



UAE NATIONAL REPORT
To The Second CNS Extraordinary Meeting
(August 2012)

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1. INTRODUCTION

1.1 Purpose and Scope of This Report

The UAE respectfully submits the following report to address the six (6) topical areas identified by the IAEA Secretariat for the 2nd CNS Extraordinary Meeting. The UAE report concentrates on actions, responses and new developments that have been initiated or influenced by the accident at the Fukushima Daiichi NPPs.

1.2 UAE Policy On Nuclear Safety

In 2008 the United Arab Emirates (UAE) adopted a Policy on the Evaluation and Potential Development of Peaceful Nuclear Energy. The policy was based on a study of viable options to meet future energy needs, and it focused on the potential benefits of nuclear power for the UAE people, the environment, and the economy. The policy included commitments to the highest standards of safety and security, complete operational transparency, and nonproliferation. It also outlined a process for working with the IAEA, foreign governments and nuclear companies, and expert organizations to develop a nuclear energy program. Long Term Sustainability is also pointed out. The UAE's program is on schedule to meet the growing energy needs of the country. But more important, it has become a model program for ensuring that nuclear safety, security, and nonproliferation are its highest priorities.

The Nuclear Policy statement is available for review

at: http://fanr.gov.ae/ar/media/get/20090430_uae-policy-white-paper.pdf

1.3 Status Of UAE's Nuclear Program

The UAE has moved forward on the commitments outlined in its Nuclear Policy through the adoption of the relevant international instruments for nuclear safety, security and non-proliferation and through the formal establishment of the Federal Authority for Nuclear Regulation (FANR) with Federal Law by Decree No. (6) of 2009 and formal establishment of the Emirates Nuclear Energy Corporation (ENEC) with Law No. (21) of 2009.

The UAE has chosen the advanced third-generation light water reactor (LWR), also known as APR1400 (Advanced Power Reactor), to ensure safety at the highest levels due to significant safety improvements including enhanced user-friendly instrumentation and controls, reduced fuel use and waste, design specifications ensuring lower vulnerability to operational disruptions, and safety systems permitting a reduction in active controls or interventions to avoid accidents in case of a malfunction.

A consortium led by KEPCO was awarded a contract on December 27, 2009, by ENEC to supply the UAE with four nuclear power reactors. The scope of the contract covers engineering, procurement, construction, fuel, and operations and maintenance support.

In December 2010 ENEC lodged an application with FANR for a licence to construct the first two units of a nuclear installation at the proposed site of Barakah in the Western Region of Abu Dhabi. The application includes a comprehensive Preliminary Safety Analysis Report based on the Shin-Kori 3&4 facility, for which the Korean authorities issued a construction permit in 2008 and which serves as the reference plant for the UAE. FANR is currently reviewing ENEC's application.

The UAE has made multiple bilateral government-to-government cooperative arrangements, and engaged with the IAEA in peer review and assessment activities. The bilateral agreements enabled the UAE to obtain scientific and technical information and assistance from other countries, and to acquire materials and equipment. On the industry level, ENEC has asked the World Association of Nuclear Operators and its members to provide assessments and to share

experiences through peer reviews and feedback reports. ENEC joined the World Association of Nuclear Operators in October 2010.

The UAE has finalized the relevant international agreements in the areas of nuclear nonproliferation, nuclear safety, and security. The UAE is in the process of working on the civil nuclear liability and strategy for the management of radioactive waste and the management of spent fuel. The UAE is now also developing the required physical and legal infrastructure, including implementing regulations issued by FANR, to ensure that its obligations under these international agreements are met by the time they are brought into force. Development of the infrastructure requires the active participation of multiple stakeholders in the country. To expedite the process and ensure that it is complete and efficient, multiple joint committees and interagency working groups have been established to coordinate infrastructure development efforts. The progress to date has proven that, with strong commitment and vision, safe and secure nuclear energy can be developed and sustained.

The UAE has established a high-level group of international experts; the '*International Advisory Board*' (IAB) to advise the government on progress in achieving and maintaining the policy objectives.

The UAE requires all participants in its nuclear energy programme to accept personal responsibility for safety, although the operator, ENEC, retains the ultimate responsibility. Early and responsive action to reevaluate nuclear safety requirements, in light of the accident in Fukushima in Japan, demonstrates the UAE's willingness to make continual safety checks and adjustments as its nuclear program evolves.

More information on the UAE nuclear programme is available in the UAE National Report to the 5th Review Meeting on the Convention on Nuclear Safety at:

<http://www.fanr.gov.ae/Ar/AboutFANR/OurWork/Documents/CNS-National-Report-English.pdf>

2. OVERVIEW OF ACTIONS TAKEN BY THE UAE

2.1 Actions Taken By the Regulatory Body (FANR) and the Operating Organization (ENEC)

2.1.1 Immediate Actions

FANR's role in the immediate aftermath of the Fukushima accident consisted of monitoring the situation, advising other government agencies, and providing a brief statement to the public via its web site. The United Arab Emirates are located a considerable distance across the globe from Japan and so were at no time subject to levels of radioactive emissions from Fukushima that threatened public health or safety.

The UAE currently has no operating Nuclear Power Plants. No immediate actions in this realm were necessary to ensure public safety. The UAE has thus had the opportunity to observe and learn from the response of, and interact with different foreign regulatory authorities and international organisations as a fundamental part of its operating experience feedback program.

2.1.2 Plans to Further Address the Regulatory Implications of the Fukushima Accident

Both FANR and ENEC established task forces to coordinate actions to be taken to further address the implications of the Fukushima accident.

To directly address the safety of the proposed UAE nuclear power plant, FANR issued a letter to ENEC on 4 July 2011, in which FANR requested ENEC to provide a supplement to its application for a construction licence and Preliminary Safety Analysis Report, describing its assessment of how experience at Fukushima and the lessons learned so far have been applied to address any potential safety issues at the proposed Braka nuclear facility. FANR's letter provided a specification for the assessment report based on the European Nuclear Safety Regulators Group (ENSREG) 'stress tests'. The letter requested ENEC to provide its report by 31 December 2011 and stated that; "FANR intends to use this report as a supplement to the ENEC construction licence application".

ENEC has submitted its assessment report as scheduled. FANR organized a group, composed in part of specialists reviewing the PSAR, to assist in the evaluation of ENEC's assessment. FANR is in the process of reviewing ENEC's report as part of its safety evaluation for the construction licence application (CLA). Periodic technical coordination meetings between FANR and ENEC are ongoing.

3. SPECIFIC ACTIONS TAKEN BY THE UAE

3.1 External Events

3.1.1 Overview

In the UAE, the proposed Barakah site is located adjacent to the shore of the Arabian Gulf. Therefore, the site is required to be protected from flooding caused by probable maximum precipitation, storm surges, and tsunamis among other hazards. The supplementary safety assessment conducted by ENEC covered the robustness of the proposed nuclear facilities to cope with extreme natural events on the same site. The safety assessment included the review of earthquake, flooding, sand storm, fire and explosion, and oil spills. Aircraft impact and the potential loss of the physical protection systems due to malevolent act of terrorisms were not part of this supplemental Fukushima-related review, but are being addressed in separate reports.

In addition, the UAE invited an IAEA Site Safety Review Mission in Oct-Nov, 2011, which reviewed FANR's draft Safety Evaluation report and concluded that the site studies carried out for the Barakah Site follow international criteria and practices and that a comprehensive review

process has been followed by FANR. The site has several positive features and the coastal flooding seems to be the only critical issue for the Barakah Site.

3.1.2 Activities Performed By The Operator

- A. ENEC submitted a Safety Assessment Report to FANR on December 31, 2011 as a supplement to the previously submitted Preliminary Safety Analysis Report (PSAR) for the Construction License Application for Braka Units 1&2 that describes how experience at Fukushima and the lessons learned so far have been applied to address any potential safety issues at the proposed Braka nuclear facility. This assessment is currently being reviewed by FANR.
- B. ENEC will submit a revision to its safety assessment in May, 2012 describing the schedules and milestones to complete the operator's planned activities. ENEC will complete design enhancements in accordance with scheduled activities during the construction, commissioning and operation phases of the nuclear facilities. ENEC is working to resolve all aspects, with a sense of priority, for each activity being performed. ENEC will also continue to review all applicable lessons learned, for any further actions to be taken, as new information becomes available.
- C. The results of the assessment show a high level of plant robustness for the Braka NPP design with respect to external hazards. There were no design deficiencies identified regarding provisions currently provided to accommodate potential external hazards. However, design features for further enhancement of the robustness of the nuclear facilities, based on the lessons learned from the Fukushima accident, will be implemented at Braka NPP. These design features are outlined in Section 3.2.2 of this report and are being reviewed by FANR as part of the licensing process for the construction and operation of the UAE nuclear facilities.

3.1.3 Activities Performed By The Regulator

- A. FANR organized a review group, composed in part of specialists reviewing the PSAR, to evaluate ENEC's assessment. FANR is in the process of reviewing ENEC's report as part of its safety evaluation for the construction licence application (CLA). Periodic technical coordination meetings between FANR and ENEC are ongoing.
- B. FANR is on schedule to review the supplemental information provided by the licensee on this topic as part of its review of the PSAR for the CLA. Issuance of the Safety Evaluation Report for the CLA is scheduled for mid-2012.
- C. Conclusions of the safety evaluation for this topic are pending based on the complete review of the PSAR for the CLA, scheduled for completion in mid-2012. Conclusions regarding the outcome of the operator's activities are also pending based on inspection and evaluation during all phases of construction, commissioning and operation of the nuclear facilities.

3.2 Design Issues

3.2.1 Overview

The UAE has chosen an advanced third-generation light water reactor (LWR), known as APR1400 (Advanced Power Reactor), to ensure a high level of safety. The safety assessment performed by ENEC included a review of various areas of the design which include the response to loss of safety functions including Station Blackout (SBO) and Loss of Ultimate Heat Sink.

3.2.2 Activities Performed By The Operator

- A. ENEC submitted a Safety Assessment Report to FANR on December 31, 2011 as a supplement to the previously submitted Preliminary Safety Analysis Report (PSAR) for the Construction License Application for Braka Units 1&2 that describes how experience at Fukushima and the lessons learned so far have been applied to address any potential safety issues at the proposed

Braka nuclear facility. The assessment included a review of the design of the Braka nuclear facilities to mitigate Station Blackout (SBO) and Loss of Ultimate Heat Sink events.

- B.** ENEC will submit a revision to this assessment in May, 2012 describing the schedules and milestones to complete the operator's planned activities. ENEC will complete design enhancements in accordance with scheduled activities during the construction, commissioning and operation phases of the nuclear facilities. ENEC is working to resolve all aspects, with a sense of priority, for each activity being performed. ENEC will also continue to review all applicable lessons learned, for any further actions to be taken, as new information becomes available.
- C.** The results of the review show a high level of plant robustness for the Braka NPP design with respect to a loss of electrical power or loss of ultimate heat sink. However, design features for further enhancement of the robustness of the nuclear facilities, based on the lessons learned from the Fukushima accident and proposals made for the reference plant in Korea taking account of site-specific factors, will be implemented at Braka NPP. These design features are described below.

At the proposed Braka facility, two Emergency Diesel Generators (EDGs) are provided for each unit, and each EDG has sufficient capacity for loads necessary to safely shutdown each unit and to mitigate the effects of an accident, assuming a Loss of Offsite Power (LOOP). Should offsite power be lost due to a seismic event, these seismically-designed EDG's will supply power to safety related Structures, Systems & Components (SSCs). A single Alternate AC (AAC) diesel generator provides further redundant power supply for all four units. However, to improve the robustness of the nuclear facilities, based on lessons learned from the Fukushima accident, design changes have been proposed. The proposed design changes include EDG and AAC cross-ties, battery life extension and connections for mobile DGs. These changes will further improve the robustness of Braka NPP in terms of mitigation of an SBO event.

The safety assessment conducted by ENEC identified supplementary design features to be added as follows:

- Improving the Seismic Capacity of Main Control Room Display
- Installation of water-proof doors/gates for Auxiliary Building, Alternate AC (AAC), Diesel Generator (DG) Building, Emergency Service Water (ESW) intake Structure and Component Cooling Water (CCW) Heat Exchanger (HX) Building
- Preparing countermeasures for damage of the outdoor tanks
- Improving Fire Protection Facilities and Response Capability of Plant Firefighting Team
- Unit cross tie design of Emergency Diesel Generators (EDG's) and Alternate AC (AAC)Diesel Generator for Emergency Power Supply
- Installation of Connection Provision for Mobile DGs
- Extension of Fuel Capacity of AAC DG Fuel Oil Storage Tank
- Seismic design of AAC DG building
- Battery Duty Extension
- External Water injection for Steam Generators (also to the Reactor Primary System is under consideration)
- External Water Injection for Spent Fuel Pool
- Additional level sensors for Spent Fuel Pool

The results of the review showed the design includes several features to prevent the development of severe accident sequences and to mitigate the consequences of the unlikely occurrence of a severe accident. The severe accident design mitigation features include:

- Large, dry pre-stressed concrete containment
- Cavity Flooding System
- Hydrogen Mitigation System
- Safety Depressurisation and Vent System
- Large reactor cavity designed for retention and cooling of core debris Emergency containment backup spray system

All design changes for safety enhancements will be implemented and described in detail in supplementary submissions following the issuance of the Construction Licence and/or in the the FSAR as part of the Operating License Application (OLA). As part of the Construction License Application (CLA), ENEC also submitted a preliminary Level 1 & 2 Probabilistic Risk Assessment (PRA) for internal events at power. The final Braka NPP PRA will include the Level 1 and Level 2 PRA for both internal and external events of accident sequence including both at-power, low power and shutdown modes of operation which will be submitted at the Final Safety Analysis Report (FSAR) stage to confirm that the design meets the probabilistic safety criteria.

3.2.2 Activities Performed By The Regulator

- A. FANR organized a reviewgroup, composed in part of specialists reviewing the PSAR, to assist in the evaluation of ENEC's assessment. FANR is in the process of reviewing ENEC's report as part of its safety evaluation for the construction licence application (CLA). Periodic technical coordination meetings between FANR and ENEC are ongoing.
- B. FANR is on schedule to review the supplemental information provided by the licensee on this topic as part of its review of the PSAR for the CLA. Issuance of the Safety Evaluation Report for the CLA is scheduled for mid-2012.
- C. Conclusions of the safety evaluation for this topic are pending based on a complete review of the PSAR for the CLA, scheduled for completion in mid-2012. Conclusions regarding the outcome of the operator's activities are also pending based on inspection and evaluation during all phases of construction, commissioning and operation of the nuclear facilities.

3.3 Severe Accident Management And Recovery (On-Site)

3.3.1 Overview

As previously discussed, the UAE nuclear power program is currently in too early a stage to undertake a thorough review of the effective implementation of severe accident management and on-site recovery actions from the lessons learned from the combined effects of the March, 2011 earthquake and tsunami in Japan.

Therefore, there currently are no plant specific operating procedures such as emergency operating procedures (EOPs), abnormal operating procedures (AOPs), periodic test and maintenance procedures and plant specific operating guidelines such as severe accident management guidelines (SAMGs) and operational emergency plans.

In the UAE, both FANR and ENEC are fully aware that this is a complex undertaking and needs to be carefully planned. The accident at Fukushima highlight the importance of having plant operators who are well prepared and well supported by technically sound and practical procedures, guidelines and strategies. In addition, a pre-planned approach to command and control and decision making is of vital importance to the success of a severe accident management program.

ENEC will emphasize, during the development of such procedures and guidelines, the importance of strengthening and integrating onsite emergency response capabilities through the development of emergency plans, emergency operating procedures and severe accident management guidelines. These plans, procedures and guidelines will be developed by the plant operating stage and will address newly adopted design features resulting from assessment of the lessons learned at Fukushima.

Both FANR and ENEC are currently reviewing operating experience for severe accident management and on site recovery actions for the Braka NPP.

3.3.2 Activities Performed By The Operator

A. ENEC submitted a Safety Assessment Report to FANR on December 31, 2011 as a supplement to the previously submitted Preliminary Safety Analysis Report (PSAR) for the Construction License Application for Braka Units 1&2 that describes how experience at Fukushima and the lessons learned so far have been applied to address any potential safety issues at the proposed Braka nuclear facility. This assessment is currently being reviewed by FANR. A revision to this assessment will be submitted in May, 2012 describing the schedules and milestones to complete the operator's planned activities. The assessment included a review of preliminary severe accident management arrangements.

B. ENEC will develop Emergency Operating Procedures (EOP) and Severe Accident Management Guidelines (SAMG) in accordance with scheduled activities during the construction, commissioning and operation phases of the nuclear facilities. ENEC will also continue to review all applicable lessons learned, for any further actions to be taken, as new information becomes available.

ENEC has conducted a review of EOP and SAMG considerations related to multi-unit events. This review concluded that procedures for these areas will include:

- Determining and implementing the required staff to fill necessary positions for responding to a multi-unit event
- Adding guidance to the emergency plan that documents how to perform a multi-unit dose assessment using site-specific dose assessment software and approach
- Conducting periodic training and exercises for multi-unit and prolonged SBO scenarios
- Providing means to power communications equipment needed to communicate onsite (e.g. radios for response teams and between facilities) and offsite (e.g. cellular telephones, satellite telephones) during a prolonged SBO.

C. The outcome is pending completion of the above activities.

3.3.3 Activities Performed By The Regulator

A. FANR organized a review group, composed in part of specialists reviewing the PSAR, to evaluate ENEC's assessment. FANR is in the process of reviewing ENEC's report as part of its safety evaluation for the construction licence application (CLA). Periodic technical coordination meetings between FANR and ENEC are ongoing

B. FANR is on schedule to review the supplemental information provided by the licensee on this topic as part of its review of the PSAR for the CLA. Issuance of the Safety Evaluation Report for the CLA is scheduled for mid-2012.

C. Conclusions of the safety evaluation for this topic are pending based on a complete review of the PSAR for the CLA, scheduled for completion in mid-2012. Conclusions regarding the outcome of the operator's activities are also pending based on inspection and evaluation during all phases of construction, commissioning and operation of the nuclear facilities.

3.4 National Organizations (Regulator, TSO, Operator, Government)

3.4.1 Overview

From the very beginning of the UAE nuclear power program, emphasis was placed on ensuring that the primary responsibility for nuclear safety rests with the operating organisation (ENEC) for the nuclear facilities. The UAE is also aware of the vital roles and responsibilities that the government, the regulator, technical support organizations, vendors, service providers and other stakeholders play for achieving and maintaining a high level of nuclear safety. The UAE government, the regulatory authority (FANR) and ENEC have established well-defined roles and responsibilities and transparent and open communications.

The UAE is in the process of developing its crisis and emergency management framework as further discussed in Section 3.5 of this report.

3.4.2 Activities Performed By The Operator

- A. To enhance the transparency and effectiveness of communication among operators, regulators and international organisations ENEC is responsible for:
- Working closely with the Abu Dhabi and Federal governments to ensure that the civil nuclear power program is aligned with the industrial infrastructure plans of the UAE.
 - Developing public communications and education programs to ensure that UAE residents understand the civil nuclear energy program and are provided information on the program's progress.
 - Operating the civil nuclear power plants safely, securely and in accordance with the UAE's safeguard commitments.

ENEC has developed an integrated management system (referred to as the ENEC Management System) based on FANR Regulations, IAEA Safety Requirements GS-R-3, *Management System for Facilities* and best practices in nuclear utilities. The system consists of policies, program requirements, process descriptions and implementing tools.

ENEC has also developed a very detailed system for identifying business-related stakeholders and logging contacts and further actions. ENEC has initiated an ongoing program of ENEC Forum public meetings in both the city of Abu Dhabi and the Western Region, where the plants will be located. ENEC focuses on engagement of key stakeholders on a wide range of issues relating to the development, construction, operations, and emergency planning for the UAE civil nuclear energy program.

ENEC is developing a Safety Culture, which means that the priority is to ensure the safety of the UAE community, employees and the environment. Safety always comes first. Employees are encouraged to raise any safety concerns or identify areas for improvement. Any ENEC employee is empowered to stop work if they believe a situation is unsafe. This rigor promotes a culture of continual improvement and promises excellence in creating and sustaining a safety conscious work environment. ENEC employees participate in regular safety training programs and are expected to meet the highest safety standards and use best practices in their everyday work.

ENEC has selected a team led by the Korea Electric Power Corporation (KEPCO) to design, build and assist in operation and maintenance of four 1,400 MWe civil nuclear power units. KEPCO will supply the full scope of works and services for the UAE Civil Nuclear Power Project including engineering, procurement, construction, nuclear fuel and operations and maintenance support. The contract also provides for extensive training, human resource development, and education programs as the UAE builds the capacity to eventually staff the nuclear energy program with national talent, and develops the industrial infrastructure and commercial businesses to serve the nuclear energy business.

The protocol for interactions between operator and contractors is addressed in the prime contract with KEPCO and the operating organization's management system. The process and responsibilities for review and understanding of information supplied by the vendor are addressed by the management system for the operating organization.

In response to Fukushima, ENEC developed a task force led by the ENEC Deputy Chief Nuclear Officer comprised of subject matter experts from areas such as Probabilistic Risk Assessment (PRA), Safety Analysis, Mechanical, Electrical, I&C, Civil and Human Factors Engineering. The role of the task force is to obtain, evaluate and recommend implementation of applicable lessons learnt to enhance the safety features or organizational requirements. The sources of information used by the task force will include:

- Reports and/or recommendations provided by formal operating experience feedback organizations such as INPO, WANO and IAEA as and when they are issued. These will be coordinated via the ENEC operating experience program;
- Reports and/or recommendations from the KEPCO/KHNP reviews of their own nuclear power plant siting analyses, design features and organizational requirements performed as a result of this event;
- Any additional common mode failure evaluations including assessments of external hazards such as earthquakes, floods, tsunami and extreme metrological conditions (such as sandstorms).

Lessons learned will continue to be identified for an extended period and will be evaluated via the ENEC operating experience program,

- B.** ENEC's planned activities in this area will be ongoing during all phases of construction, commissioning and operation of the nuclear facilities. Emphasis will be placed on developing clear lines of authority, roles and responsibilities and good communications for all stakeholders prior to plant operation. The lessons learned from the accident at Fukushima will be factored into the activities to strengthen the organisations involved in maintaining and enhancing nuclear safety in the UAE.
- C.** Preliminary and final results of ENEC's planned activities for this topical area are ongoing pending the start of plant operations.

3.4.3 Activities Performed By The Regulator

- A.** FANR has exclusive responsibility in the UAE for licensing regulated activities related to nuclear and radiation safety and security. FANR is also responsible to cooperate with other competent authorities which have related responsibilities.

FANR uses various methods of engagement with the stakeholders & the public including:

- Direct Engagement including one to one meeting or round table discussion.
- Stakeholder Engagement Groups and Joint Steering Committees to support the production of unified reports and materials requested as an obligation of international conventions that the state has ratified with the lead of FANR.
- National Channel for Consultation on Nuclear Regulation
- Conferences and Technical Workshops
- Memoranda of Understanding (MOUs)
- Public Information

FANR engages with approximately 50 government entities representing the legal, safety, energy, medical, security and environment sectors in addition to key government departments

such as the Ministry of Presidential Affairs, the Ministry of State for the Federal National Assembly, and the Secretariat of the Cabinet.

FANR has concluded Memoranda of Understanding with the following governmental entities to support mutual cooperation:

- FANR & Critical National Infrastructure Authority (CNIA): on the physical protection of nuclear facilities
- FANR & National Transportation Authority (NTA) : on the transportation of nuclear regulated material
- FANR & Khalifa University: on the establishment of nuclear safety research and educating the UAE's future nuclear workforce

FANR also maintains an active public information programme including:

- Annual Reports highlighted FANR yearly activities and accomplishments
- Press releases, press conferences and interviews focused FANR's response to Fukushima nuclear accident, emergency preparedness and response
- FANR website with various features including e-services, e-participation introducing public discussion forum, direct access to the Director General, comments platform, events calendar and the soft launch for the social media tools starting with the YouTube channel.
- FANR Corporate video highlighting its role and function
- Public information sessions throughout the UAE, starting with Abu Dhabi's Western Region- planned in May 2012

In response to the Fukushima event, FANR established an internal task force to coordinate its actions. The current FANR Fukushima task force work plan contains the elements shown below:

- i. Review ENEC's Safety Assessment Report within the framework of the established licensing review process.
- ii. Collect information supporting FANR in learning applicable lessons for the UAE and Braka NPP.
- iii. Monitoring of actions of other countries/regulators to evaluate applicability for the UAE, e.g. KINS, WENRA, USA.
- iv. Review of WANO/INPO SOER and other "lessons learned" reports.
 - v. Review of the adequacy of existing FANR regulatory framework.
- vi. Support Outreach Efforts by FANR to National Stakeholders along with Website Updates.
- vii. Support FANR Efforts to Collaborate with Other UAE Government Organizations.
- viii. Support FANR/UAE Effort towards the International Community.
- ix. Support the IAEA Ministerial Conference (June 2011)
- x. Participate at the IAEA Extraordinary Meeting on the Convention on Nuclear Safety (Aug 2012)
- xi. FANR's request to the IAEA for a safety review mission: FANR hosted an IAEA Site Safety Review Mission in December, 2011 to review the draft ENEC Safety Assessment Report. The IAEA concluded that the Barakah site was adequate for construction of the NPP.

- B.** Schedules and milestones to complete the regulatory body’s planned activities are ongoing in accordance with program progress for the development of a strong national infrastructure.
- C.** FANR continues to work closely with all National Organisations and other stakeholders to ensure timely completion of activities to strengthen nuclear safety in the UAE. Conclusions regarding the outcome of the operator’s activities are pending based on oversight and evaluation during all phases of construction, commissioning and operation of the nuclear facilities.

3.5 Emergency Preparedness And Response And Post-Accident Management (Off-Site)

3.5.1 Overview

The UAE is currently in the process of developing its Emergency Preparedness and Response (EPR) infrastructure. The further development of EPR arrangements will be guided by lessons learned from the Fukushima response. The most significant of these is that there needs to be a very clear definition of responsibilities for actions to be taken to protect the public and clear communication protocols that are frequently and effectively tested through exercises.

FANR and ENEC are working together to identify the relevant Government agency stakeholders and to work with them on identifying and specifying their roles for a nuclear emergency. A broad framework for EPR is established in the Nuclear Law and a national ‘all-emergency’ coordination body (National Emergency, Crisis and Disasters Management Authority – NCEMA) has been set up.

The responsibilities and duties for implementation of emergency plans, the mitigation measures and protective actions, arrangements for warning of the public and measures for testing emergency preparedness will be laid out, once agreed, in regulations under the Nuclear Law.

3.5.2 Activities Performed By The Operator

- A.** ENEC is developing its onsite emergency plan. As a part of this development, it will review the emergency event classification; and the development of emergency action levels (as related to developments in severe accident management guidelines following Fukushima). The plan will also take account of the need for frequent exercising of the plan in coordination with offsite authorities, including exercises that assume the development of catastrophic conditions. The plan will include contingencies for its operation in the event of substantial breakdown of communications infrastructure. In particular, the onsite planning will take account of the possibility of simultaneous severe accidents in several units on the site.
- B.** In the context of its construction licence application for Braka Units 1 and 2, ENEC has agreed that it will supply details of various aspects of its onsite emergency plan for review by FANR at intervals up to 30 months from the time of the issuance of the construction licence. The Nuclear Law requires that FANR approve the on-site plan prior to commissioning.
- C.** At this time, the outcomes of these activities are awaited.

3.5.3 Activities Performed By The Regulator

- A.** FANR has issued a Regulation (FANR-REG-12) for ‘onsite’ Emergency Preparedness for Nuclear Facilities. This regulation will be reviewed in the light of the Fukushima lessons and if necessary, such review will take into account recommendations for revision of GS-R-2 that arise from the IAEA review of its Safety Standards.
- B.** With regard to offsite planning FANR is working through the national Radiation Protection Committee which FANR chairs to establish nationally accepted criteria to be used for taking protective actions in emergency response. Those criteria will guide the development of emergency action levels and operational intervention levels as part of the national ‘offsite’ planning and response process. The necessity for these levels to be clearly established and understood was demonstrated by the Fukushima accident. In addition to its direct regulatory

role, FANR is required by the Nuclear Law to cooperate with and advise Government agencies concerned with emergency preparedness and response on relevant matters of radiation protection. As the off-site plan is developed and defined in regulation, FANR will work with the identified response agencies to ensure that they have the knowledge and resources to effectively manage their roles.

- C. It is planned that a framework structure for offsite planning will be available to guide drafting of the regulation will be completed by mid-2013.
- D. At this time, the outcomes of these activities are awaited.

3.6 International Cooperation

3.6.1 Overview

As noted above, the Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy states as objectives that:

1. The UAE will work directly with the IAEA and conform to its standards in evaluating and establishing a peaceful nuclear energy program.
2. The UAE will develop peaceful domestic nuclear power energy in partnership with the Governments and firms of responsible nations, as well as with the assistance of appropriate expert organizations.

Consistent with this policy and Requirement 14 of GSR Part 1, the UAE continues to be an active participant in a wide range of international activities that contribute to the Global Safety Regime for achieving and maintaining worldwide a high level of safety at nuclear facilities and activities. The UAE is a party to the relevant international safety conventions.

The UAE invited and has been subject to an Integrated Nuclear Infrastructure Review (INIR) mission. The UAE's commitment to international peer review is further demonstrated by the invitation to the IAEA conduct an IRRS mission early in the life of FANR and the UAE regulatory system.

Both FANR and ENEC have taken a number of actions to strengthen the global nuclear safety regime. The IAEA Action Plan was used, in part, to address National (UAE) Safety Assessments of its proposed nuclear facilities, improve implementation of the IAEA Safety Standards, improve the effectiveness of IAEA Conventions and strengthen its regulatory framework. The actions that have been taken, or are planned, to enhance international cooperation are described in sections 3.6.2 and 3.6.3 of this report.

3.6.2 Activities Performed By The Operator

- A. ENEC has established a Nuclear Safety Review Board (NSRB) headed by the former head of the U.S. Nuclear Regulatory Commission and comprised of nuclear energy and safety experts from the United States, Jap and Korea. Additionally, ENEC has become a member of WANO and INPO to gain insights and operating experience for use in developing the program.

ENEC is committed to forming strategic partnerships with local and international companies and pursuing investment opportunities to support the growth of the nuclear energy industry in the UAE; and partnering with academic institutions to develop the human capital required for the UAE's nuclear energy industry well into the future.

ENEC has placed key personnel with nuclear experience in the organization. ENEC has selected several contractors with experience in nuclear plant regulation, operation and construction to supplement their staff. In addition, a well-designed mentoring and shadowing concept has been implemented to utilize the foreign expertise for the development of the UAE nuclear technology competence.

Changes to the national education infrastructure to support future engineering needs have been completed. The plan continues to use universities in the US, UK, Korea and France to help diversify education.

- B. It is contemplated that ENEC will form joint ventures. The UAE has offered joint-venture arrangements to the KEPCO Korean Electric Power Corporation related to the nuclear power plants. for the construction of the initial generating units. The involvement of experienced and reputable foreign commercial partners in the construction and operation of planned and eventual nuclear plants provides a continuous and fully transparent window into the UAE nuclear sector. Schedules and milestones to complete the operating organisations planned activities are ongoing, as the nuclear program matures.
- C. ENEC works closely with the Regulatory Authority and other stakeholders to ensure a coherent approach to strengthening the Nuclear Safety Regime.

3.6.3 Activities Performed By the Regulator

- A. FANR has taken or planned a number of actions to address international cooperation to strengthen nuclear safety. The IAEA Action Plan on Nuclear Safety was used, in part, for reporting on following actions taken or planned to enhance National and International cooperation.

FANR officers are members of the safety standards committees: CSS, NUSSC and RASSC and have participated in the IAEA review of its safety standards. FANR has performed a comprehensive “Gap Analysis” between the FANR Regulations and the IAEA Safety Standards, and is in the process of evaluating the results and any necessary actions to be taken. FANR will also ensure that future enhancements to the IAEA Safety Standards, based on lessons learned from Fukushima, are reflected in its regulatory framework.

FANR staff has also taken part in:

- The IAEA General Conference and the Senior Regulators Meeting.
- The Ministerial Conference on Nuclear safety following the Fukushima accident.
- International Nuclear Safety Advisory Group (INSAG) activities.
- IAEA Expert Meeting on Reactor and Fuel Safety.
- The Regulatory Cooperation Forum.

FANR also participates as an observer in some activities of the OECD NEA and closely observes and follows meetings of the MDEP.

FANR has hosted an IAEA IRRS mission and an IAEA Site Safety Review mission in December, 2011. In addition to requesting peer reviews of its programme, the UAE has participated in IRRS Missions to Republic of Korea and Spain.

To improve the effectiveness of the Convention on Nuclear Safety, FANR submitted three proposals to the IAEA in April, 2012.

The proposals included:

- Proposal for a periodic report by IAEA on the safety of nuclear installations as an input to the review process;
- Proposal to revise the content of National Reports to report on significant changes to the country nuclear policy and programme, operating experience and lessons learned.
- Proposal to focus the review process under the CNS on significant safety issues and lessons learned.

FANR has concluded cooperative agreements with regulatory bodies in other countries having mature nuclear energy programmes, including Korea and the United States.

As part of the joint nuclear approach within the GCC, FANR is a member in the country team responsible for preparing the detailed studies of the uses of nuclear energy for peaceful purposes and sharing with the GCC counterparts the available nuclear legislation, regulations and lessons learned from the nuclear energy.

B. FANR activities in this area are ongoing.

C. Conclusions regarding the outcome of these operator's activities are also pending based on oversight and evaluation during all phases of construction, commissioning and operation of the nuclear facilities.

ANNEX 1: Summary Table

Activity	Activités by the Operator*			Activités by the Regulator*		
	(Item 2.a) Activity - Taken? - Ongoing? - Planned?	(Item 2.b) Schedule Or Milestones for Planned Activities	(Item 2.c) Results Available - Yes? - No?	(Item 3.a) Activity - Taken? - Ongoing? - Planned?	(Item 3.b) Schedule Or Milestones for Planned Activities	(Item 3.c) Conclusion Available - Yes? - No?
Topic 1 – External Events						
Requested re-evaluation of NPP design basis and assessment of proposed NPP's, based on European ENSREG « stress test »	Taken	Report submitted in Dec. 2011. Rev. To Report, for scheduled activities to be submitted, scheduled for May, 2012	Yes	Taken	Safety Evaluation to be completed as part of Const.Lic. App. Mid-2012	No
Invited independent TSO group to review ENEC's response to Fukushima	Taken	To be submitted in May, 2012	Yes	Taken	Safety Evaluation to be completed as part of Const. Lic. App. Mid-2012	No
UAE hosted an IAEA Site Safety Eval. of Licensee SAR	Taken	Concluded in Dec. 2011	Yes	Taken	Completed 2011	Yes
propose design enhancement	Ongoing	May, 2012	No	Ongoing	TBD during const. and comm.	No
Topic 2 – Design Issues						
Reevaluated Design Basis. Proposed enhancements	Taken	Dec. 2011	Yes	Ongoing Safety Eval.	SER-2012	No
Licensee proposed design enhancements	Taken	Ongoing during Construction and Commissioning	No	Ongoing	Construction, Commissioning and Operating License schedule	No
Topic 3 – Severe Accident Management						
Proposed design enhancements for prevention and mitigation measures	Ongoing	Present- to plant operation	No	Taken	Present- to plant operation	No

Activity	Activities by the Operator*			Activities by the Regulator*		
	(Item 2.a) Activity - Taken? - Ongoing? - Planned?	(Item 2.b) Schedule Or Milestones for Planned Activities	(Item 2.c) Results Available - Yes? - No?	(Item 3.a) Activity - Taken? - Ongoing? - Planned?	(Item 3.b) Schedule Or Milestones for Planned Activities	(Item 3.c) Conclusion Available - Yes? - No?
Topic 4 - National Organizations						
Strengthen Transparency, Communications, and Roles and Responsibilities for all National Stakeholders	Ongoing	Prior to Commissioning the first NPP	No	Ongoing	Prior to Commissioning the first NPP	No
Topic 5 - Emergency Preparedness And Response And Post-Accident Management (Off-Site)						
Develop on-site and off-site EPR and SAMG procedures	Planned	Prior to Commissioning and Operation	No	Planned	Present to Comm.	No
Topic 6 – International Cooperation						
Host a IRRS Follow-up Mission	NA	NA	NA	Planned	2014	No
Strengthen Transparency, Communications and Roles and Responsibilities for all International Stakeholders	Ongoing			Ongoing		Strengthen Transparency, Communications and Roles and Responsibilities for all International Stakeholders
Review and revise as necessary, UAE regulations based on IAEA safety standards Gap Analysis	Planned	NA		Planned	Dec. 2012	No

ANNEX 2: LIST OF ABBREVIATIONS

APR	Advanced Pressurized Reactor
CLA	Construction Licence Application
CNIA	Critical National Infrastructure Authority
CNS	Convention on Nuclear Safety
CSS	Commission on Safety Standard
EAL	Emergency Action Level
ENEC	Emirates Nuclear Energy Corporation
EOF	Emergency Operating Facility
EPRI	Electric Power Research Institute
EQAM	ENEC Quality Assurance Manual
ERF	Emergency Response Facility
FANR	Federal Authority for Nuclear Regulation
FSAR	Final Safety Analysis Report
GCC	Gulf Cooperation Council
HRD	Human Resources Development Service of Korea
IAB	International Advisory Board
IAEA	International Atomic Energy Agency
IAT	Institute of Applied Technology
IDP	Individual Development Programme
IFRS	International Financial Reporting Standards
IMS	Integrated Management System
INIR	Integrated Nuclear Infrastructure Review
INPO	Institute of Nuclear Power Operations
ISV	Independent Safety Verification
KAIST	Korea Advanced Institute of Science and Technology
KDI	Korea Development Institute
KEPCO	Korea Electric Power Corporation
KINS	Korea Institute of Nuclear Safety
KHNP	Korea Hydro and Nuclear Power
KM	Knowledge Management
KUSTAR	Khalifa University of Science, Technology and Research
LWR	Light Water Reactor
MOU	Memorandum of Understanding

MW	Megawatt
NCEMA	National Emergency, Crisis and Disaster Management Authority
N-EIA	Nuclear Environmental Impact Assessment
NEA	Nuclear Energy Agency
NLA	Nuclear Law Article(s)
NPP	Nuclear Power Plant
NUSSC	Nuclear Safety Standards Committee
OECD	Organisation for Economic Co-operation and Development
OLA	Operating Licence Application
PRA	Probabilistic Risk Assessment
PSAR	Preliminary Safety Analysis Report
RASSC	Radiation Safety Standards Committee
SSC	Structure, Systems, and Component
TSO	Technical Support Organisations
WANO	World Association of Nuclear Operators
WENRA	Western European Nuclear Regulators' Association