EPREV REPORT

IAEA

Emergency
Preparedness
Review

EPREV

PEER REVIEW OF THE ARRANGEMENTS IN THE UNITED ARAB EMIRATES REGARDING THE PREPAREDNESS FOR RESPONDING TO A NUCLEAR EMERGENCY AT THE BARAKAH NUCLEAR POWER PLANT

2015-03-21 to 2015-03-31

International Atomic Energy Agency

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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 implemented an Emergency Preparedness Review (EPREV) mission to conduct, in accordance with Article III of the IAEA Statute, a peer review of the UAE's emergency preparedness and response arrangements for the Barakah nuclear power plant on the basis of the relevant IAEA standards.

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.

Contents

EXECUTIVE SUMMARY

An Emergency Preparedness Review (EPREV) mission was conducted by the International Atomic Energy Agency (IAEA) in the United Arab Emirates (UAE) from 21 to 31 March 2015. EPREV missions are designed to provide a peer review of emergency preparedness and response arrangements in a country based on the IAEA Safety Standards. The specific purpose of this EPREV mission was to review emergency preparedness and response (EPR) arrangements and capabilities associated with the Barakah Nuclear Power Plant.

The nuclear emergency preparedness and response framework in the UAE is being effectively built on an existing national crisis and emergency management structure that is clear, well defined and tested. This all-hazard approach is consistent with IAEA safety standards and is a key to the future success of the emergency preparedness and response program. In addition, the EPREV identified particular strengths in the following areas:

- Roles and responsibilities are clearly defined;
- The operational emergency management system is well established and clear;
- Detailed draft EPR plans and procedures are developed for the Barakah Nuclear Power Plant, which are generally consistent with IAEA safety standards;
- Great progress is being made in the development of facilities and a capability to manage the medical aspects of a nuclear emergency;
- There is a national framework for recovery, on which to build the strategy for the transition to existing exposure situation following an emergency;
- Co-locating the onsite and offsite emergency operations centres is considered a good practice that can greatly enhance the coordination of these authorities during an emergency; and
- The participation of the UAE in the GCC Regional Nuclear and Radiological Emergency Preparedness and Response Plan is also a good practice.

The EPREV identified some areas where improvements need to be considered, or where progress in implementation should be sustained. These include the following key elements:

- There is a need to clarify the public protection strategy, including the decision-making process for the protection of the public during an emergency, addressing amongst others the field survey strategy and the use of measurements in the decision-making process;
- The national public communications strategy for nuclear emergencies needs to be accurately reflected in all plans;
- Key offsite emergency stakeholders need to ensure the availability of a sufficient number of qualified personnel for extended emergencies;
- The team encourages the continued strong efforts to complete the implementation and testing of relevant emergency plans and procedures, as well as the construction of emergency facilities and acquisition of equipment to ensure their readiness before the May 2016 large-scale exercise.

The EPREV team noted the excellent cooperation of all organizations involved in the review mission. In particular, the team would like to commend all parties met during the mission for the safety culture attitude and the quest for excellence displayed.

This report serves as the final record of the EPREV mission. The IAEA will continue to work with the UAE to further develop and improve nuclear and radiological emergency preparedness arrangements. It is expected that the UAE will develop an Action Plan to implement the recommendations and suggestions contained in this report, and will invite the IAEA for an EPREV Follow-Up Mission within two to four years to review the implementation.

1. INTRODUCTION

1.1. Objective and Scope

The purpose of this EPREV mission was to conduct a review of the United Arab Emirates (UAE) emergency preparedness and response (EPR) arrangements and capabilities associated with the Barakah nuclear power plant (NPP). The review was carried out by comparing existing arrangements with the IAEA EPR safety standards.

The key objectives of this mission were to enhance nuclear emergency preparedness and response by:

- Providing the UAE with an opportunity for self-assessment of its EPR arrangements against IAEA safety standards;
- Providing the UAE with a review of its emergency preparedness and response arrangements and an objective evaluation of the degree of consistency of its EPR arrangements with respect to relevant IAEA safety standards;
- Contributing to the harmonization of emergency preparedeness and response approaches among IAEA Member States;
- Promoting the sharing of experience and exchange of lessons learned, thereby allowing an open, professional discussion between expert reviewers and UAE specialists in EPR;
- Providing the UAE with recommendations and suggestions for improvement; and
- Identifying good practices that can be shared with other States to enhance the global EPR capabilities.

1.2. Preparatory Work and Review Team

At the request of the Government of the UAE, a preparatory EPREV meeting was conducted from 19 to 20 October, 2014. The preparatory meeting was carried out by the appointed Team Leader Mr. Raoul Awad, and the IAEA EPREV Team Coordinator, Mr. Jean-Francois Lafortune. During the preparatory meeting, an agreement was reached on the terms of reference for the EPREV mission and the tentative composition of the EPREV review team of experts.

The final review team is listed in Appendix 1.

1.3 Reference for the Review

In March 2015, the IAEA Board of Governors approved the revised General Safety Requirements (GSR Part 7) on EPR [1] for publication. This document served as the main reference for the review. Two other IAEA safety standards were used as a basis for the EPREV: GSG-2, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency [2], and GS-G-2.1, Arrangements for Preparedness for a Nuclear or Radiological Emergency [3].

The terms used in this report are consistent with those found in the aforementioned IAEA safety standards.

2. DETAILED FINDINGS ON GENERAL REQUIREMENTS

2.1. Emergency management system

The national emergency management system is based on the Incident Command System and is clearly documented in the National Response Framework, under the leadership of the National Crisis and Emergency Management Agency (NCEMA)[1]. This provides a harmonized emergency management system for all levels: national, federal, local and industrial. It is reflected in the draft National Offsite Nuclear Emergency Response Plan for Barakah Nuclear Power Plan (further referred to as the offsite plan). The National Response Framework addresses all types of emergencies.

The lead agency for nuclear emergencies is the Ministry of Interior (MOI). NCEMA approved the "Nuclear and Radiological Emergencies Planning Guide", which describes the minimal requirements for planning and clearly describes the roles and responsibilities of each relevant organization and operators in radiological and nuclear emergencies.

The overall national preparedness effort is coordinated through a Nuclear Emergency Preparedness Coordination Committee. Two subcommittees report to it: one on training and one on exercises.

ENEC's emergency response management system for the onsite Emergency Response Organization (ERO) is documented in the Barakah NPP Unit 1&2 Emergency Plan (further referred to as the onsite plan), submitted to FANR on 26 March 2015, and in the supporting Emergency Preparedness Implementing Procedures (EPIP). The EPIPs are in draft form but are detailed. The emergency management system encompasses all types of hazards that could affect the site and is integrated with offsite plans. The onsite emergency organization is described in the onsite plan. The emergency management system will be capable of maintaining a high level of emergency preparedness when it is implemented, trained and tested as planned.

2.2. Roles and responsibilities

Roles and responsibilities of key entities are well defined and documented in the National Response Framework, and reflected in more detail for nuclear emergencies in the offsite plan.

The role of the operating organization is clearly and consistently defined in the regulations (FANR-REG-12), the National Response Framework, the offsite plan and the onsite plan. This includes a clear statement on the roles in preparedness and in response, including the requirements for training and support to be provided by the operating organization, as well as the interface between the operating organization and offsite authorities.

The role of FANR is also clearly documented in the National Response Framework (with a possible misinterpretation in sub paragraph da/iii of the list of responsibilities). However, the current arrangements within FANR for fulfilling its role during an emergency do not appear sufficient. For example, FANR is expected to provide qualified representatives to at least eight positions in the offsite emergency organization. The role of each and the staffing for sustainability of this deployment are not described in the current organizational emergency plan. This is addressed in suggestion 4.

[1] Established by Federal Law by Decree (2) of 2011 Establishing the National Emergency, Crisis and Disaster Management Authority

2.3. Hazard assessment

A detailed Hazard Assessment is included in the Preliminary Safety Analysis Report (PSAR). The Draft Emergency Action Level procedure, EP-EPIP-PA-001 "Emergency Classification" identifies all postulated hazards with potential radiological and non-radiological (e.g. chemical, bomb) significance, as well as external events. Details from the probabilistic risk assessment are included in the onsite plan to relate core damage frequency (CDF) accidents and large early release to accident source terms. This is unique in emergency plans and communicates information important to emergency preparedness, e.g. that station black out accidents dominate the CDF. While EPR must take into account a large spectrum of emergencies, knowledge of the dominant accident initiators allows a focus for preparedness efforts. This information reinforces the need for response resiliency during loss of power events.

2.4. Protection strategy for an emergency

The onsite protection strategy is stated in the onsite plan and includes the immediate evacuation of non-essential staff. However, procedures do not yet reflect the planning necessary to accomplish the evacuation of the large construction force expected to be present during the remaining construction phase. This is likely to be a challenging task logistically and even more challenging if there is any need to monitor evacuees and potentially decontaminate them. While ENEC is responsible for the evacuation, offsite authorities process the evacuees at the reception centres. At the forecasted staffing level of about 17,000 construction plus non-essential workers when the first plant will be operating (and the other units are being completed), the process will require a large number of monitors and technical staff to complete in a reasonable time. ENEC is working with other stakeholders to ensure that appropriate arrangements are developed and tested prior to fuel load.

The protection strategies described in the onsite and offsite plans are not fully consistent. Inconsistencies in the onsite plan are further discussed in section 3.4. The offsite plan does not include some information that could be important for planning offsite response operations, such as:

- The fact that all site workers (approximately 17,000) will be evacuated from the site at Site Area Emergency, which could impact offsite operations;
- The general strategy and approach for assessing the need for protective actions;
- The need for offsite field monitoring and the general survey strategy, as well as how the data is intended to be used; and
- The need to assess if public protective actions need to be implemented outside the Urgency Protective Action Zone (UPZ).

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.

3. DETAILED FINDINGS ON FUNTIONAL REQUIREMENTS

3.1. Managing emergency response operations

Offsite, managing emergency response operations is clearly under the authority of the Incident Commander, who is a senior representative of the MOI located at the EOC. The system builds on the existing command and control framework, infrastructure and expertise, according to an all-hazard approach. The national emergency management framework provides a clear description of the overall system, and the offsite plan builds on this by adding the necessary components needed for nuclear emergencies.

The onsite emergency management system is clearly described in the onsite plan. It includes all the elements and functions expected for the effective management of an emergency.

The interface between the operating organization and the offsite authorities is defined in the onsite and offsite plans. As discussed later, the interactions will be facilitated through the co-location of emergency operations centres for the onsite and offsite authorities in Al Ruwais.

3.2. Identifying, notifying and activating

The operator is required to classify emergencies on the basis of Emergency Action Levels (EAL). Upon recognition that a classifiable emergency situation is occurring, the on-duty Shift Manager, in his/her role as the Emergency Director at Barakah NPP, will carry out the required classification procedure. A logical classification scheme has been drafted in EP-EPIP-PA-001 Emergency Classification. However four observations of the EAL scheme are offered:

- The "abnormal radiological release" EAL, table R.1 presents "out of range monitors" in a manner that could be confusing to operators.
- The "Hazards and Other Conditions" sections contain (Hazard Alert) HA1.1, regarding impeded vital area access. Note 2 qualifies the use of this EAL. Experience has shown that spurious activation of the fire suppression system in vital areas creates nuisance Alert declarations. The EAL should be further qualified in accordance with guidance to state that the declaration is only appropriate if the event precludes procedurally required access.
- The "Systems Malfunctions" EALs SG3.1, SS3.1, SA3.1 and SU5 are not consistent with development guidance. A Probabilistic Risk Analysis (PRA) for EALs was performed by the US Nuclear Regulatory Commission (NRC) and these EALs were reclassified downward in accordance with their risk significance.
- The "Systems Malfunctions" EALs SU 4.1 and AS4.1 should not include annunciators. The PRA analysis referred to above found that loss of annunciators has little risk significance and was removed. Loss of indicators should remain in the EALs.

Upon declaration of an emergency, Barakah NPP is required to notify FANR and the offsite 24/7 notification point in less than 15 minutes. This is reflected in EP-EPIP-PA-0004, Offsite Notification.

Notification procedures have been drafted and a dedicated email system is planned to facilitate offsite notification (western region command centre and FANR). This system is expected to be operational in October 2015.

Procedures for activation of the ERO are drafted and the time target for emergency response facility (ERF) activation is in the onsite plan. Communications systems between emergency facilities are planned to be operational before fuel receipt. The site activation time target is one hour for the Technical Support Centre and Operational Support Centre, and two hours for the emergency operations facility (EOF). The Offsite Response Organisation (ORO) can be operational within two hours, even though the offsite plan calls for offsite stakeholders to be able to implement emergency procedures only within six hours.

FANR is identified as the UAE National Warning Point (NWP) and National Competent Authority (Domestic and Abroad) for the IAEA Early Notification and Assistance Conventions. FANR has its own emergency communication procedure (ERP-03), which is in draft form, and which addresses the notification of IAEA. FANR coordinates with MOFA for the notification of the IAEA.

The offsite plan identifies the roles of the entities as related to the main notification point and during activation of an emergency response. FANR coordinates with MOFA and NCEMA (NOC) to notify the Gulf Cooperation Council (GCC) countries through the GCC Joint Emergency Operation Centre that will be established in 2015 in Kuwait.

3.3. Taking mitigatory actions

The onsite plan describes the organisation that is responsible for implementing mitigatory actions.

Barakah NPP has specified that a fire brigade will be part of the on-shift ERO. This is a five-person brigade and is a collateral duty of various on-shift personnel. In addition, the site has a fire station outside the plant's protected area continually staffed by ENEC contract personnel for protection of the construction site and onsite worker accommodations (villages). This station has one fire truck with a professional qualified crew. They can support fire suppression efforts within the protected area.

ENEC is in the process of developing a plant-specific severe accident mitigation strategy. Severe Accident Management Guidelines (SAMG) and Extreme Damage Mitigation Guides (EDMG) would be implemented under the auspices of the ERO. ENEC intends to obtain mobile equipment to support SAMG and EDMG implementation. Final decision has not been made on the configuration, but use of the site fire truck(s) for portable pumping capacity is being considered. Portable electric generating systems and instrument systems are also planned. All will be bunkered in a manner protected from natural element challenges. Training and drills in the use of this equipment are planned.

A high level of mitigation capability can result from completion of the process, development of procedures, procurement of equipment and implementation of the advanced mitigation capability. The planned program of training, drills and evaluated exercises is needed to ensure the capability is fully implemented.

3.4. Taking urgent protective actions and other response actions

Protective actions in the Precautionary Action Zone (PAZ) are under the control of ENEC and only involve plant and construction personnel. The onsite plan states that all non-essential personnel (about17,000 during the construction phase of units 2, 3 and 4) will be evacuated at Site Area Emergency by bus. As discussed above in section 2.4 on protection strategy, evacuating and processing this large number of people poses operational challenges. This will require a detailed plan and procedures. As discussed above, ENEC is taking actions to develop the required arrangements.

As described in the onsite plan, public protective actions are based on Emergency Actions Levels (EAL) for immediate actions, then on source term estimation and dose projection, and, when available, on field measurements. It should be noted that IAEA safety standards recommend against the use of computer-modelled dose projections as a sole basis for decisions on urgent protective actions, except to help prioritize areas where surveys should be conducted and preparation for protective actions should be considered. In the case of the Barakah NPP, the UPZ population is small, and therefore surveys would focus on populated areas outside the UPZ and in any relevant agricultural areas.

The onsite plan contains a procedure on protective action recommendations (1&2 EP-EPIP-PA-0002). The procedure contains guidance on the use of Operational Intervention Levels (OIL) that is not consistent with IAEA safety standards (see for example 6.2.2 E 1.). Also, the OILs provided are not consistent with IAEA safety standards (GSG-2). The criteria (shown in Table 1 of the same procedure as "OIL") are also not consistent with IAEA safety standards or draft FANR-RG-024.

The offsite plan also contains a procedure "Protective Action Decisions for the Public".

Field measurements come from fixed monitoring stations (data accessible by ENEC and FANR), as well as mobile survey teams from the Armed Forces, MOI, Environmental Agency Abu Dhabi (EAD), Abu Dhabi Food Control Authority (ADFCA) and (possibly) ENEC. At present, there is no system for the integration of all field monitoring data. There is also no integrated field monitoring strategy between the various teams conducting field monitoring during an emergency (the onsite plan does contain a strategy for the onsite teams). In addition, although FANR RG-024 (draft) contains requirements on the use of OILs, this is not currently reflected in the offsite plans. It is therefore not clear how the field monitoring data are expected to be used in the mix of technical information available to make decisions on protective actions. Furthermore, the plans state that the Incident Commander makes decisions on the basis of recommendations from ENEC, but ENEC does not have access at the moment to all field monitoring data. The offsite plan also states that technical recommendations come from the Technical Support Team in the ORO, but that the Radiation Safety Team reviews field measurements. It is therefore not clear how protective action decisions will be made once field monitoring data become available.

The points above are addressed in the Recommendation 1, in section 2.4 on protection strategy.

Emergency planning zones are defined by ENEC and are explained in detail in the onsite plan. The PAZ and the UPZ are consistent with IAEA safety standards. The Extended Planning Distance (EPD) is defined as an area "within which the offsite stakeholders have pre-planned actions for the monitoring and control of contaminated food, water, and agricultural products in the medium and long term. This area is delineated by an 80 kilometre radius circle centred at the Barakah NPP site". This is not consistent with the definitions of the zones provided in the offsite plan, second edition. There is an inconsistency between the onsite and offsite plans on the definition of the PAZ (at least 3 km in the onsite plan and 5 km in the offsite plan). Furthermore, the planning zones are not fully consistent with the concept of EPD and Ingestion and Commodities Planning Distance (ICPD) described in the IAEA general safety requirements, although the offsite plan does address the need for a generic food restriction planning radius of 300 km, consistent with IAEA safety standards.

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.

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.

3.5. Providing instructions, warnings and relevant information to the public

The Incident Commander is responsible for providing instructions to the public in the UPZ. Notification of the (mainly transient) population in the UPZ is the police with the support of the Western Region municipality, using mobile phone, SMS, radio messages on the truckers' frequency and loud hailers where required. Work is underway to add notification through the national mosque system. Notification of the public outside the UPZ is not envisaged in the offsite plan. This is addressed in Recommendation 2 contained in section 3.4.

3.6. Protecting emergency workers and helpers in an emergency

Draft FANR-RG-024 contains requirements and guidance on the protection of emergency workers, generally consistent with IAEA safety standards. They include a requirement to ensure that ERO members are pre-designated in advance and attend training, as well as fit-for-duty requirements. However, the concept of "helpers" is not addressed.

The onsite plan contains provisions and arrangements for requesting and effectively using assistance from ORO during and after an emergency. An MOU will be established with those external services. When they are at the site, the plan contains arrangements for the provision of equipment and dosimetry.

Provisions for the management and protection of emergency workers are contained in the offsite plan. The Radiological Safety Team is in charge of ensuring safety in the performance of response activities and the protection of emergency response personnel. Briefing of emergency workers prior to deployment is also addressed in the offsite plan. The ORO could benefit from FANR guidance on how to apply the regulatory requirements in practice. Furthermore, arrangements should be in place to address the management of the protection of contractual staff that were not pre-designated but may act as emergency workers.

3.7. Medical response

The onsite plan organization includes a medical capability on shift. At the Barakah NPP, the expected support and assistance requested from offsite response organizations are arranged through a Memorandum of Understanding (MOU) between the plant and each relevant offsite entity. The following MOUs are in the process of review and signature:

- ADNOC MSD Ruwais Hospital
- MOI Fire and Rescue
- MOI Ambulance

The Health Authority Abu Dhabi (HAAD) has taken a leadership role to develop local radiological medical capabilities for Ruwais and Madinet Zayed hospitals. Specifications and funding have been issued to Madinat Zayed hospital and implementation is progressing. The contents of the specification cover all necessary aspects of a fully functional radiological medical capability in support of Barakah NPP. The funding for ADNOC MSD Ruwais Hospital for radiation and nuclear emergency preparedness is part of MSD's Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) Preparedness Plan and comes from ADNOC. The specifications for ADNOCs mobile and fixed decontamination units are designed by ADNOC MSD, taking into consideration the preparedness needs for Barakah NPP, ADNOC's CBRNE risks and the HAAD regulations.

This includes a capability to receive, decontaminate and treat contaminated or overexposed patients. This capability consists of a fixed decontamination unit (80 patients/hour, available in June 2016), three mobile decontamination units (20 patients/h each, available in September 2015) and the capability to provide critical medical care to contaminated patients. Detailed plans of these units and the training program were presented to the EPREV reviewers. Training courses include both national and several international courses organised in cooperation with the IAEA.

HAAD is planning demonstration drills to identify weaknesses for correction and an oversight system is in place

ADNOC, in cooperation with ENEC and FANR, is also conducting public health awareness campaigns for the ADNOC Ruwais Hospital catchment areas and surroundings.

ADNOC MSD has formalized an Agreement with Japan and South Korea for the treatment of highly exposed people. This means that there is a current capability to expeditiously deal with overexposed people in the UAE.

A high level of medical capability can result from the completion of the process, development of procedures, procurement of equipment and the implementation. The planned program of training, drills and evaluated exercises is needed to ensure the capability is fully implemented.

3.8. Communicating with the public throughout an emergency

The National Emergency Framework contains a clear public communication strategy. During a nuclear emergency, which is immediately classified as a national emergency (level 1 or 2 in the National Emergency Framework), all activities related to communications to the public are managed from the National Operations Centre (NOC), through the public communications cell. This includes media messaging, monitoring of media and social media, rumour control, press conferences, etc. According to NCEMA, the Public Information Centre (PIC) serves as a satellite and does not lead the public communications activities but supports the national cell. The onsite plan (section 11.1.2) and the offsite plan are not fully consistent with this vision; the onsite plan states that the PIC is where the information is prepared and released to the public.

FANR is likely to have a key role to play in public communication, under the umbrella of the national framework. The existing communication procedure can be expanded to cover actions during emergencies.

The operating organization does not have a direct role in public communication during an emergency but supports the national public communications cell and the PIC.

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.

3.9. Taking early protective actions

The onsite plan contains provisions for the possible extension of protective actions beyond the UPZ. This is not reflected in the offsite plan. Furthermore, there is no survey and sampling strategy in the EPD for the identification of areas where early protective actions may be required. This is addressed in section 3.4. In particular, Recommendation 2 in section 3.4 calls for a consolidated field monitoring strategy, which should include all the required sampling and measurements required to make early protective action decisions.

3.10. Managing radioactive waste in an emergency

The UAE government will appoint a Waste Management Organisation (WMO) for the management of radioactive waste. When the WMO is appointed, work to develop a national waste management plan will take place. This plan will include the management of radioactive waste generated by a nuclear emergency.

In addition, a FANR-EAD MOU on "Radioactive Waste Management and Spent Fuel Management" indicates the following: "Further to FANR's authority in licensing the transport, storage and disposal of radioactive waste and nuclear spent fuel and regulation the disposal facilities for such activities, the Parties will coordinate and exchange information relating to the environmental aspects of radioactive waste and nuclear spent fuel management, transport and disposal. The parties will also work on developing strategies and related plans".

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.

3.11. Mitigating non-radiological consequences

During a national emergency, the NOC planning cell prepares a strategic recommendation to the head of NCEMA that explicitly takes into account diverse potential impacts such as political, economic, health and public reaction in the decision-making process. In addition, the public information cell has specific tasks to monitor public response on media and social media, and to take appropriate actions to ensure an objective understanding of risks.

The onsite plan does not address the management of non-radiological impacts amongst workers and their family other than through a statement that counselling will be covered under an MOU with the ORO.

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.

3.12. Requesting, providing and receiving international assistance

It was recognised, during the IAEA ConvEx-2a (exercise on the Conventions of Early Notification and Assistance), conducted in March 2015, that the existing draft procedures to request and offer assistance could be improved. FANR is in the process of evaluating the lessons learned from the ConvEx-2A exercise and incorporating necessary changes in CP 6 Emergency Response.

3.13. Terminating an emergency

According to the offsite plan, the termination phase starts after the event at the Barakah NPP is under control, as reported by the Emergency Director. The decision to terminate the offsite emergency is made by the Incident Commander in consultation with ENEC, FANR and NCEMA. Prior to terminating the emergency, the Incident Commander performs tasks aimed at ensuring a transition to the recovery phase, including the turnover to a Recovery Manager.

There is a National Disaster Recovery Framework. It is an all-hazard plan.

Criteria for the transition to an existing exposure situation following a nuclear emergency are contained in FANR-REG-19. However, they are not integrated in an overall strategy for transition to existing exposure situation following a nuclear emergency.

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.

3.14. Analysing the emergency and emergency response

The communication systems in place at NCEMA, the Western Police services and ENEC allow the recording of key communications for documenting emergency response actions and follow-up in light of identified emergency response needs. WebEOC will be used as the operational management system at the NOC. This means that all key actions will be on record. The planned program of training, drills and evaluated exercises is needed to ensure the capability is fully implemented.

Furthermore, the National Committee for Nuclear Emergency Preparedness, composed of executive representatives from NCEMA (committee coordinator organization), ENEC, MOI, FANR, Armed Force, Abu Dhabi Police and HAAD, is responsible for the analysis of the emergency response and for following up on recommendations for improvement for all participating organisations.

4. DETAILED FINDINGS ON REQUIREMENTS FOR INFRASTRUCTURE

4.1. Authorities for emergency preparedness and response

Authorities for preparedness and response are clearly defined in the National Emergency Framework and in the regulations. All key organizations are addressed, including (but not limited to) NCEMA, the lead federal agency (MOI), the regulatory body (FANR), Abu Dhabi Police and the operating organization (ENEC). The planning note circulated by NCEMA to all stakeholders also clearly defines the authority and the process for developing the nuclear emergency plan.

4.2. Organization and staffing for emergency preparedness and response

The onsite plan includes a description of the emergency organization staffing. Figure 11-3 of the onsite plan details the on-shift organization and the minimum staffing. This organization is capable of activating the emergency plan and performing initial response to plant emergencies. Section 11.2 of the plan provides details of the augmented ERO.

The composition of all ORO groups is clearly described in the offsite plan and the National Emergency Framework. It is not clear if all OROs will be able to provide the required staff and to sustain long-term operations. For example, in the case of FANR, at least eight external positions have been identified in the National Emergency Framework and in the offsite plan. Staffing these positions promptly and for protracted operations could be a challenge.

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.

4.3. Coordination of emergency preparedness and response

Coordination arrangements for preparedness and response on a national scale are clearly described in the National Emergency Framework, in the offsite plan and in the Nuclear and Radiological Emergency Planning Guide.

ENEC has extensively coordinated with OROs to develop appropriate EPR plans and procedures. Draft procedures exist on notification and briefing communications, which address the necessary information during a response.

The co-location of the EOF and EOC in a common building (on adjacent floors) is expected to significantly contribute to the effectiveness of the coordination arrangements. This provides for direct face-to-face interaction should coordination be compromised during response. This feature is unique and should prove valuable. It must be noted that the facilities are under construction and have not yet been tested in exercises.

The planned program of training, drills and evaluated exercises is needed to ensure the capability is fully implemented.

The National Emergency Framework addresses coordination with those states through the Regional Nuclear and Radiological Emergency Preparedness and Response Plan. This plan is unique in that it provides a strategic and operational framework for a common and harmonized response in the region, which covers, inter alia, notification, joint assessment, operational support and coordination and public communication.

Good practice 1.
Observation: The emergency response centres for the onsite and offsite managements of response operations are co-located.
Basis for good practice: GSR Part 7 para. 6.12 states "Arrangements shall be developed, as appropriate, for the coordination of emergency preparedness and response and of protocols for operational interfaces among operating organizations and authorities at the local, regional and national levels, including those organizations and authorities responsible for the response to conventional emergencies and to nuclear security events".
Good practice: The co-location of the EOF and EOC is considered a good practice that can enhance the effectiveness of the onsite-offsite coordination during an emergency.
Good practice 2.
Observation: There is a regional mechanism for coordination with neighbouring member states, which covers strategic and operational response harmonization across all emergency response functions.
Basis for good practice: GSR Part 7 para. 6.13 states "When several different organizations of the State or of other States are expected to have or to develop tools, procedures or criteria for use in the response to the same emergency, arrangements for coordination shall be put in place to improve consistency of the assessments of the situation". GSR Part 7 para 6.14 states "Arrangements shall be made to coordinate with other States in the event of a transnational emergency any protective actions and other response actions that are recommended to their citizens and to embassies".
Good practice: The coordination with neighbouring states in the region through the Regional Plan is considered a good practice.

4.4. Plans and procedures for emergency response

While several of the plans needed to support the UAE's EPR program are developed and finalized or nearly finalized, many are still in the early stages of development. The EPREV team reviewed several emergency preparedness and response plans and found that they are generally consistent with IAEA safety standards. On the other hand, few supporting procedures are ready, owing to the fact that organizations are waiting for approval of the plans before proceeding to the development of procedures. There is a need to expedite the completion of all plans and procedures so they can be implemented, trained and tested in preparation for the 2016 exercise.

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.

4.5. Logistical support and facilities

Some equipment and facilities required to support nuclear emergency functions are currently fully functional and have the necessary arrangements to be fully effective. This is the case, for example, of the NOC and the Western Region Municipality. Most emergency facilities required are under construction. This is the case for the EOC, EOF, TSC and PIC, for example. Some facilities have yet to be designed, for example the two planned reception centres. The situation is the same at the site, where most facilities and systems for EPR have yet to be implemented. Some facilities, such as the FANR EOC, are basic and need to be reassessed and improved. Although the designs and framework observed by the review team are impressive, it is not possible to make a conclusion on the adequacy of these at present; this will have to be further assessed during the follow up mission.

Many of the planned facilities, systems, equipment and tools have the potential to be excellent. The planned program of training, drills and evaluated exercises is needed to ensure the capability is fully implemented.

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.

4.6. Training, drills and exercises

The onsite plan provides an extensive drill and training program. However, position-specific training plans and drills schedule have yet to be developed. ENEC has an extensive training program for emergency personnel offsite and training programs have ambitious goals of several hundreds of trained personnel prior to fuel loading.

A systematic training, drills and exercise program has been started leading to the May 2016. Further inter-organizational integrated drills and exercises during the fall/winter of 2015 are planned. Furthermore, NCEMA facilitates training as requested by the various stakeholders. NCEMA also delivers training on generic aspects of emergency management, such as risk assessment. Training

programs are the responsibility of the individual entities involved in the plan. NCEMA, in cooperation with FANR, establishes a national exercise program.

The following is planned for 2015-2016:

- Offsite ERO Training - May 2016
- Onsite ERO Training - June 2016
- Weekly Emergency Response Facility Table tops - September 2015
- Weekly Site Drills - October 2015
- Weekly Integrated Drills with Offsite Stakeholders - November 2015
- Fuel Receipt Exercise (prior to fuel receipt) - 23 February 2016
- Contingency Exercise (if required) - 29 March 2016
- Fuel Load Exercise (prior to fuel load) - 3 May 2016.

NCEMA also has a comprehensive exercise evaluation tool based on performance and incorporating clear criteria and a scoring scheme. The training programs for offsite emergency personnel review at HAAD and ADNOC Al Ruwais hospital are also extensive and comprehensive.

Train-the-trainer programs are envisaged for the Western Region. Training will initially be provided by NCEMA and then be incorporated in a local training program delivered by local personnel.

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.

4.7. Quality management

NCEMA has its own quality management process in place addressing equipment, systems, plans and procedures, and including a tracking system for managing changes. This quality management system is supported by an internal and external audit program. NCEMA has the following certifications: Health & Safety OHSAS 18001, Environment ISO 14001, Information Security ISO/IEC 27001, Business Continuity ISO 22301, Quality ISO 9001, Integrated Management Systems PAS 99.

ENEC Emergency Preparedness uses ENEC Quality Assessment Manual, QA MAM. 111-01.

5. IRRS 2011 FINDINGS

In 2011, an Integrated Regulatory Review Service (IRRS) Mission was conducted in UAE. Module 10 of this mission focused on the EPR arrangements and made recommendations and suggestions regarding the general EPR arrangements in the country, primarily dealing with the expected operation of an NPP. In 2015, an IRRS Follow Up mission was held to review progress made on the findings of the 2011 mission. It was decided that this follow up mission would not address module 10 findings, which would be reviewed as a standard part of the present EPREV mission. This section summarizes the review by the EPREV team of the IRRS 2011 findings resolutions.

S25 Suggestion: FANR and NCEMA should as soon as possible finalize and implement the Memorandum of Understanding (MOU). The MOU should consider the issues of public communication and of cooperation between the Emergency Operation Centres of NCEMA and FANR.
FANR assessment: CLOSED
EPREV assessment: CLOSED

The MOU between FANR and NCEMA has been signed 15 July 2012. It clarifies the respective roles of the two entities in terms of cooperation on nuclear emergency response. Please also refer to section 2.1 of this report.

R12 Recommendation: The Government should make sure that the roles, responsibilities and organizational relationships and interfaces between all the response organizations should be clarified, agreed and formalized as soon as possible.
FANR assessment: CLOSED
EPREV assessment: CLOSED

The National Emergency Framework provides a clear standardized basis for the assignment of roles and responsibilities in all types of emergencies. The offsite plan builds on this framework and further defines the roles of the major entities involved in nuclear EPR for Barakah NPP. This framework is equally applicable to radiological emergencies, provided it is so documented.

S26 Suggestion: The Government of the UAE should consider inviting an Emergency Preparedness Review (EPREV) mission upon the completion of the national and local off-site radiation emergency plans.
FANR assessment: CLOSED
EPREV assessment: CLOSED

R13 Recommendation: Organisations, involved in emergency planning, should finalize the assessment of hazards at the national level properly taking into account radiological hazards in accordance with GS-R-2.
FANR assessment: CLOSED
EPREV assessment: CLOSED

The hazard assessment is completed by ENEC and is included in the Preliminary Safety Analysis Report (PSAR). It includes very low probability events. However, as discussed in section 2.3 of this report, a summary of this hazard assessment, demonstrating a good understanding of the need for the offsite protection strategy, should be documented in the offsite plan.

S27 Suggestion: FANR, with other relevant stakeholders and through the coordination of the Radiation Protection Committee, should continue to work towards the establishment of national intervention levels for application in emergency situation, in compliance with the international standards.
FANR assessment: CLOSED
EPREV assessment: CLOSED

FANR-RG-024, about to be promulgated, contains criteria that are consistent with IAEA safety standards.

S28 Suggestion: The Government of the UAE should consider establishing an exclusion zone around the NPP site to prevent the development, which would unnecessarily increase the population density and complicate emergency planning.
FANR assessment: CLOSED
EPREV assessment: CLOSED

According to Statistical Center Abu Dhabi (SCAD) data, the only population within the UPZ, but outside the PAZ, is the (non-permanent) residents of the beach villas located on either side of the Barakah NPP site between Highway E11 and the coastline. In addition, there will be workers for the Etihad Rail project who would reside at camps at various locations inside the UPZ until the project is completed. There are no other public population centres until the greater Al Ruwais and Al Sila'a areas are reached, which are outside the UPZ.

R14 Recommendation: The Government of the UAE should establish a minimum medical capability at the national level to face medical emergencies, at the hospital level and by medical first responders. Consideration should be given to educating and training medical professionals to recognize the symptoms of radiation injuries.
FANR assessment: OPEN
EPREV assessment: CLOSED

The ADNOC hospital in Al Ruwais has an interim capability to treat contaminated patients and is implementing a permanent facility for the processing and treatment of contaminated and overexposed patients. UAE has formalised agreements with Japan and Korea for the advanced medical care of severely exposed patients.

S29 Suggestion: FANR should consider developing a communication plan taking into account the psychological consequences of radiation emergencies.
FANR assessment: CLOSED
EPREV assessment: CLOSED AND REPLACED BY EPREV RECOMMENDATION

The national strategy for public communication with regard to EPR is not under FANR jurisdiction but under MOI and NCEMA. The national public information strategy is clearly defined, as discussed in section 3.8 of this report. However, as discussed in this same section, 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. Psychological aspects are also addressed in section 3.11.

R15 Recommendation: The Government of the UAE should ensure that the plans and procedures for coordinating national response, based on a comprehensive assessment of hazards and coordinated with other relevant and existing plans, are established and completed by the indicated deadlines. Each response organization should prepare its own plan for coordinating and performing their assigned functions.
FANR assessment: CLOSED
EPREV assessment: CLOSED

MOI is the lead agency for nuclear emergencies and is in the process of finalizing the offsite plan, in cooperation with all involved entities and with NCEMA. The planning process for the development of this plan is well documented. The requirement for all entities to develop their own plans is in the National Emergency Framework.

6. SUMMARY OF FINDINGS

The EPREV mission identified six recommendations, five suggestions and two good practices. They are as follows:

Recommendations

1. 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 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.
2. 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.
3. 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.
4. 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.
5. All stakeholders should expedite the completion of relevant emergency plans and procedures, test them and fully implement them prior to the 2016 exercise.
6. 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.

Suggestions

1. 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.
2. 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.
3. MOI and FANR should consider developing a consolidated termination and transition strategy consistent with IAEA safety standards.
4. 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.
5. 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.

Good practices

1. The co-location of the EOF and EOC is considered a good practice that can enhance the effectiveness of the onsite-offsite coordination during an emergency.
2. The coordination with neighbouring states in the region through the Regional Plan is considered a good practice.

IRRS 2011

All IRRS findings were closed. One finding has been converted to an EPREV suggestion for NCEMA to 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.

APPENDIX I: MISSION TEAM COMPOSITION

Name and LAST NAME	Position	Organization
Raoul AWAD	EPREV Team Leader	Director General, Security and Safeguards, Canadian Nuclear Safety Commission, Canada
Jeff Lafortune	EPREV Team Coordinator	Emergency Preparedness Coordinator, IAEA
Pascal Dumont	EPREV Team Member/Observer	Emergency Preparedness Officer, IAEA
Frédéric Mariotte	EPREV Team Member	Deputy Director, Risk Management, CEA, France
Raul dos Santos	EPREV Team Member	Head, Nuclear and Radiological Emergency Preparedness and Response Division, Brazil
Itimad Soufi	EPREV Team Member	Director, Safety and Security Department, Morocco
Randy Sullivan	EPREV Team Member	Senior Specialist, Emergency Preparedness, US NRC, United States

APPENDIX II: MISSION SCHEDULE

IAEA EPREV MISSION TO UAE
21-31 March 2015
PROGRAMME

Day	Team 1	Team 2	Attendees
Sat 21 Mar (pm)	Internal team meeting to finalize approach and coordination 1600: Meeting with counterpart liaison officer to finalize arrangements		EPREV Mission Team
Sun 22 Mar (9:00 am) **Lunch 12:00**	Opening Meeting, Intercontinental Hotel, Abu Dhabi Mariam Al Mahmoud (FANR) Introductions By WT/JL/DG (FANR) Presentation by UAE of overall national framework for EPR (NCEMA) (15 min) Presentation by UAE of self-assessment (ENEC) (30 min) Presentation by IAEA of EPREV process (IAEA) Presentation by ENEC on Barakah Nuclear Power Plant Progress (30 min)		FANR ENEC NCEMA MOI/ABU DHABI Police Western Region Police Western Region Municipality EAD HAAD MOFA ABU DHABI Food Control Agency ADNOC/MSD (Al Ruwais Hospital)
Sun 22 Mar (1:30-4:00) pm)	FANR, Yas Conference Room Maha Aziz (EPREV Mission Liaison Officer) Discussion on IRRS Mission Module 10 Recommendations and Suggestions		Daniele Giuffrida Michael Nichols Aayda Al Shehhi Andy Woodruffe Walid Al Mowafi Ahmed Al Shemaili Hussain Al Katheeri Mark Kearney Mike Lemay Fahed Al Bloushi
Mon 23 Mar	NCEMA (9:00 am-11:00 am) Marwan Al Kaabi (NCEMA) Michael Nichols (FANR) Walid Al Mowafi (FANR) Ahmed Al Shemaili (FANR) MOI/ABU DHABI Police/ Western Region Police (and ambulance service – also includes discussions on fire fighting – emergency services facility) (1:30 pm-3:30 pm) Eid Al Shamsi Aayda Al Shehhi (FANR) Walid Al Mowafi (FANR)	Health Authority ABU DHABI (HAAD) (9:00am-11:00am) Mr. Mansour Al Mansouri Dr. Yasser Sherif Aayda Al Shehhi (FANR) Hussain Al Katheeri (FANR) ENEC Off-site plan (1:30 pm-3:30 pm) Khalid al Kaabi Maha Aziz (FANR) Hussain Al Katheeri (FANR)	

Day	Team 1	Team 2	Attendees
Tue 24 Mar	NOC 9:00 am to 11:00 am Aayda Al Shehhi (FANR) Walid Al Mowafi (FANR) Ahmed Al Shemaili (FANR) Environmental agency (EAD) (1:30pm -3:30 pm) Michael Nichols (FANR) Ahmed Al Shemaili (FANR) Jasim Alshehhi Mohamed Mahrouka Mariam Al Memari	Travel to Barakah Site Frederic Mariotte Randy Sullivan Itimad Soufi Hussain Al Katheeri (FANR) Abulla Al Junaibi (ENEC) ENEC site offices (Visit the Simulator) Al Ruwais emergency complex (EOF/EOC/PIC and alternate TSC) (9:00 am-11:00 am) ADNOC/MSD Al Ruwais Hospital (2:00-4:00 pm) Dr. Ghuwaya Al Neyadi Mr. Ayedh Al Masaabi Daniele Giuffrida Hussain Al Katheeri (FANR)	Randy Sullivan will be back to Abu Dhabi after Lunch
Wed 25 Mar	ABU DHABI Food Control (9:00am am-11:00 am) Michael Nichols (FANR) Walid Al Mowafi (FANR) Ahmed Al Shemaili (FANR) Dr. Salama Al Muhairi Mr. Omar AlShammari MOFA (1:30pm-3:00pm) Aayda Al Shehhi (FANR) Walid Al Mowafi (FANR) Ahmed Al Shemaili (FANR) Dr. Marwan AlKaabi Fatima Yousef Al Suwaidi Basma Alhebsi	Western Region Municipality (9:00am am-11:00 am) Saeed Fadhel Alhashmi Mohamed Rashed Al Mazrouei Mohamed Hadif Al Mansouri Dr. Jelloul Beheloul Hussain Al Katheeri (FANR) Travel back to Abu Dhabi Randy Sullivan at ENEC HQs Onsite Plan all day (9:00 am-4:00 pm)	
Thu 26 Mar	Follow up on outstanding issues Briefing of EPREV Mission RA (Team Leader) and JL (Team coordinator) with WT (FANR DG) and JL (FANR DDG-O) NCEMA (1:00pm-2:00 pm) Walid Al Mowafi (FANR)		FANR ENEC NCEMA Other Government entities may be requested to attend
Fri 27 Mar	Report writing (Yas Conference Room)		
Sat 28 Mar	Report writing Submission of draft report for national counterpart review		
Sun 29 Mar	1:00 pm Meeting with national counterparts to discuss draft report and press release FANR HQs (1:30-5:00 pm) All government entities are requested to attend to disposition the		FANR ENEC NCEMA Other Government

Day	Team 1	Team 2	Attendees
	suggestions and recommendations as indicated in the EPREV Mission draft report.		entities may be requested to attend Greg Webb
Mon 30 Mar	Draft report finalization Finalize press release Formal dinner		FANR ENEC NCEMA Greg Webb
Tue 31 Mar	Closing Meeting, Intercontinental Hotel, Abu Dhabi FANR DDG-O introductory speech 9:30 am 10:00 Plenary presentation (PowerPoint) of draft report by IAEA FANR DDG-O closing speech IAEA closing speech Team departure		FANR ENEC NCEMA MOI/ABU DHABI Police Western Region Police Western Region Municipality EAD HAAD MOFA ABU DHABI Food Control Agency ADNOC/MSD (Al Ruwais Hospital)

REFERENCES

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Preparedness and Response for a Nuclear or Radiological Emergency, GSR Part 7, IAEA, Vienna (Rev. 10, 6 Nov 2015)

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, GSG-2, IAEA, Vienna (2011).

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Arrangements for Preparedness for a Nuclear or Radiological Emergency, GS-G-2.1, IAEA, Vienna (2007).

ACRONYMS

ADFCA	Abu Dhabi Food Control Authority
ADMG	Extensive Damage Mitigation Guides
ADNOC	Abu Dhabi National Oil Company
AOP	Abnormal Operating Procedures
CBRNE	Chemical, Biological, Radiological, Nuclear and Explosive
EAD	Environmental Agency Abu Dhabi
EAL	Emergency Action Level
ENEC	Emirates Nuclear Energy Company
EOC	Emergency Operations Centre
EOC	Emergency Operations Centre
EOF	Emergency Operations Facility
EPD	Extended Planning Zone
EPR	Emergency Preparedness and Response
EPREV	Emergency Preparedness Review
FANR	Federal Authority for Nuclear Regulation
GCC	Gulf Cooperation Council
HAAD	Health Authority of Abu Dhabi
ICPD	Ingestion and Commodities Planning Zone
IRRS	Integrated Regulatory Review Service
MOFA	Ministry of Foreign Affairs
MOI	Ministry of Interior
MOU	Memorandum of Understanding
MSD	Medical Services Division
NCEMA	National Crisis and Emergency Management Agency
NOC	National Operations Centre
NPP	Nuclear Power Plant
ORO	Offsite Response Organization
PAZ	Precautionary Action Zone
PRA	Probabilistic Risk Assessment
SAMG	Severe Accident Management Guidelines
TSC	Technical Support Centre
UPZ	Urgent Protective Action Zone
US NRC	United States Nuclear Regulatory Commission
WMO	Waste Management Organisation