response, on the basis of a graded approach and in accordance with the protection strategy". GSR Part 7 para. 5.38 states "Within emergency planning zones and distances, arrangements shall be made for the timely monitoring and assessment of contamination, radioactive releases and doses for the purpose of deciding on or adjusting the protective actions and other response actions that need to be taken or that are being taken. These arrangements shall include the use of pre-established operational criteria in accordance with the protection strategy".
Recommendation: NCEMA, MOI, ENEC and FANR should consider reviewing the protection strategy and concept of operations, and taking appropriate measures to ensure a common understanding of this strategy by all stakeholders. MOI, with the help of FANR and ENEC, should develop a formalized process for the assessment of required protective actions. This process should make use of all available information, including plant parameters and field survey results. It should include Operational Intervention Levels (OIL) and how they are used. It should include a coordinated field survey strategy involving all survey assets and a consolidated system for the collection of data. This should be included in the offsite plan and/or emergency procedures.

Changes since the 2015 EPREV Mission

Since the 2015 EPREV mission, several new documents relating to the protection strategy have been developed, and many existing documents have been updated to ensure consistency. In particular, the Barakah NPP Off-Site Emergency Plan[1] and Barakah NPP Unit 1T4 Onsite Emergency Plan have been revised, with the last versions dated August 2019 (Version 4) and March 2019 (Revision 3, approved by Nawah), respectively, contributing to an increased consistency between the on-site and off-site concept of operations for the Barakah NPP. The

[1] This document is considered restricted by the authorities in UAE, and it was not provided as part of the Advanced Reference Material for the mission. Version 4 of the plan was published the week prior to the EPREV Follow-Up Mission and was available only in Arabic and for in-person review during site visits. An English summary presentation was given by the Incident Commander.

plans of the relevant stakeholders have been updated accordingly, contributing to a better common understanding of the overall concept of operations.

During the interviews, Nawah described its procedure for issuing off-site protective action recommendations (1T4-EP-EPIP-PA-0002 Revision 00), which takes into account the emergency classification and plant conditions. This procedure uses the criteria of an existing regulation, FANR-REG-12 (Regulation for Emergency Preparedness for Nuclear Facilities) and a draft FANR Regulatory Guide FANR-RG-24 (Criteria for Protective Actions in Response to a Nuclear or Radiological Emergency), to decide on the protective actions to be recommended. The regulation FANR-REG-12 is currently under revision to fully align with GSR Part 7.

The recommended protective actions for the Urgent Protective Action Planning Zone (UPZ) are included in the notification of an emergency sent by Nawah to off-site authorities, using the template included in Attachment 5 of the procedure Initial Emergency Response Organization,1T4-EP-EPIP-ORG-0001 Revision 02. Additional information about the on-site protective actions is included in the notification form.

Upon receipt of the notification and recommended protective actions, the Incident Commander (IC) in the Emergency Operations Centre (EOC) has the authority to issue protective action decisions. The IC has procedures for this decision-making process which are secret and were not available to the review team.

FANR conducts independent assessments of the recommended protective actions using direct plant conditions available in the FANR EOC, as well as information from the off-site response organizations. This independent assessment is codified in an internal procedure, ERI-11 Revision 2, and is based on the criteria defined in the draft Regulatory Guide FANR-RG-24.

Since 2015, UAE has also made significant progress in developing and implementing a new operational concept for a Joint Emergency Radiological Monitoring and Assessment Team (JERMAT). This joint team, with membership from relevant stakeholders in the country, plans and conducts coordinated monitoring, sampling and laboratory analysis during an emergency. The JERMAT concept is defined in the Barakah NPP Off-Site Emergency Plan. It was originally defined in version 3, published in 2016, and is further refined in version 4, published in August 2019. The JERMAT maintains a separate plan, the JERMAT Plan, to outline the detailed arrangements for the operation of the JERMAT. The JERMAT Plan v1 was published in 2017, and version 2 is expected to be published before the end of 2019 to become fully aligned with v4 of the Barakah NPP Off-Site Emergency Plan. The current JERMAT Plan includes membership of the Abu Dhabi Agriculture and Food Safety Authority (ADAFSA), the Environment Agency–Abu Dhabi (EAD), the General Headquarters of the Army (GHQ) field teams, the GHQ laboratory and the laboratory of the Abu Dhabi Quality and Conformity Council (QCC). Nawah is included in the JERMAT Plan to ensure coordination of data, but their laboratory analysis and sample collection are handled under their on-site authorities. When published, v2 of the JERMAT Plan will also include membership of FANR in the JERMAT to increase coordination of data sharing. However, the completion of the FANR independent assessments remains with the FANR Emergency Operations Centre (EOC).

The JERMAT Plan defines a structure for the management of the JERMAT. The JERMAT Director reports to the Operations Section Leader under the IC and operates out of the off-site emergency operations centre in Al Ruwais. The JERMAT Director is supported by a JERMAT Manager and team leaders for the field teams and laboratories. The JERMAT field teams

operate out of operations centres for each of the JERMAT agencies. The JERMAT members are responsible for coordinating and conducting field monitoring and sampling from the site boundary to the edge of the Ingestion and Commodities Planning Distance (ICPD). The staffing analysis and field exercises have shown that the JERMAT can mobilize 38 personnel in the field (separate from the JERMAT management positions) within 24 hours of the beginning of an emergency. GHQ field teams would operate from the site boundary to the edge of the UPZ (16 km), while EAD and ADAFSA field teams would operate from the edge of the UPZ to the edge of the ICPD, as needed. The JERMAT is continuing to study its composition and concept of operations to reflect the expanded ICPD in the Barakah NPP Off-Site Emergency Plan version 4. The JERMAT is also continuing to define a monitoring strategy within the UPZ. The monitoring strategy in the UPZ is currently based on weather conditions provided by the meteorological authority and a determination by the JERMAT Manager.

The results of the JERMAT monitoring and sampling are included in a report submitted by the JERMAT Director to the IC. This technical report compares the results to the OILs in the FANR-RG-24 Revision B (draft). Field monitoring results in excess of the OILs are immediately confirmed and brought to the attention of the JERMAT Director and the IC.

Status of the finding

Recommendation 1 is closed on the basis of progress made and confidence in the effective completion of the revision of FANR-REG-12, FANR-RG-24, as well as the revision of related plans and procedures to reflect the changes in these documents.

2019 Follow-up mission observation

During the course of the review, the EPREV review team noted that, while the specific elements of Recommendation 1 were addressed, the complete elements of a national protection strategy are included among several documents, both published and in draft. This includes the Barakah NPP Off-Site Emergency Plan, Barakah NPP Unit 1T4 Onsite Emergency Plan, the draft revised FANR-REG-12 and the draft FANR-RG-24. These documents are aligned with the national emergency preparedness and response frameworks issued by the NCEMA.

The government would benefit from continuing the current initiative already underway to harmonize all elements of a protection strategy in a national level document which can then be supported by related plans and procedure. For example, the generic criteria for taking protective actions and other response actions, the reference level of 20 mSv is defined in the draft revised FANR-REG-12, a binding regulation for operating organizations, while the generic criteria, OILs and proposed protective actions are defined in the draft FANR-RG-24, a non-binding regulatory guide for operating organizations. The current plans and procedures do not document a justification and optimization process for the assigned values.

There is an initiative already underway with significant progress to document a protection strategy in a national level document endorsed by the Radiation Protection Committee (RPC) and is expected to be issued by the Prime Minister's Office (PMO), which would then become binding for all response organizations on and off the site. A working group was assigned by RPC and is led by FANR and with representatives of the Department of Health (DOH), Nawah, EAD, ADAFSA, the General Authority for the Security of Ports, Borders and Free Zones (MANAFTH), the Ministry of Climate Change and Environment (MOCCAE), Civil Defense, NCEMA and GHQ. The working group has already had several meetings and produced two

drafts of the national protection strategy document. It is expected that the document will be submitted to the RPC in 2020 and subsequently sent to the PMO.

Suggestion 1.
Observation: In UAE, the protection strategy encompasses contributions from several documents issued by several entities, impeding the common understating and implementation by all the stakeholders.
Basis for suggestion: GSR Part 7, para. 4.27, states: "The government shall ensure that, on the basis of the hazards identified and the potential consequences of a nuclear or radiological emergency, protection strategies are developed, justified and optimized at the emergency preparedness stage for taking protective actions and other response actions effectively in a nuclear or radiological emergency to achieve the goals of emergency response".
Suggestion: The Government should consider continuing the initiative to formally document and approve a justified and optimized national protection strategy for taking protective actions and other response actions for emergencies at the Barakah NPP and ensure alignment in supporting plans and procedures.

3. ACTIONS RELATED TO THE FINDINGS ON FUNCTIONAL REQUIREMENTS

3.1. Taking urgent protective actions and other response actions

2015 EPREV Recommendation 2
Observation: The planning zones described in the offsite plan are only partially consistent with the emergency planning zones and distances contained in the IAEA general safety requirements.
Basis for recommendation: GSR Part 7, para. 5.36 (a), states: "These emergency planning zones and distances shall [...] include: [...] iii. Extended planning distance (EPD) [...] which is the area beyond the urgent protective action planning zone for which arrangements shall be made to conduct monitoring and assessment of the radiological situation off the site in order to identify areas [for] taking protective actions and other response actions within a day to a week and a month following a significant release; iv. Ingestion and commodities planning distance (ICPD) [...] is the area beyond the extended planning distance for which arrangements shall be made to take response actions (1) for protecting the food chain and water supply as well as for protecting commodities other than food from contamination following a significant release and (2) for protecting the public from the ingestion of food, milk and drinking water and from the use of commodities other than food with possible contamination following a significant release".
Recommendation: FANR, ENEC and MOI should review the requirements for emergency planning zones to clarify the PAZ size and delimitation and to include the concepts of EPD and ICPD consistent with IAEA safety standards. ENEC and MOI should ensure that the plans are consistent with the definition of the planning zones, including the capacity to implement instructions and protection actions for the public outside the UPZ, if required.

Changes since the 2015 EPREV Mission

The draft revised regulation FANR-REG-12 and draft regulatory guide FANR-RG-24 provide revised requirements and guidance to licensees on the determination of emergency planning zones and distances. The draft FANR-RG-24 provides suggested sizes for four emergency planning zones and emergency planning distances as listed below, while noting that "the exact zone sizes can be different provided that they are justified by an appropriate technical analysis of the risk and consequences of emergencies."

- Precautionary Action Zone (PAZ) – An area around a facility for which arrangements have been made to take Urgent Protective Actions in the event of a nuclear or radiological emergency to reduce the risk of severe deterministic effects off-site.
- Urgent Protective Action Zone (UPZ) – An area around a facility for which arrangements have been made to take urgent protective actions in the event of a nuclear or radiological emergency to avert doses off-site in accordance with international safety standards.
- Extended Planning Distance (EPD) – An 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 release of radioactive material that would allow the risk of stochastic effects among members of the public to be effectively reduced.
- Ingestion and Commodities Planning Distance (ICPD) – The distance around a nuclear power plant for the area within which arrangements are made within hours of being

notified by the nuclear power plant of the declaration of a general emergency to: (a) place grazing animals on covered feed; (b) protect drinking water supplies that directly use rainwater (e.g. to disconnect rainwater collection pipes); (c) restrict consumption and distribution of nonessential local produce, wild-grown products (e.g. mushrooms and game, milk from grazing animals, rainwater, animal feed); and (d) restrict distribution of commodities until further assessments are performed.

Emergency Planning Zone and Distance	Draft FANR-RG-24 Suggested Size
Precautionary Action Zone	3 to 5 km
Urgent Protective Action Planning Zone	15 to 30 km
Extended Planning Distance	100 km
Ingestion and Commodities Planning Distance	300 km

The emergency planning zones and distances in the Barakah NPP Off-Site Emergency Plan version 4 are consistent with the draft FANR-RG-24, while the Barakah NPP Unit 1T4 Onsite Emergency Plan is expected to be updated to reflect the 300 km ICPD.

The PAZ specified in the Barakah NPP Unit 1T4 Onsite Emergency Plan remains the same as during the 2015 EPREV Mission. A more detailed justification has been provided in the plan to support this determination, and it has been accepted by FANR. The Barakah NPP Off-Site Emergency Plan version 4 includes arrangements to receive evacuees from the PAZ and to evacuate the UPZ during a site emergency or general emergency, unless conditions dictate otherwise, as determined by the IC.

The capacity to implement instructions and protective actions for the public outside the UPZ, if required, are described in the "Evacuation and sheltering plan for radiological and nuclear emergencies", an appendix to the Barakah NPP Off-Site Emergency Plan, which was reviewed during a site visit. It provides for the allocation of resources outside the UPZ as needed.

Status of the finding

Recommendation 2 is closed on the basis of progress made and confidence in the effective completion of the revision of FANR-REG-12, FANR-RG-24, as well as supporting plans and procedures to implement the revised emergency planning zone and emergency planning distances, namely the 300 km ICPD.

2015 EPREV Recommendation 3
Observation: There is a large construction population on site that will remain after Unit 1 begins operation. The construction emergency plan (Barakah NPP-HSE-P07-A) does not contain detailed procedures for evacuation of the construction population beyond the local village. The reception centre that is planned beyond the UPZ is not

specified nor implemented. Plans to disposition the construction population after monitoring at the reception centre are not outlined.
Basis for recommendation: GSR Part 7, para. 5.36, states: "For facilities in category I or II, arrangements shall be made for effectively making decisions on and taking urgent and early protective actions [including] a precautionary action zone (PAZ), for facilities in category I, for which arrangements shall be made for taking urgent protective actions and other response actions, before any significant release".
Recommendation: ENEC should develop detailed evacuation plans for the construction population, and procedures for reception centre operations. The reception centre should be designed and implemented and the offsite response organization should develop plans for disposition of the construction population upon processing through the reception centre.

Changes since the 2015 EPREV Mission

The evacuation of non-essential personnel is described in the Barakah NPP Unit 1T4 Onsite Emergency Plan section on "Non Essential Personnel Evacuation", and a detailed description of non-essential personnel evacuation can be found in the related Nawah implementing procedure EP-EPIP-PA-003 "On-site Protective Measures".

The Korea Electric Power Corporation (KEPCO) plan BNPP-HSE-P07 and procedure BNPP-HS-P07-B implement the process described in EP-EPIP-PA-003. EP-EPIP-PA-003 instructions state that the Notification and Call Out System delivers a text message and an audio message to the KEPCO IC. When the KEPCO IC returns the call, the individual is instructed to implement BNPP-HSE-P07, KEPCO Emergency Evacuation. In accordance with the KEPCO Health and Safety Procedure BNPP-HS-P07-B, KEPCO will staff and activate the KEPCO EOC at an Alert declaration in preparation for a site evacuation. Upon direction from the Nawah Emergency Director, the KEPCO IC will initiate the evacuation of the workers. First, the workers will be alerted and notified to report to their assembly points, where buses will transport them to their accommodations to await further instructions. The capacity for transportation of KEPCO workers during the evacuation process is 402 buses and 379 light vehicles, for a total capacity of 24 575 individuals. The current number of KEPCO workers is around 7000. As a result, all construction personnel that would be evacuated would be sheltered in their housing units until the need to evacuate the site is determined. The Nawah Emergency Director would direct that evacuation is to proceed when it is determined that the reception centre in Ruwais or Al Sila was open or would be open by the time the evacuees could arrive. After the reception centre is ready to receive evacuees, workers will be transported by buses, or by personal or company provided vehicles, to the reception centre. Once processed at the reception centre, evacuees will be transported to shelters that are managed by a sheltering team led by the MOI for a period of up to two weeks, until they are either returned to their home countries or to a final destination as decided by KEPCO.

The off-site response organizations have put in place two reception centres, in Ruwais (to the east of the Barakah NPP) and Al Sila (to the west of the Barakah NPP). These reception centres are currently large paved areas near the highway. Equipment and personnel from the Civil Defence CBRN teams would operate these sites. Two equipment stockpiles are maintained, one for each site. Based on the prevailing meteorological conditions in the area, the site near Ruwais is considered the primary site, while the other site would only be used upon the determination of the IC, based on the prevailing conditions at the time of the emergency. The reception centres can begin receiving and processing individuals within two hours, using 36 designated personnel from the CBRN teams in Ruwais. The reception centres can be fully operational within six

hours, using additional designated personnel and equipment from Abu Dhabi. The total staffing of the reception centres amounts up to 139 workers from the CBRN teams, plus additional staffing from the Red Crescent, Abu Dhabi police and others as needed. There are plans to construct a permanent reception centre in Ruwais, expected in to be finished by 2020, while maintaining the mobile reception centre in Al Sila as a backup.

Status of the finding

Recommendation 3 is closed on the basis of actions taken to develop detailed and harmonized on-site and off-site arrangements for the evacuation and care of non-essential personnel.

3.2. Protecting emergency workers and helpers

2019 Follow-up mission observation

The protection of emergency workers is addressed in FANR-REG-12, Regulation for Emergency Preparedness for Nuclear Facilities, and implemented by the licensees. The regulation contains information on emergency exposure limits, rather than guidance values, and requirements to implement emergency worker protection measures. The regulation is implemented by Nawah in the Barakah NPP Unit 1T4 Onsite Emergency Plan and related procedures. The draft revised FANR-REG-12 contains more detailed requirements for licensees, including revised guidance values and requirements to minimize exposure.

The current arrangements in place based on the published FANR-REG-12 do not consider the possibility of non-designated emergency workers, nor do they cover the use of helpers in an emergency. Furthermore, the draft regulatory guide FANR-RG-24 contains inconsistencies both internally and with the IAEA safety standards, specifically regarding the protection of non-designated workers and helpers, including the guidance values for restricting the exposure of these groups. Once the draft revised FANR-REG-12 is approved, it is planned to revise FANR-RG-24 for consistency.

Recommendation 1.
Observation: The arrangements for protection of emergency workers and helpers are contained in separate plans and procedures of response organizations. There is no national level guidance for the protection of emergency workers and helpers which can be consistently implemented by response organizations. The draft regulatory guide FANR-RG-24 contains inconsistencies internally and with the IAEA safety standards.
Basis for recommendation: GSR Part 7, requirement 11, states: "The government shall ensure that arrangements are in place to protect emergency workers and to protect helpers in a nuclear or radiological emergency."
Recommendation: The Government should develop national guidance for the protection of emergency workers and helpers, and FANR should ensure that the revised version of FANR-REG-12 and the new FANR-RG-24 are updated accordingly.

3.3. Communicating with the public throughout an emergency

2015 EPREV Suggestion 1

Observation: There are differences between the plans on the role of the PIC in the national public communication strategy during an emergency.
Basis for suggestion: GSR Part 7, para. 5.66, states: "Arrangements shall be made for providing useful, timely, truthful, clear and appropriate information to the public in a nuclear or radiological emergency". GSR Part 7, para 5.67, states: "Arrangements shall be made to ensure that information provided to the public by response organizations, operating organizations, the regulatory body and others (e.g. international organizations) in a nuclear or radiological emergency is coordinated and consistent, with due recognition of the evolutionary nature of the emergency".
Suggestion: NCEMA should consider ensuring that all plans and all stakeholders provide consistent information about the national communication strategy and the role of the public information centres during a nuclear emergency.

Changes since the 2015 EPREV Mission

NCEMA has developed and implemented a "National Media and Public Information Plan to Support all Emergencies, Crises and Disasters". This plan is considered a general framework to provide guidance to all response organizations to: provide a unified communication system; ensure unified messages; monitor and respond to the media, including social media; and provide instruction on how to effectively communicate with the public. The first edition of the plan was completed in 2014, with updates approved in 2019.

For nuclear or radiological emergencies, a separate plan entitled "Media and Public Information Response Plan to a Nuclear or Radiological Emergency for Barakah NPP" was developed in 2016 and updated in 2017. The main aim of the plan is to have a unified communication system to provide the media and the public with useful, timely, accurate and clear messages during an emergency at the Barakah NPP.

The plans have been tested during exercises, and improvements have been made based on documented lessons learned as reviewed by the EPREV team.

The plan defines a media cell which is comprised of liaison officers from all major organizations involved in the response. The flow of information and approval processes are well understood. Relevant stakeholders are familiar with the strategy, and both the off-site and on-site arrangements are consistent with the plan. Pre-drafted public communications templates are in place to enable a rapid communications response to different events and protective actions from the Barakah NPP Off-Site Emergency Plan, including information about protective actions, road closures, emergency updates and emergency termination. The media cell has the capability to release information to the public in five languages. Communication channels include TV, radio, social media and an early warning system that includes different communication means such as information in mosques, announcements on smart screens and cell phone notifications.

Status of the finding

Suggestion 1 is closed on the basis of actions taken to develop and test a government-wide communications plan with templates based on the possible events and protective actions described in the on-site and off-site plans.

3.4. Managing radioactive waste in an emergency

2015 EPREV Recommendation 4
Observation: There is no policy, requirement, guidance or arrangement to deal with radioactive wastes generated during a nuclear emergency.
Basis for recommendation: GSR Part 7, para. 5.81, states: "The national policy and strategy for radioactive waste management shall apply for radioactive waste generated in a nuclear or radiological emergency taking into account these requirements."
Recommendation: FANR in cooperation with relevant stakeholders, should develop requirements and regulatory guidance on the management of radioactive waste generated during a nuclear emergency at the Barakah NPP.

Changes since the 2015 EPREV Mission

FANR has undertaken efforts to develop regulations and regulatory guidance for the management of radioactive waste generated during a nuclear or radiological emergency based on the draft national policy in UAE on the long-term management and disposal of spent fuel and radioactive waste, dated November 2016. The draft national policy is based on the nuclear law and is to be approved by the UAE Cabinet. This will establish a radioactive waste management organization that will have some responsibilities for waste generated during an emergency.

The draft revised FANR-REG-12 contains updated requirements for licensees; the draft Regulatory Guide FANR-RG-035, Regulatory Guide for Emergency Preparedness for Nuclear Facilities, addresses radioactive waste and assigns responsibilities to the licensee. These regulations and regulatory guides address: the minimization of radioactive waste; the characterization and segregation of waste; treatment options; clearing, discharging and the disposal of radioactive waste. It should be noted that these regulations and guidance documents are primarily oriented toward the management of low-level waste and waste resulting from decontamination activities.

Status of the finding

Recommendation 4 is closed on the basis of progress made and confidence in the effective completion of the revision of FANR-REG-12 and the finalization of FANR-RG-035.

2019 Follow-up mission observation

During the course of the review, the review team noted that the national policy drafted in 2016 has not yet been approved. Off-site response organizations have developed individual procedures for limited management of radioactive waste during their operations, but with no final disposition plan or standardization among organizations. There is a need for a comprehensive review of on-site and off-site arrangements for the management of large volumes of radioactive waste, including the potential for high-level waste generated during an emergency and emergency response.

It should be acknowledged that there are interim arrangements and agreements in place. FANR has developed interim guidance and Nawah has developed interim agreements with some off-site response organizations to handle radioactive waste in an emergency. These interim agreements include the disposal of contaminated waste in an emergency, including waste

arising from used personal protective equipment (PPE), decontamination liquid waste, contaminated samples that have been processed and other solid wastes. In this regard, Barakah NPP is assigned the responsibility to transport and store this waste as appropriate. These activities are addressed in the off-site plan which includes segregating the waste into low, medium and high level radioactive waste as per IAEA guidance.

Recommendation 2.
Observation: While a draft policy has been developed for the disposal of large-scale radioactive waste, this policy has not been approved. Similarly, the Radioactive Waste Management Organization has not been formed, nor has planning commenced on a radioactive waste management strategy.
Basis for recommendation: GSR Part 7, para. 5.81, states: "The national policy and strategy for radioactive waste management shall apply for radioactive waste generated in a nuclear or radiological emergency taking into account these requirements."
Recommendation: The Government should approve a national policy on management of radioactive waste in an emergency and develop a strategy and related emergency arrangements for its implementation.

3.5. Mitigating non-radiological consequences

2015 EPREV Suggestion 2
Observation: The onsite plan does address the provision of psychological care to workers following an emergency and the details of an MOU are under negotiation with ADNOC MSD Ruwais hospital.
Basis for suggestion: GSR-Part 7, para. 5.87, states; "Arrangements shall be made for mitigating the non-radiological consequences of an emergency and an emergency response [...]. These arrangements shall include providing the public with [...] medical and psychological counselling".
Suggestion: ENEC is encouraged to complete the MOU with ADNOC MSD Ruwais hospital to address the non-radiological impacts of an emergency and of the response on the personnel and their families.

Changes since the 2015 EPREV Mission

At the time of the EPREV mission in 2015, MOUs were drafted between the ADNOC Ruwais Hospital and Nawah (at the time ENEC). These MOUs were being negotiated to include psychological care of workers after an emergency. However, following the completion of the 2015 EPREV mission, DOH developed and issued a number of standards and procedures addressing hospitals performing medical response functions for nuclear and other incidents following an all-hazards approach. As a result, the MOUs were permitted to expire. Since Suggestion 2 advised that the revised MOU was encouraged to be completed, Suggestion 2 is no longer relevant.

Status of the finding

Suggestion 2 is closed on the basis that it is no longer relevant to develop a specific MOU between Nawah and ADNOC Ruwais Hospital.

2019 Follow-up mission observation

The Red Crescent has a specific procedure, "Red Crescent Procedure for Barakah Sheltering Operation", which includes a checklist item concerning the provision of psychological support to individuals at the reception centre following decontamination. However, this procedure does not consider activities beyond the reception centres and sheltering, and it does not contain guidance on the specific non-radiological consequences needed during a nuclear or radiological emergency.

Suggestion 2.
Observation: The arrangements of the response organizations do not comprehensively address non-radiological consequences, specifically medical and psychological counselling, following an emergency at the Barakah NPP.
Basis for suggestion: GSR Part 7, para. 5.87, states: "Arrangements shall be made for mitigating the non-radiological consequences of an emergency and an emergency response [...]. These arrangements shall include providing the public with [...] medical and psychological counselling".
Suggestion: The Government should consider developing national guidelines to address the non-radiological consequences of a nuclear or radiological emergency, and the emergency arrangements of relevant response organizations should be updated to reflect specific procedures at the reception centres and after the emergency is terminated.

3.6. Terminating an emergency

2015 EPREV Suggestion 3
Observation: There is no consolidated transition strategy that incorporates technical and operational guidelines.
Basis for suggestion: GSR Part 7, requirement 18, states: "The government shall ensure that arrangements are in place and are implemented for the termination of a nuclear or radiological emergency, with account taken of the need for the resumption of accustomed social and economic activities." GSR Part 7, para. 5.94, states: "The termination of a nuclear or radiological emergency shall be based on a formal decision made public and shall include prior consultation with interested parties, as appropriate". GSR Part 7, para. 5.95, states: "Both radiological consequences and non-radiological consequences shall be considered in deciding on the termination of an emergency as well as in justifying and optimizing further protection strategies as necessary".
Suggestion: MOI and FANR should consider developing a consolidated termination and transition strategy consistent with IAEA safety standards.

Changes since the 2015 EPREV Mission

Since the 2015 EPREV, some guidance for the termination of a nuclear or radiological emergency has been developed for licensees in the draft revised FANR-REG-12 and draft FANR-RG-24. At the on-site level, there are requirements for the licensee to guarantee conditions and criteria for terminating the on-site emergency response actions of a declared emergency and develop general arrangements for transition to a planned exposure situation or an existing exposure situation, including the process for consultation with the concerned agencies. The procedure 1T4-EP-EPIP-REC-0001 Revision 00, Emergency Termination and Recovery Planning, implements the existing requirements in the published FANR-REG-12.

At the off-site level, both the draft FANR-RG-24 and the Barakah NPP Off-Site Emergency Plan provide guidance for coordination of on-site and off-site decision making in the transition phase and present several criteria to be met for the termination of the emergency. However, the arrangements do not reflect the transition from the emergency exposure situation to an existing exposure situation or to a planned exposure situation or, in some cases, to both in different areas of the affected region. Specific criteria should be developed for transition to either exposure situations, taking into account their specificities and requirements. It is also not foreseen in the arrangements that the transition can occur in different locations at different times based on the conditions.

The recommendation to terminate the emergency off the site is made by the IC only after the emergency at the Barakah NPP has been terminated. The IC will recommend the termination to the strategic level at the National Operations Centre (NOC) after receiving the inputs from relevant entities, A final decision is made at Government level by MOI and the relevant ministries.

Status of the finding

Suggestion 3 remains open based on the need to develop criteria and arrangements for the termination of a nuclear or radiological emergency. The review team recognizes the efforts already underway to develop a regulatory guide, to conduct a workshop to learn from previous experiences of international partners and the inclusion of some arrangements in the current draft of the protection strategy.

4. ACTIONS RELATED TO THE FINDINGS ON REQUIREMENTS FOR INFRASTRUCTURE

4.1. Organization and staffing for emergency preparedness and response

2015 EPREV Suggestion 4
Observation: Staffing of key emergency positions in the ORO could require a large number of trained staff.
Basis for suggestion: GSR Part 7, para. 6.10, states: "Appropriate numbers of suitably qualified personnel shall be available at all times (including during 24 hour a day operations) so that appropriate positions can be promptly staffed as necessary following the declaration and notification of a nuclear or radiological emergency. Appropriate numbers of suitably qualified personnel shall be available in the long term to staff the various positions necessary to take mitigatory actions, protective actions and other response actions".
Suggestion: Key organisations identified in the offsite plan that have not yet done so should consider performing an analysis of the staffing needs and identifying rosters of personnel to be trained for the positions allocated to them in the emergency plans.

Changes since the 2015 EPREV Mission

Off-site response organizations have conducted analyses of the staffing needs and developed systematic training to qualify personnel.

The IC noted that a total of 1248 individuals from Abu Dhabi Police and Civil Defence have been trained in various aspects of the off-site response to an emergency at the Barakah NPP in more than 50 training sessions since the 2015 EPREV mission. The training has been organized across the government with the support of FANR and Nawah for various responding teams in charge of Medical, Rescue, Sheltering, Evacuation, Reception Centres, JERMAT, Public Warning and Circulation.

DOH indicated that 2929 staff were trained to fulfil the response functions assigned to the health sector, with regard to the off-site medical response, the medical transport and the two designated hospitals, ADNOC Ruwais hospital and Madinat Zayed Hospital. These hospitals have identified staff needed to perform their emergency functions and are organized into three shifts during a response.

FANR conducted the analysis of the staffing needs and identified the roster of personnel needed to perform its functions during an emergency in the Barakah NPP. An instruction on the FANR Emergency Response Organization staffing and augmentation was developed and approved. Based on the qualification needs, FANR conducts an annual training and exercise programme.

EAD has 18 persons trained in monitoring and sampling in contaminated areas outside the UPZ which are organized into on-call shifts. ADAFSA has trained 32 inspectors organized in three shifts to perform their duties. Both EAD and ADAFSA are updating their staffing analyses to determine updated needs based on the expansion of the ICPD to 300 km.

Status of the finding

Suggestion 4 is closed based on the actions taken by many off-site response organizations to conduct a staffing analysis and develop rosters of trained individuals.

4.2. Plans and procedures for emergency response

2015 EPREV Recommendation 5
Observation: Most plans and procedures are in various stages of development, approval and testing.
Basis for recommendation: GSR Part 7, para. 6.17, states: "Each response organization shall prepare a general emergency plan or plans for coordinating and performing their assigned functions [...]. A national emergency response plan shall be developed that integrates all relevant plans for emergency response in a coordinated manner [...] The plans for emergency response shall be coordinated with any other plans and procedures that may be implemented in a nuclear or radiological emergency, in order to ensure that the simultaneous implementation of the plans would not reduce their effectiveness or cause conflicts".
Recommendation: All stakeholders should expedite the completion of relevant emergency plans and procedures, test them and fully implement them prior to the 2016 exercise.

Changes since the 2015 EPREV Mission

Since the 2015 EPREV mission, response organizations have made significant progress in developing, finalizing and in some cases revising plans and procedures. On-site and off-site plans were in place and tested for the 2016 exercise, and another full-scale exercise was conducted in 2017. Plans and procedures are developed within the context of the all-hazards NCEMA National Response Framework and the NCEMA National Response Framework for Nuclear and Radiological Emergencies. This is verified through a standing committee established by NCEMA to coordinate planning efforts.

The review team noted the significant efforts of the IC and off-site response organizations to revise and implement the Barakah NPP Off-Site Emergency Plan. Since 2015, the off-site plan has undergone two revisions, to version 3 in 2016 and to version 4 published in August 2019, immediately before the EPREV follow-up mission. The latest version takes into consideration the 2015 EPREV mission findings, the lessons learned from past exercises and the latest developments made by the response organizations in enhancing the national EPR system. There have been major updates to the arrangements on communication with the public, emergency planning zones and distances, and monitoring and sampling through JERMAT.

Other off-site key organizations, such as the Abu Dhabi Police and ADNOC Ruwais Hospital, developed, approved and tested their supporting emergency plans and procedures. Al Dhafra Municipality developed and approved its emergency plan for Barakah NPP emergencies. JERMAT has also developed a plan for its activities.

NCEMA has developed a "Media and Public Information Response Plan to a Nuclear or Radiological Emergency for Barakah NPP", issued in January 2016 and updated in June 2017, supported by associated procedures and described previously in this report.

FANR has developed an internal emergency response organization and related procedures and work instructions, which have been reviewed, approved and tested in exercises. Some of the exercises included notification to neighboring countries through the IAEA.

The plans and procedures have also been revised to harmonize arrangements with the Cooperation Council for Arab States in the Gulf (GCC) Regional Radiological and Nuclear Emergency Preparedness and Response Plan, including coordination with the regional coordinating committee during the preparedness stage and operational arrangements with the GCC Emergency Management Center during an emergency.

Status of the finding

Recommendation 5 is closed based on actions taken to update plans and procedures, while recognizing that some plans and procedures will need to be revised for consistency with the recently published Barakah NPP Off-Site Emergency Plan version 4.

2019 Follow-up mission observation

The review team noted that since the 2015 EPREV mission significant work has been undertaken by response organization to formalize a process for initiating and completing necessary revisions to plans and procedures. Minutes are developed and circulated for each planning meeting with clear conclusions on the path forward and a timeline for completion of tasks. This has resulted in a strong planning processes between organizations, in particular for the many organizations involved in the off-site response, under the leadership and coordination of the Abu Dhabi Police and the Incident Commander. It is reflected in the fact that the Barakah NPP Off-Site Emergency Plan is already at published version 4 and the Barakah NPP Unit 1T4 Onsite Emergency Plan is already at version 3, approved by Nawah and submitted to FANR as part of the license application.

Good Practice 1.
Observation: Response organizations conduct regular planning meetings and document the outcomes, allowing for rapid updating and revision of plans and procedures, as needed.
Basis for Good Practice: GSR Part 7, para. 6.18, states: "The appropriate responsible authorities shall ensure that: … Response organizations and operating organizations, as appropriate, are involved in the preparation of emergency plans and procedures, as appropriate. … Emergency plans and procedures are periodically reviewed and updated."
Good Practice: Response organizations have developed a strong planning process including regular meetings, documenting the outcomes of the meetings, and revising plans and procedures as necessary.

4.3. Logistical support and facilities

2015 EPREV Recommendation 6
Observation: Logistics and facilities for EPR are not yet completed.
Basis for Recommendation: GSR-Part 7, para. 6.22, states: "Adequate tools, instruments, supplies, equipment, communication systems, facilities and documentation (such as procedures, checklists, manuals, telephone numbers and email addresses) shall be provided for performing the [emergency] functions".

Recommendation: All stakeholders in the nuclear emergency plans (onsite and offsite) should continue their effort to operationalise, test and maintain the required emergency equipment and facilities.

Changes since the 2015 EPREV Mission

Since the 2015 EPREV mission, there has been significant construction and completion of emergency preparedness and response facilities as well as the procurement of related equipment.

NCEMA has updated the National Operations Centre to include the nuclear or radiological emergencies as part of its current all-hazards approach.

FANR has updated the equipment and resources available in its emergency operations centre to include data directly from the Barakah NPP and expanded communications capabilities with the site and with off-site response organizations. The equipment has been updated to include: WebEOC; Safety Parameters Display and Evaluation System (SPADES) from Barakah NPP; access to FANR's Radiation Monitoring System; tools for assessment of plume dispersion and dose calculation; and access to IAEA systems, including the Unified System for Information Exchange in Incidents and Emergencies (USIE) and the International Radiation Monitoring Information Management System (IRMIS).

DOH has issued several revised standards for facilities and equipment at hospitals, which have been implemented by ADNOC Ruwais Hospital in its CBRN department and for the care of patients admitted to the hospital. The hospital has increased its trauma care capacity and is now a Level 3 facility with a standing capacity of 102 beds, which can be increased to 122 during a large emergency. The hospital has constructed new decontamination facilities for both clinical and non-clinical decontamination at the site, which includes a fixed unit with 4 lanes and 3 mobile decontamination units for a total of 7 lanes that can operate in parallel. The facilities are adapted to the climate, with negative pressure air conditioning being available even in the mobile units. Further procedures have been developed to limit staff to working 45 minutes at a time in PPE to ensure successful operation of the facility. Potassium Iodide has been procured in line with the arrangements and is stored in seven geographically dispersed, secure, climate-controlled locations across UAE.

Nawah has constructed a building located outside the UPZ which has separate and distinct facilities co-located in the same building for laboratory analysis — the Nawah Emergency Operating Facility (EOF) and the off-site Emergency Operations Centre managed by the IC of the Abu Dhabi Police. Both the EOF and EOC are fully equipped to perform their assigned functions. Nawah has also finished construction of the Technical Support Centre (TSC) within the Main Control Room envelope for Unit 1 to support emergency response and is in the process of constructing the TSCs for Units 2 to 4. Similarly, an Operational Support Centre (OSC) is in place for Units 1 and 2 to coordinate on-site monitoring and emergency response actions, while the OSC for Units 3 and 4 is under construction. Both OSCs will have redundant capabilities and will be able to serve as a backup or expanded capacity for a large response.

FANR has a network of 17 fixed environmental radiation monitoring stations in place, which are undergoing technical updates to ensure operational readiness.

Data will be available in the EOC (including for JERMAT). JERMAT in the EOC has access to specialized equipment and resources for monitoring and assessment, including GIS tools and

pre-planned monitoring locations for food processing facilities, farms and other relevant locations.

Status of the finding

Recommendation 6 is closed based on actions taken to construct and equip emergency facilities for the on-site and off-site response.

4.4. Training, drills and exercises

2015 EPREV Suggestion 5
Observation: Some EPR exercises have taken place; most are planned for the end of 2015 and 2016.
Basis for suggestion: GSR Part 7, para. 6.30, states: "Exercise programmes shall be developed and implemented to ensure that all specified functions required to be performed for emergency response, all organizational interfaces [...] are tested at suitable intervals".
Suggestion: ENEC (for onsite), as well as NCEMA (for offsite), in cooperation with MOI and FANR, are encouraged to continue the implementation of the systematic training, drills and evaluated exercise program to test procedures and tools and to make required improvements prior to testing the overall emergency response system.

Changes since the 2015 EPREV Mission

On-site and off-site response organizations have implemented systematic training for response personnel, and a number of drills and exercises have taken place.

Nawah has implemented training programme and qualification criteria for the emergency response organization (ERO) defined in 1T4-EP-EPIP-GEN-005 and implemented through a comprehensive learning management system, *taqa*. Similarly, 1T4-EP-EPIP-GEN-009 provides objectives and demonstration criteria for drills and exercises. During a site visit, Nawah shared the 2019 drill and exercise programme as well as evaluation reports for the drills and exercises conducted thus far in 2019.

The FANR Emergency Response Organization (FERO) maintains EPI-01, which describes in detail how to prepare, conduct, evaluate and follow up FERO exercises and drills. During a site visit, FANR shared the 2019 drill and exercise programme for the FERO. This included five Convention Exercises (ConvEx) with the IAEA, eight drills/exercises with NAWAH and three drills/exercise with off-site response organizations.

The Abu Dhabi Police established in 2018 a new Nuclear Security Division to help maintain readiness for designated emergency responders. This division is responsible for coordinating training and exercise activities. It includes four branches; Planning, Training, Follow up, and Permits & Coordination with Stakeholders.

As part of its establishment, JERMAT has conducted two training sessions, each including two workshops, across organizations (in addition to the internal training conducted by each JERMAT agency) and conducted seven joint drills that included the participation of Nawah, Abu Dhabi Police and FANR.

Between 2016 and 2019, the ANDOC Ruwais Hospital held 68 trainings and 11 major drills.

During a site visit, the ADNOC Al Ruwais Hospital was able to demonstrate its training programme and certification process, including continuing education for licensed personnel.

Status of the finding

Suggestion 5 is closed based on actions taken to conduct training, drills and exercises for on-site and off-site response organizations.

2019 Follow-up mission observation

The review team noted that response organizations have a comprehensive drill and exercise programme to test the arrangements in the plans and procedures. The drill and exercise plan is documented annually with specific objectives for each event. There is a clearly documented process to identify areas for improvement during drills and exercises, and to incorporate those topics into future meetings and revisions of the relevant plans and procedures.

Good Practice 2.
Observation: Response organizations have a process to identify areas for improvement during drills and exercises and incorporate the findings from evaluation reports into future revisions of the relevant plans and procedures.
Basis for Good Practice: GSR Part 7, para. 6.33, states: "The conduct of exercises shall be evaluated against pre-established objectives of emergency response to demonstrate that identification, notification, activation and response actions can be performed effectively to achieve the goals of emergency response."
Good Practice: Areas for improvement identified during drills and exercises are discussed during regularly scheduled planning meetings and changes are made to relevant plans and procedures, as needed.

Appendix I: EPREV Follow-Up Mission Team Composition

No.	Name and LAST NAME	Position	Organization
1.	Mr David Nodwell	Team Leader	Canada
2.	Mr Mark Breitinger	Team Coordinator	IAEA
3.	Ms Muzna Assi	Deputy Team Coordinator	IAEA
4.	Mr Thorsten Hackl	Reviewer	Netherlands
5.	Mr Robert Kahler	Reviewer	United States of America
6.	Mr Luis Portugal	Reviewer	Portugal
7.	Ms Itimad Soufi	Reviewer	Morocco

Appendix II: Mission Schedule

Agenda EPREV Follow-up Mission				UAE only activity IAEA only activity IAEA and UAE activity
Day	**Time**	**Location**	**Activity**	**Participants**
2019-09-07 Saturday		Courtyard Marriot Hotel	IAEA Team internal meeting: briefing, refresher training, review of mission plan, review of preliminary observations and assignment of priorities	• IAEA team • UAE Coordinator (as needed)
2019-09-08 Sunday	09:00 to 11:00	Hotel 1	Entrance meeting: • UAE's overall national framework for EPR (FANR's DDGO) • UAE's self-assessment (FANR EP Manager) • EPREV objectives and process (IAEA Team leader)	• IAEA team • UAE representatives (senior management and focal points)
	11:00 to 11:15	Hotel 1	Break	
	11:15 to 12:00	Hotel 1 – Room 1	Meetings with stakeholders	• 11:15 to 12:00 NCEMA ○ Ahmed Al Shemeili (NCEMA) ○ Ahmed Al Harthi (NCEMA)
	11:15 to 12:00	Hotel 1 – Room 2	Meetings with stakeholders	• 11:15 to 12:00 FANR ○ Fahed Al Blooshi (FANR) ○ Rodrigo Salinas (FANR) ○ Mohamed Al Marzooqi (FANR) ○ Hessa Al Marzooqi (FANR) ○ Edward Deogracias (FANR) ○ Kirk Redwine (FANR)
	12:00 to 13:30	Hotel 1	Lunch and praying time	
	13:30 to 15:30	Hotel 1 – Room 1	Meetings with stakeholders	• 13:30 to 14:10 ENEC-NAWAH ○ Saleh Al Harthi (NAWAH) ○ Roger Freeman (NAWAH) ○ Mohamed Al Teneiji (NAWAH) • 14:10 to 14:50 IC ○ Mseed Al Mansoori (ADP) ○ Hamad Ateeq Al Mansoori (ADP) ○ CBRN ○ JERMAT • 14:50 to 15:30 EAD ○ Mohamed Mahrouka (EAD) ○ Mouza Al Rashidi (EAD) ○ Jumaa Abdallah (EAD)
	13:30 to 15:00	Hotel 1 – Room 2	Meetings with stakeholders	• 13:30 to 14:20 Health sector ○ Mansoor Al Mansoori (DOH) ○ Yasser Sharif (DOH) ○ Salma Al Hanaei (ADNOC Ruwais Hospital) • 14:20 to 15:00 ADAFSA Khalifa Alhosani (ADAFSA)
	15:30 to 16:00	Hotel 1	UAE team meeting	• UAE team
	16:00 to 18:30		Travel to Al Dhafra region (accommodation to be	• IAEA team • UAE representatives

Agenda EPREV Follow-up Mission					UAE only activity IAEA only activity IAEA and UAE activity
Day		**Time**	**Location**	**Activity**	**Participants**
				provided by ADNOC Ruwais Hospital for IAEA EPREV experts)	
		19:00 onwards	ADNOC Ruwais hospital	IAEA team meeting	• IAEA team
2019-09-09 Monday	TEAM A	07:00 to 08:00		Travel to Barakah NPP	• IAEA team • UAE representatives ○ Saleh Al Harthi (NAWAH) ○ Roger Freeman (NAWAH) ○ Mohamed Al Teneiji (NAWAH) ○ Fahed Al Blooshi (FANR) ○ Rodrigo Salinas (FANR)
		08:00 to 11:00	Barakah NPP	Interviews and walk around in Barakah NPP	
		11:00 to 12:00		Travel to Ruwais Emergency Operations Centre (EOC) – NAWAH's EOF	
	TEAM B	08:00 to 08:30		Travel to ADNOC Ruwais Hospital	• IAEA team • UAE representatives (DOH, FANR, ADNOC Ruwais Hospital) ○ Yasser Sharif (DOH) ○ Salma Al Hanaei (ADNOC Ruwais Hospital) ○ Hessa Al Marzooqi (FANR) ○ Mohamed Al Marzooqi (FANR)
		08:30 to 11:30	ADNOC Ruwais Hospital	Interviews and walk around	
		11:30 to 12:00		Travel to Ruwais Emergency Operations Centre (EOC) – NAWAH's EOF	
2019-09-09 Monday		12:00 to 13:00	Ruwais EOC	Lunch and praying time	
		13:00 to 14:30	Ruwais EOC	Interviews and walk around in EOC	• IAEA team • All UAE representatives mainly (IC, FANR, Al Dhafra Civil Defense & Al Dhafra Municipality) ○ Mseed Al Mansoori (ADP) ○ Hamad Ateeq Al Mansoori (ADP) ○ Jasem Al Mazrouai (Al Dhafra Municipality) ○ Raed Ali Al Muhairi (Al Dhafra Civil Defense) ○ CBRN ○ JERMAT (GHQ) ○ Fahed Al Blooshi (FANR) ○ Rodrigo Salinas (FANR) ○ Hessa Al Marzooqi (FANR) ○ Mohamed Al Marzooqi (FANR)
		14:30 to 16:00	Ruwais EOF	Interviews and walk around in EOF	• IAEA team • All UAE representatives mainly (NAWAH, FANR) ○ Saleh Al Harthi (NAWAH) ○ Roger Freeman (NAWAH) ○ Mohamed Al Teneiji (NAWAH) ○ Fahed Al Blooshi (FANR) ○ Rodrigo Salinas (FANR) ○ Hessa Al Marzooqi (FANR) ○ Mohamed Al Marzooqi (FANR)
		16:00 to 18:00		Travel to Abu Dhabi	

Agenda EPREV Follow-up Mission				UAE only activity IAEA only activity IAEA and UAE activity
Day	**Time**	**Location**	**Activity**	**Participants**
	19:00 onwards	Courtyard Marriot Hotel	IAEA team meeting	• IAEA team
2019-09-10 Tuesday	08:00 to 09:00	FANR	UAE team meeting (internal meeting to discuss general pending requests)	• UAE team (All focal points)
	08:00 to 16:00	FANR	Report writing	• IAEA team
	12:00 to 13:00	FANR	Lunch and praying time	
	13:00 to 17:00	FANR	Additional interviews as needed and report writing	• UAE team (all focal points available as needed) • IAEA team
	17:00 onwards	Courtyard Marriot Hotel	IAEA team meeting Report writing	• IAEA team
2019-09-11 Wednesday	10:00		Preliminary draft report submitted to UAE EPREV coordinator	• IAEA team
	10:00 to 12:00	FANR	UAE team reviews report and prepares written comments	• UAE team (all focal points)
	12:00 to 13:00	FANR	Lunch	
	13:00 to 16:00	FANR	UAE team reviews report and prepares written comments	• UAE team (all focal points)
	10:30 to 18:00	TBD	Social activity or rest	• IAEA team
	18:00	FANR	UAE submits report with UAE written comments	• UAE team coordinator
	18:00 onwards	Courtyard Marriot Hotel	IAEA team meeting to finalize report	• IAEA team
2019-09-12 Thursday	08:00 to 10:00	Hotel 1	Draft executive summary and press release	• IAEA team
	08:00 to 09:00	Hotel 1	Meetings to discuss open issues (if any)**Error! Bookmark not defined.**	• EPREV team leaders
	09:00 to 10:00	Hotel 1	Meeting to agree on executive summary and press releases content	• IAEA Team Leader • IAEA Coordinator • UAE Coordinator • UAE representatives as needed
	10:00 to 12:00	Hotel 1	Final changes to the EPREV report	• IAEA Team
	12:00 to 13:00	Hotel 1	Exit meeting and delivery of agreed report	• IAEA team

Agenda EPREV Follow-up Mission				UAE only activity IAEA only activity IAEA and UAE activity
Day	**Time**	**Location**	**Activity**	**Participants**
				• UAE team (senior management)

Appendix III: Attendees to EPREV Follow-Up Mission Meetings

No.	Name	Organization
1.	Mohamed Suhail Al Rashidi	Ministry of Interior – Abu Dhabi Police
2.	Hamdan Saif Al Mansoori	Ministry of Interior – Abu Dhabi Police
3.	Saeed Ahmed Al Mansoori	Ministry of Interior – Abu Dhabi Police
4.	Salem Al Baqmi	Ministry of Interior – Abu Dhabi Police
5.	Mseed Al Mansoori	Ministry of Interior – Abu Dhabi Police
6.	Hamad Al Mansoori	Ministry of Interior – Abu Dhabi Police
7.	Yousef Al Kaabi	Ministry of Interior – Abu Dhabi Police
8.	Khaled Al Badi	Ministry of Interior – Abu Dhabi Police
9.	Abdulla Ali	Ministry of Interior – Abu Dhabi Police
10.	Sultan Al Kaabi	Ministry of Interior – Abu Dhabi Police
11.	Mohamed Bin Omer	Ministry of Interior – Abu Dhabi Police
12.	Rashid Al Shehhi	Ministry of Interior – Abu Dhabi Police
13.	Saeed Al Rashedi	GHQ
14.	Abdulla Al Mansoori	GHQ
15.	Saleh Al Antali	GHQ
16.	Salem Al Hafeeti	GHQ
17.	Salem Al Ketbi	GHQ
18.	Raoul Awad	FANR
19.	Aayda Al Shehhi	FANR
20.	Fahad Al Blooshi	FANR

No.	Name	Organization
21.	Maha Aziz	FANR
22.	Edward Deogracias	FANR
23.	Rodrigo Salinas	FANR
24.	Mohamed Al Marzooqi	FANR
25.	Hessa Al Marzooqi	FANR
26.	Aysha Al Khadouri	FANR
27.	Mariam Al Hemeiri	FANR
28.	Mohammed Amasha	FANR
29.	Saif Mohamed Al Shamsi	NCEMA
30.	Ahmed Al Harthi	NCEMA
31.	Ahmed Al Shemeili	NCEMA
32.	Jumana Ghanem	NCEMA
33.	Ali Al Kaabi	NCEMA
34.	Falah Al Ahbabi	NCEMA
35.	Saleh Al Harthi	Nawah
36.	Roger Freeman	Nawah
37.	Mohamed Al Teneiji	Nawah
38.	Danny Cleavenger	Nawah
39.	Yasser Sharif	DOH
40.	Mansoor Al Mansoori	DOH
41.	Khalifa Alhosani	ADAFSA

No.	Name	Organization
42.	Omar Al Shimmari	ADAFSA
43.	Ali Al Obaidly	ADAFSA
44.	Mohamed Mahrouka	EAD
45.	Mouza Al Rashidi	EAD
46.	Jumaa Abdallah	EAD
47.	Jasem Al Mazrouai	Al Dhafra Municipality
48.	Raed Ali Al Muhairi	Civil Defense
49.	Saif Al Derai	Civil Defense
50.	Mohamed Al Mazrouai	Civil Defense
51.	Ghuwaya Al Neyadi	ADNOC
52.	Salma Al Hanaei	ADNOC
53.	Ajith George	ADNOC
54.	Mohamed Sultan Al Naimi	MOFAIC
55.	Abdulla al Blooshi	MOFAIC

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Acronyms

ADAFSA	Abu Dhabi Agriculture and Food Safety Authority
CBRN	Chemical, Biological, Radiological and Nuclear
ConvEx	Convention Exercises
DOH	Department of Health
EAD	Environment Agency–Abu Dhabi
ENEC	Emirates Nuclear Energy Corporation
EOC	Emergency Operations Centre
EOF	Emergency Operating Facility
EPC	Emergency Preparedness Category
EPD	Extended Planning Distance
EPREV	Emergency Preparedness Review
FANR	Federal Authority for Nuclear Regulation
FERO	FANR Emergency Response Organization
GCC	Cooperation Council for Arab States in the Gulf
GHQ	General Headquarters of the Army
IC	Incident Commander
ICPD	Ingestion and Commodities Planning Distance
IRMIS	International Radiation Monitoring Information Management System
JERMAT	Joint Emergency Radiological Monitoring and Assessment Team
KEPCO	Korea Electric Power Corporation
MANAFTH	General Authority for the Security of Ports, Borders and Free Zones

MOCCAE	Ministry of Climate Change and Environment
MOI	Ministry of Interior
MOU	Memorandum of Understanding
MSD	Medical Services Division
NCEMA	National Emergency Crisis and Disaster Management Authority
NOC	National Operations Centre
NPP	Nuclear Power Plant
OIL	Operational Intervention Level
OSC	Operational Support Centre
PAZ	Precautionary Action Zone
PMO	Prime Minister's Office
QCC	Abu Dhabi Quality and Conformity Council
SPADES	Safety Parameters Display and Evaluation System
TSC	Technical Support Centre
UAE	United Arab Emirates
UPZ	Urgent Protective Action Planning Zone
USIE	Unified System for Information Exchange in Incidents and Emergencies