REPORT

on

THE INTEGRATED NUCLEAR INFRASTRUCTURE REVIEW (INIR) MISSION

to

Review the Status of the National Nuclear Infrastructure

in

The United Arab Emirates

Counterparts: FANR, ENEC

Technical Cooperation Project UAE9008

FOREWORD
by the
Director General

The IAEA's Integrated Nuclear Infrastructure Review (INIR) missions are designed to assist Member States, at their request, in assessing the status of their national infrastructure for the introduction of a national nuclear power programme. Each INIR mission is coordinated by the IAEA and conducted by a team of international experts drawn from different Member States, who have experience in different aspects of developing and deploying nuclear infrastructure. Through the INIR missions, the IAEA facilitates the exchange of knowledge and experience between team members and the organizations responsible for preparing the infrastructure for nuclear power in the country inviting the mission. INIR missions also help the IAEA to better understand the needs of Member States, which in turn contributes towards improving the services provided by the IAEA.

The IAEA's "*Milestones in the Development of a National Infrastructure for Nuclear Power"* (IAEA Nuclear Energy Series No. NG-G-3.1) contains a description of 19 infrastructure issues to be considered during the different stages of development of a nuclear power programme.

The starting point for an INIR mission is a self-evaluation performed by the Member State against these infrastructure issues. Following such a self-evaluation, the INIR mission reviews the status of the national nuclear infrastructure, identifies existing gaps in specific infrastructure-related areas and proposes plans to fill these gaps. An important aspect of the INIR mission is that it provides Member State representatives with an opportunity to have in-depth discussions with international experts about experiences and best practices in different countries. In developing its recommendations, the INIR team takes into account the comments made by the relevant national organizations. Implementation of any of the team's recommendations is at the discretion of the Member State requesting the mission.

The results of the INIR mission are expected to help the Member State with the development of an action plan to fill any gaps which in turn will help them to proceed with the development of their nuclear infrastructure. The IAEA stands ready to assist, as requested and appropriate, in the different steps of this action plan.

CONTENTS

1. EXECUTIVE SUMMARY

The United Arab Emirates (UAE) formally requested the International Atomic Energy Agency (IAEA) to perform an Integrated Nuclear Infrastructure Review Mission (INIR) in a letter dated 15 October 2010. In response to the UAE request, the IAEA prepared a mission to provide a holistic coordinated peer review conducted by a team of IAEA staff and international experts who have direct experience in specialized nuclear infrastructure areas. The UAE provided a self-evaluation report to the IAEA to facilitate IAEA review and preparation for the INIR mission.

The mission was conducted from 16-23 January 2011. The mission represents an evaluation of the development status of the infrastructure issues described in the NE Series *Milestones* Guide (NG-G-3.1), applying the holistic approach described in the NE Series *Infrastructure Evaluation* technical report (NG-T-3.2). Given the status of the UAE programme and the conclusion of the contract for the nuclear power plant (NPP), the team review of conditions for Phase 1 were limited to those areas in which the UAE self-evaluation report identified ongoing actions. The mission team focused its efforts on conditions for Phase 2. The advanced stage and rapid pace of the UAE infrastructure development was taken into account, and the mission team also considered what future actions would be conducted by the UAE as it continues with its plans.

Some of the key milestones in the development of the UAE nuclear programme are as follows: In April 2008, the UAE published the Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy", based on studies that found nuclear power to be a safe and environmentally friendly option that could supplement the existing power plants in meeting the growing energy needs. With the issuance of this Policy, the UAE began implementation of a Nuclear Energy Program Implementation Organization as recommended by the IAEA, which was identified as the The Executive Affairs Authority (EAA) of Abu Dhabi. The EAA developed an internal strategy document called the "Roadmap to Success" which, building on the guidance from IAEA, set the early path for the programme.

On 23 September 2009, the UAE issued Federal Law by Decree No. 6 of 2009 on the Peaceful Uses of Nuclear Energy that set in place the framework for nuclear regulation and formally established the nuclear regulatory body, the Federal Authority for Nuclear Regulation (FANR).

On 23 December 2009, the President of the UAE in his capacity as the Ruler of Abu Dhabi established by decree the Emirates Nuclear Energy Corporation (ENEC), the organization charged with implementing the UAE nuclear energy programme.

On 27 December 2009, ENEC announced that it had 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. The first of the four units is scheduled to begin providing electricity to the grid in 2017, with the other three units being completed by 2020. 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 vast majority of the nuclear energy program with national talent.

A site selection process was undertaken using IAEA and other international guidance materials. FANR has so far issued three licenses to ENEC: Licence for Selection of a Site for the Construction of a Nuclear Facility on 28 February 2010, Licence for Preparation of a Site for the Construction of a Nuclear Facility, and Limited Licence for the Construction of a Nuclear Facility, both on 8 July 2010.

Most recently, on 27 December 2010, ENEC submitted to FANR the construction licence application (CLA).

The mission team recognized that the UAE infrastructure is progressing rapidly and is well advanced. From the time the self-evaluation report was submitted in July 2010 until the time the INIR mission was conducted in January 2011, several notable developments had taken place. Progress made to date is, for the most part, consistent with the overall development of the nuclear power programme. The mission team concluded that the UAE has reached Milestone 1, having "made a knowledgeable decision" regarding its nuclear power programme. The mission team further concluded that the UAE has accomplished all of the conditions for Phase 2 in each of the 19 issues, with the exception of the adoption of an international instrument on Civil Liability for Nuclear Damage and promulgation of associated implementing legislation. As the UAE reported that civil liability was the subject of an on-going study and that it expected to make significant progress in this area by the end of 2011, the mission team considered this a minor gap for Phase 2. The mission team observed that the UAE nuclear power programme in general has progressed into Phase 3.

Though no additional gaps were identified for Phase 2, the mission team identified some areas needing further attention as the programme progresses into NPP project implementation. Some of the areas are consistent with the areas identified in the self-evaluation report by the UAE as areas needing continued attention. The mission team highlights the following areas and acknowledges the UAE's on-going work in them:

- Nuclear Safety: Development of a safety culture was an area where the mission team found that the UAE programme is particularly strong. During the implementation of the programme, vigilant and sustained attention is necessary, especially considering its rapid pace and continued growth of involved organizations.

- Safeguards: As the UAE rescinds its small quantities protocol and implements a comprehensive safeguards agreement, implementing regulations should be finalized and training conducted.

- Fuel Cycle and Radioactive Waste: the Government should continue its work in developing its national strategy for the back end fuel cycle and radioactive waste management, including finalizing its implementation strategy.

- Regulatory Framework: Recognizing the regulations already in place, FANR and other regulatory authorities will need to continue to develop and implement regulations and guidance in line with the nuclear power programme's development. Also, coordination among regulatory authorities should be continued, and relationships between them should be formalized, for example between the Environmental Agency – Abu Dhabi and FANR.

Industrial Involvement: It was understood that for Braka units 1 and 2, KEPCO will qualify local contractors as appropriate. For future units, local participation may be increased based on greater experience. ENEC may consider additional involvement in assisting local suppliers in understanding the required nuclear qualifications. Establishment of a nuclear forum for local suppliers would be a useful support to this process**.**The team made 16 specific suggestions to support continued improvement and strengthening of the UAE programme.

The Team further recognized 14 good practices, which are worthy of the attention of other countries involved in the development of nuclear infrastructure, as a model in the drive for excellence.

The mission team wishes to thank the UAE for its participation in this mission. This was the first mission to thoroughly incorporate the Phase 2 evaluation methodology in NG-T-3.2, and several areas for improvement in the methodology were identified. The experience of the UAE in applying the self-evaluation methodology to its programme was valuable to the IAEA and will be taken into account when the IAEA documents are updated.

It should be noted that the purpose of this INIR Mission is to evaluate the progress made by the UAE in the development of the milestones recommended by the IAEA, but does not assess in depth the quality of the infrastructure building activities. This would require specific targeted missions.

2. INTRODUCTION

The United Arab Emirates (UAE) is a federation of seven Emirates (Abu Dhabi, Dubai, Sharjah, Umm al-Qaiwain, Fujairah, Ajman, and Ra's al-Khaimah) with the second largest economy in the Arab Middle East after Saudi Arabia.

The rapid increase in electricity and water demand has created a need to evaluate alternative sources of power production. In April 2008, The Government of the United Arab Emirates published a white paper entitled the „Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy", that found nuclear power to be a safe and environmentally friendly option that could supplement existing power plants in meeting the growing energy needs. As a result of this study, the UAE is pursuing a peaceful, civilian nuclear energy program.

The Policy outlines the government's fundamental principles for its work in this area:

1. Complete operational transparency
2. Highest standards of non-proliferation
3. Excellence in safety and security
4. Working directly with the IAEA and conforming to its standards
5. Partnership with the governments and firms of responsible nations
6. Ensuring long-term sustainability.

The Policy also express the Government's committment to establishing structured and documented methods for managing a safe, peaceful nuclear energy program that upholds the highest standards of safety, security, nonproliferation and operational transparency.

Key roles and responsibilities have been assigned and put into place for the development and implementation of the national nuclear power program.

With the issuance of this Policy, the UAE began implementation of a Nuclear Energy Program Implementation Organization (NEPIO) as recommended by the IAEA. The Executive Affairs Authority (EAA) of Abu Dhabi performed the early functions of the NEPIO, incubating the development of both the nuclear regulator and the owner/operator. In the early stages, the EAA developed an internal strategy document called the "Roadmap to Success" which, building on the guidance from IAEA, set the early path for the program. This roadmap addressed the broad range of issues from legislation to capacity building to radioactive waste management.

Federal Law by Decree No. 6 of 2009 on the Peaceful Uses of Nuclear Energy, issued on 23 September 2009, sets in place the framework for nuclear regulation and formally established the nuclear regulatory body, the Federal Authority for Nuclear Regulation (FANR).

On 23 December 2009, the President of the United Arab Emirates in his capacity as the Ruler of Abu Dhabi established by decree the Emirates Nuclear Energy Corporation (ENEC), the organization charged with implementing the UAE nuclear energy program as it produces electricity, supports economic development, and provides employment opportunities for its citizens. ENEC will be responsible for:

- Overseeing the work of the Prime Contractor in the design, construction and operation phases.
- 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. This will include overseeing work that will be done near the eventual nuclear power plant site, such as community development, roads, utility and telecommunications projects, as well as working to build the human resource capacity for the nuclear energy program in coordination with the educational sector in 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 program safely, securely and in accordance with the UAE's safeguard commitments.

On 27 December 2009, the Emirates Nuclear Energy Corporation (ENEC) announced that it had selected a team led by Korea Electric Power Corporation (KEPCO) to design, build and assist in the operation and maintenance of four 1,400-MW civil nuclear power units. The first of the four units is scheduled to begin providing electricity to the grid in 2017, with the three later units being completed by 2020. 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.

In addition to the delivery of the four plants, ENEC and KEPCO have also agreed to key terms under which Korean investors will have an equity interest in the project. This arrangement is designed to further strengthen the business relationship, and powerfully incentivize the partners to ensure that the necessary experience, technology and skills are available to achieve on-time and on-budget delivery, and safe and reliable operation of the plants. It was reported that the contract contains provisions that lower the project risk and allow the UAE to take advantage of the experience gained by Korea during the past three decades. The contract also provides for extensive training, human resource development, and education programs as the UAE builds the capacity to eventually staff the vast majority of the nuclear energy program with national talent, and develops the industrial infrastructure and commercial businesses to serve the nuclear energy industry.

As of 8 July 2010, the Federal Authority for Nuclear Regulation (FANR) had issued three licenses to the Emirates Nuclear Energy Corporation (ENEC): "Licence for Selection of a Site for the Construction of a Nuclear Facility" on 28 February 2010, "Licence for Preparation of a Site for the Construction of a Nuclear Facility" and "Limited License for the Construction of a Nuclear Facility", both on 8 July 2010. The site selection process was initiated based on guidance and references from the IAEA, the US NRC and the US-based Electric Power Research Institute (EPRI). Ten candidate sites were identified and criteria were applied to narrow the search to a smaller number of suitable sites, including what is now the Preferred Site. The Site Preparation License provides FANR's authorization to ENEC to conduct site preparation activities at the Preferred Site, Braka, in the Western Region of Abu Dhabu, including the installation of site infrastructure and construction of parts of the facility not related to nuclear safety. ENEC also obtained a separate authorization from the Environment Agency–Abu Dhabi to begin this work. The Limited Construction Licence authorizes ENEC to manufacture and assemble structures, systems and components, such as reactor pressure vessels, steam generators, coolant pumps and other components.

On 27 December 2010, ENEC submitted to FANR the construction license application (CLA).

The UAE formally requested the IAEA to perform an Integrated Nuclear Infrastructure Review Mission (INIR) in a letter dated 15 October 2010.

In order to support the request, the relevant organizations in the UAE prepared a self-evaluation report, based on the guidance provided in IAEA's Technical Report NG-T-3.2 „Evaluation of the Status of National Nuclear Infrastructure Development." In acordance with the IAEA Milestone approach, the UAE has been working on activities for Phases 1 and 2 in parallel. The report documents the UAE's progress to date, evaluation of readiness, areas where further work is needed, and broadly identify the actions necessary to continue progress in the development of the national infrastructure to support a peaceful nuclear energy program. The self-evaluation report was provided to the IAEA to facilitate IAEA review and preparation of the INIR mission on 19 July 2010.

In response to this request, the IAEA prepared a mission to give a holistic coordinated peer review conducted by a team of IAEA staff and international experts who have direct experience in specialized nuclear infrastructure areas.

3. OBJECTIVES OF THE MISSION

The main objectives of the missions were:

- Evaluation of the development status of the infrastructure issues described in the NE Series *Milestones* Guide (NG-G-3.1), applying the holistic approach described in the NE Series *Infrastructure Evaluation* technical report (NG-T-3.2).
- Identification of the areas needing further attention during the building of the national infrastructure in the UAE.
- Assistance to UAE in preparation of an Action Plan to address areas for further improvement in Phase 2, which will be prepared by the UAE. .

4. SCOPE OF THE MISSION

The mission focussed on the status of the infrastructure conditions in the UAE covering all of the 19 issues identified in the *Milestones* publication in a comprehensive and holistic way. More specifically it included:

- A review of the current status of infrastructure development in the UAE
- Recommendations and Suggestions for further development of the infrastructure
- Action Plans and International Assistance

The mission utilized the following techniques:

a) Review of documents, both prior to the mission as part of preparation, and during the mission. The review concentrated on the process to introduce nuclear power and did not go into great depth to evaluate the quality of the planning and infrastructure building activities. (See Attachment 4 for references)

b) Discussions with representatives of the appropriate organizations in the UAE. (See Attachment 2 for the list of participants from the UAE)

5. WORK DONE

Prior to the mission, the mission team reviewed the self-evaluation report and supporting materials with input from relevant IAEA sections. Several team meetings were conducted prior to the mission, including full team meetings in Vienna on 14 January 2011 and Abu Dhabi on 15 January 2011 to discuss the team's initial views of the self-evaluation report.

The mission was conducted from 16-23 January 2011. Given the status of the UAE programme and the conclusion of the contract for the NPP, the team reviewed conditions for Phase 1 where the self-evaluation identified gaps. The mission team focused its efforts on conditions for Phase 2. Recognizing that in some areas the UAE infrastructure had developed beyond Phase 2 conditions by the time of the mission, the mission team also kept in mind the description of Phase 3 in the *Milestones* guide NG-G-3.1, even though the reference evaluation methodology NG-T-3.2 does not provide for evaluation conditions for Phase 3. This was done as a matter of practicality and with the usefulness of the mission results to the UAE in mind.

The mission was coordinated on the UAE side by FANR and ENEC. The meeting was held at ENEC offices. The interviews were conducted over five days, including parallel sessions. The preliminary draft report was prepared and discussed with the counterparts. The mission results were presented to senior officials in an exit meeting.

The results of the mission are presented, in tabular form in Attachment 1 (and summarized in Section 7), for each of the 19 Infrastructure issues in Phase 2. The "basis of evidence" for each issue as described in NES Report NG-T-3.2, *Evaluation of the Status of National Nuclear Infrastructure Development*, is identified in the left hand column. The team's findings are then presented against each condition of the "basis of evidence." The team drew "Review Observations" based on the findings for each condition to determine the progress against Milestone 2. The team reviewed for gaps and made recommendations and suggestions, as well as identified good practices.

6. MAIN CONCLUSIONS

The INIR Mission was conducted in a cooperative and open atmosphere with participation from various involved organizations in the UAE, in particular with ENEC, FANR and the Ministry of Foreign Affairs, though it was noted that not all of the

organizations listed in the draft agenda in pre-meeting discussions were available during the mission.

The mission team recognized that the UAE nuclear power programme and associated infrastructure is progressing rapidly and is well advanced. From the time the self-evaluation report was submitted in July 2010 until the time the INIR mission was conducted in January 2011, several notable developments had taken place, including:

- the entry into force of the Additional Protocol in December 2010
- the submission by ENEC to FANR of the CLA on 27 December 2010
- finalization of the nuclear environmental impact assessment by ENEC and submission to the Environmental Agency – Abu Dhabi on 27 December 2010
- FANR issuance of a limited construction license to enable ENEC to contract with KEPCO for fabrication of long-lead items
- Initiation of site preparation work by ENEC based on a site preparation license issued by FANR and an environmental permit issued by EAD.
- The workforces in both FANR and ENEC have increased dramatically in this same period, notably with the recruitment of experienced senior personnel; and consequently the commencement of training programmes to rapidly integrate new staff.
- The ENEC project management team was also established, made up of 200 people, including 60% UAE nationals, some of whom are in on-the-job-training.
- Implementation of the management system in both FANR and ENEC
- FANR developed regulations in consultation with stakeholders, including ENEC
- Finalization by ENEC of interface procedures and establishment of a strong relationship with the prime contractor, including establishment of an ENEC office in KEPCO.
- Initiation of familiarization by ENEC and FANR staff with the reference Korean plant
- FANR identified the needs for physical protection measures to be set in place during the construction of the NPP, CNIA and ENEC are implementing these measures.
- FANR requested an IRRS mission for the last quarter of 2011.

The implementation of actions that have occurred since the submission of the self-evaluation report was accelerated and without compromising specific requirements for NPP, compared to common practices for project development. The mission team identified several factors which contributed to the UAE's ability to meet the schedule, such as having clear policy guidance, hiring of personnel with cumulatively over 1000 years of experience in FANR and ENEC, as well as Governmental support, including financial support.

Progress made to date on specific issues is, for the most part, consistent with the overall development of the nuclear power programme. The mission team concluded that the UAE reached Milestone 1, having "made a knowledgeable decision" regarding its nuclear power programme. The mission team further concluded that the UAE has accomplished all of the conditions for Phase 2 in each of the 19 issues, with the exception of the adoption of an international instrument on Civil Liability for Nuclear Damage and promulgation of associated implementing legislation. As the UAE reported that civil liability was the subject of an on-going study and that it expected to make significant progress in this area by the end of 2011, the mission team considered this a minor gap for Phase 2. However, the mission team observed that the UAE nuclear power programme in general has progressed into Phase 3.

The team made one specific recommendation to address the minor gap identified:

- The UAE is recommended to adopt the relevant nuclear liability instruments and promulgate implementing national legislation. (R-5.1 No. 1)

Though no additional gaps were identified for Phase 2, the mission team identified some areas needing further attention as the programme progresses into NPP project implementation. Some of these areas are consistent with the areas identified in the self-evaluation report by the UAE, as areas needing continued attention. The mission team highlights the following areas and acknowledges the UAE's on-going work in them:

- Nuclear Safety: Development of a safety culture was an area where the mission team found that the UAE programme is particularly strong. During the implementation of the programme, vigilant and sustained attention is necessary, especially considering its rapid pace and continued growth of involved organizations.

- Safeguards: As the UAE rescinds its small quantities protocol and implements a comprehensive safeguards agreement, implementing regulations should be finalized and training conducted.

- Fuel Cycle and Radioactive Waste: a strategy for the back end fuel cycle and radioactive waste management should be elaborated further.

- Regulatory Framework: Recognizing the regulations already in place, FANR and other regulatory authorities will need to continue to develop and implement regulations and guidance in line with the nuclear power programme's development. Coordination among regulatory authorities should be continued, and responsibilities between them should be formalized, for example between the Environmental Agency and FANR.

- Industrial Involvement: It was understood that for Braka units 1 and 2, KEPCO will qualify local contractors as appropriate. For future units, local participation may be increased based on the gained experience. ENEC may consider additional involvement in assisting local suppliers understanding of the required nuclear qualifications. Establishment of a nuclear forum for local suppliers would be a useful support to this process**.**

The team made 16 specific suggestions to support continued improvement and strengthening of the UAE programme:

S-5.3 No. 1: It is suggested to complete a formal arrangement to clarify roles and responsibilities between FANR and EAD as planned. It is also suggested to consider amending the two laws to clearly delineate responsibilities in the longer term.

S-6.2 No. 1: To further strengthen the establishment and maintenance of the SSAC, FANR might consider requesting the IAEA SSAC Advisory Service (ISSAS mission).

S-6.3 No. 1: Despite the fact that Subsidiary Arrangements have not been completed, FANR should consider the appropriate timing for submission to the IAEA of an updated early design information for Braka NPP ~ preliminary version of DIQ reflecting the status of "Pre-Construction (Design and Planning) Phase".

S-6.4 No.1: FANR may consider requesting the IAEA to review the draft safeguards-related regulations, as planned.

S-6.4 No. 2: The necessary safeguards-related regulations for the full scope implementation of CSA and Additional Protocol requirements should be finalized as planned.

S-7.1 No. 1: FANR should finalize/implement its regulatory guidance, document management system, and the process related to the public availability of information that would directly support the licensing activities.

S-8.1 No. 1: The UAE should formalize the full implementation of Code of Conduct on the Safety and Security or Radioactive Source.

S-11.1 No. 1: ENEC is encouraged to include representatives from throughout the UAE on its Citizens Advisory Panel, to ensure involvement and feedback from across the UAE.

S-14.2 No.1: It is suggested that UAE request the IAEA to perform an EPRev Mission, to have a detailed peer review of UAE's Emergency Planning compared to the IAEA safety standards.

S-15.1 No. 1: S-15.1 No. 1: UAE may consider requesting IAEA services to support further development in this area, specifically, an IAEA mission to review nuclear security.

S-15.5 No. 1: To organize specific training of the off-site response forces for intervention at NPP (including knowledge of the facility and vital areas, radiation protection and restriction areas)

S-15.7 No. 1: UAE may consider requesting an IAEA National Training Course on nuclear security culture.

S-17.1 No. 1: For the future development of the nuclear programme, it is suggested that the Government further develop the national strategy on long-term radioactive waste and spent fuel management including the early establishment of a State entity for the disposal of SF and LILW, and to proceed with the planning of LILW disposal.

S-17.1 No. 2: The nuclear programme in the UAE is progressing rapidly, is well accepted and supported in the UAE. It would be prudent to initiate the siting of LILW disposal facility in the near term.

S-18.3 No.1: Consider developing a target for national industry participation for future units.

S-19.1 No.1: In Phase 3, ensure successful knowledge transfer from the Prime Contractor to ENEC for the preparation of NPP operation.

The Team further recognized 14 good practices, which are worthy of the attention of other countries involved in the development of nuclear infrastructure, as a model in the drive for excellence:

GP-2.2 No. 1. FANR's and ENEC's implementation of safety culture throughout their respective organizations constitutes a good practice, specifically FANR's approach in applying cultural aspects to the principles, and ENEC's training of its senior management, see GP-10.1 No. 1.

GP-3.6 No. 1: Development and implementation of the Management Systems starting with the initial stage of the newly created organisations (the nuclear regulatory body, FANR, and NPP Owner/Utility, ENEC),that will support the implementation of the appropriate level of safety culture in these involved organisations in the national nuclear power program.

GP-3.6 No. 2: Good cooperation exists between nuclear regulatory body (FANR) and the NPP Owner/Utility (ENEC), without compromising the nuclear regulatory body's independence.

GP-6.2 No. 1: A Preliminary Safeguards Plan was included within the application for the Braka Units 1 and 2 construction license (addressing the safeguards requirements at this early stage of construction).

GP 10.1 No. 1: The UAE is taking a pragmatic approach to rapidly building the national capabilities needed to implement the nuclear power project and long-term sustainability through development of a national workforce through "Emiratization". The concept is based on a mix of senior advisors, support companies and national staff which supports the efficient transfer of knowledge.

GP 10.1 No. 2: The participation of top management from ENEC in an Executive Nuclear Course demonstrates the full commitment to the values of Nuclear Competence Development and Safety Culture.

GP 10.1 No. 3: The active coordination in human resource development undertaken in the different organisations, especially between the utility, the regulatory body and the educational community, is a model for the effective use of resources. It also helps ensure an integrated approach to the development of required workforce and competence.

GP 10.2 No. 1: The consequent use of the Systematic Approach to Training (SAT) in all organizations involved, namely ENEC and FANR, and the consideration of SAT as a requirement for the development of all training programmes within contracts is considered a good practise.

GP-11.1 No. 1: ENEC produces public information materials not only in Arabic and English, but also in seven other languages widely used in the UAE, ensuring that all main sectors of the Abu Dhabi community can have access to basic information.

GP-11.1 No. 2: ENEC and FANR have each established detailed stakeholder tracking systems to identify relevant parties, log contacts and identify future action.

GP-11.1 No. 3: ENEC is developing a Nuclear Energy Education website, separate from its corporate site, to serve as a neutral education tool and to stimulate debate on nuclear energy issues. The site would be taken over in future by an entity other than ENEC, which would reinforce its independence.

GP-15.1-1: Creation of a coordination group on nuclear security issues with all relevant entities, especially FANR, ENEC and CNIA, and integration of safety and security approaches to ensure that changes in one do not adversely affect the others.

GP-15.1-2: The UAE was one of the first countries to adopt INFCIRC 225, Rev 5, and requested an IAEA review of its draft Regulation on Physical Protection of Nuclear Materials and Nuclear Facilities.

GP-19.1 No. 1: Effective procurement process utilising experienced consultants enabled successful signing of the Prime Contract.

The mission team wishes to thank the UAE for its participation in this mission. This was the first mission to thoroughly use the Phase 2 evaluation methodology in NG-T-3.2, and several areas for improvement in the methodology were identified. The experience of the UAE in applying the self-evaluation methodology to its programme is valuable to the IAEA and will be taken into account when the IAEA documents are updated.

7. EVALUATION OF INFRASTRUCTURE STATUS

As many of the 19 infrastructure elements are overlapping in nature, the team tried to associate its conclusions and recommendations with the most salient issue. Some comments may appear under more than one issue, which reflects the cross-cutting nature of infrastructure-building.

For the purposes of the INIR mission results, the following definitions are used:

Significant Actions Needed

The "Review Observations" indicates that there is considerable effort still needed to realize the stated "Condition", and that achievement of this "Condition" is needed in order to be able to sustain overall progress in developing an effective national nuclear power infrastructure.

Minor Actions Needed

The "Review Observations" indicates that there is some effort still needed to realize the stated "Condition". However, the current status, supported by the on-going activities, mostly achieves the desired "Condition".

No Actions Needed

The available evidence indicates that the intention underlying this "Condition" has been achieved. However, as work continues on the infrastructure knowledge and implementation, care has to be taken to ensure that this status remains valid. For the purposes of this report, given the specific situation in the UAE where the NPP contract has been concluded and actions from different phases are being implemented in parallel, a status of "no action needed" was also given when concrete plans are in place and being carried out to fulfil or improve the conditions for Phase Two and moving into Phase Three.

Recommendations

Recommendations are proposed when aspects related to fulfilment of conditions of nuclear infrastructure development are discrepant, incomplete or inadequately implemented. Recommendations are specific, realistic and designed to result in tangible improvement. Recommendations are based on the *Milestones* approach and, as applicable, state the relation with the specific issue. The recommendations are formulated so they are succinct and self-explanatory.

Suggestions

Suggestions may indicate areas where concrete plans exist and are being executed, or for useful improvement of existing programmes and to point out possible better alternatives to current work. In general, suggestions stimulate the management and staff to consider new or different approaches to develop infrastructure and enhance performance. Suggestions are formulated so they are succinct and self-explanatory.

Good practices

A good practice is identified in recognition of an outstanding organization, arrangement, programme or performance, superior to those generally observed elsewhere. A good practice is more than just the fulfillment of the conditions or expectations. It is worthy of the attention of other countries involved in the development of nuclear infrastructure as a model in the drive for excellence. Good practices also reference the bases (similar to suggestions), and are clearly documented in the mission report.

It should be noted that the results summarized in the following tables neither validate the UAE actions and programmes nor certify the quality and completeness of the work done by the UAE.

EVALUATION RESULTS

1. National Position	Phase 2		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
1.1 Government support evident			X
1.2 Commitments and obligations of owner/operator organizations established			X
2. Nuclear Safety	**Phase 2**		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
2.1 Safety responsibilities by all stakeholders recognized			X
2.2 Safety culture evaluated			X
2.3 Long term relationship with supplier established			X
3. Management	**Phase 2**		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
3.1 BIS Available			X
3.2 Adequate staff to prepare for and analyse bids available			X
3.3 Bid evaluation criteria determined			X
3.4 Contracting strategy established			X
3.5 Project management organization established			X
3.6 Management systems established			X
4. Funding and Financing	**Phase 2**		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
4.1 Strategy for management of financial risks available			X
4.2 Funding and financing plan available			X

5. Legislative Framework	Phase 2		
Condition	**Actions needed**		
	SIGNIFICANT	**MINOR**	**NO**
5.1 International Legal Instruments governing nuclear activities in force		X	
5.2 A comprehensive nuclear law is enacted and in force		X	
5.3 All legislation dealing with the nuclear power programme developed, promulgated and in force		X	
6. Safeguards	**Phase 2**		
Condition	**Actions needed**		
	SIGNIFICANT	**MINOR**	**NO**
6.1 Terms of international safeguards agreement in place			X
6.2 SSAC established and operational			X
6.3 Early safeguards relevant information provided to IAEA			X
6.4 Specific legislation and relevant safeguards procedures in place			X
7. Regulatory Framework	**Phase 2**		
Condition	**Actions needed**		
	SIGNIFICANT	**MINOR**	**NO**
7.1 Independent nuclear regulatory body established			X
8. Radiation Protection	**Phase 2**		
Condition	**Actions needed**		
	SIGNIFICANT	**MINOR**	**NO**
8.1 Actions to prepare adequate radiation protection programs undertaken			X
8.2 Expansion of appropriate infrastructures planned			X
9. Electrical Grid	**Phase 2**		
Condition	**Actions needed**		
	SIGNIFICANT	**MINOR**	**NO**
9.1 Detailed studies to determine grid expansion, upgrade or improvement undertaken			X
9.2 Plans, funding and schedule for grid enhancement available			X

10. Human Resources	Phase 2		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
10.1 Knowledge and skills needed in organizations for Phase 3 and operational phase identified			X
10.2 A plan to develop and maintain the human resource base in organizations for Phase 3 and operational phase is developed			X
11. Stakeholder Involvement	**Phase 2**		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
11.1 Public information and education programme developed			X
12. Site and supporting facilities	**Phase 2**		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
12.1 Detailed site characterization completed			X
12.2 Site ready for construction			X
13. Environmental Protection	**Phase 2**		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
13.1 Environmental studies for selected sites performed			X
13.2 Particular environmental sensitivities included in BIS			X
13.3 Clear and effective regulation of environmental issues established			X
14. Emergency Planning	**Phase 2**		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
14.1 Detailed approach to emergency planning being implemented			X
14.2 Emergency planning for existing radiation facilities and practices in place			X
14.3 Actions from earlier reviews completed			X

15. Security	Phase 2		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
15.1 Legislation promulgated			X
15.2 DBT defined			X
15.3 Security requirements defined			X
15.4 Sensitive information defined			X
15.5 Physical protection by trained on-site security staff provided			X
15.6 Programs for selection/qualifications of staff with access to facilities are in place			X
15.7 Security culture promulgated			X
16. Nuclear Fuel Cycle	**Phase 2**		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
16.1 Fuel cycle strategy decided			X
17. Radioactive Waste	**Phase 2**		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
17.1 Handling the burdens of radioactive waste considered			X
17.2 Implementation plan for ultimate high level waste disposal in preparation			X
18. Industrial Involvement	**Phase 2**		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
18.1 Realistic assessment of the national and local capabilities carried out			X
18.2 Ability to meet schedule and quality requirements analyzed			X
18.3 Plans and programmes to transition to national and local suppliers in place			X
19. Procurement	**Phase 2**		
Condition	Actions needed		
	SIGNIFICANT	MINOR	NO
19.1 Owner/operator competence to carry out nuclear procurement evident			X
19.2 Procurement programme consistent with national policy for industrial participation established			X

ATTACHMENT 1: REVIEW OBSERVATIONS, RECOMMENDATIONS AND SUGGESTIONS

PHASE 2

1. National Position Condition 1.1: Government support evident	Phase 2
Basis for Evaluation	**Review Observations**
Evidence that an ongoing government role for nuclear power programme implementation has been clearly defined and established within a government agency (e.g. energy or industry). Appropriate bilateral agreements in place with vendor countries.	Active Government support is demonstrated by: • Government agreed to and entered into international instruments and bi-lateral agreements (Korea, USA, France, UK) as called in the Policy document (2008) • National nuclear law -- Federal Law by Decree No. 6 promulgated on 24 September 2009 • Government made financial commitment to the program as is evident by funding FANR and ENEC ENEC selected KEPCO as the prime contractor for the first 4 NPPs and KEPCO will supply the full scope of works and services for the UAE Civil Nuclear Power Program including engineering, procurement, construction, nuclear fuel and operations and maintenance support with the assistance of other Korean members of the KEPCO Team. The contract calls for extensive training, human resource development, and education programs as the UAE builds the capacity to eventually staff the vast majority of the nuclear energy program with national talent, and develops the industrial infrastructure and commercial businesses to serve a thriving nuclear energy industry. **Condition 1.1: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 1.1

ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

1. National Position Condition 1.2: Commitments and obligations of owner/operator organizations established	Phase 2

Basis for Evaluation	Review Observations
Document setting out responsibilities of key national organizations and intended contracting strategy. Clarity of organization being licensed to operate the nuclear power plant and evidence of adequate resources to comply with license requirements. Clarity of role and responsibilities of the owner if different from the license holder. If vendor is undertaking any initial owner responsibilities, clear plans on how ownership, knowledge and capability will be transferred.	Federal Law by Decree No. 6 of 2009 established and empowered the Federal Authority for Nuclear Regulation as independent regulator to determine all matters relating to regulation, inspection, and oversight of the Nuclear Sector with respect to Safety, Nuclear Safety, Nuclear Security, Radiation Protection and Safeguards. The Emirates Nuclear Energy Corporation (ENEC) was established by Presidential Decree of 2009 as owner/operator of NPPs in UAE. During the formation period, EAA contracted experienced companies to provide extensive, broad-based nuclear experienced personnel to ENEC. Combined, the Program Office staff has over 500 years of nuclear industry experience. **Condition 1.2: Reached Milestone 2.** **Major Gaps: No major gaps identified.**

EVALUATION Condition 1.2

ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

2. **Nuclear Safety** **Condition 2.1. : Safety responsibilities by all stakeholders recognized**	**Phase 2**
Basis for Evaluation	**Review Observations**
Roles and responsibilities clearly defined with respect to nuclear safety in the operating, regulatory and technical support organizations. Protocol agreed for interactions between operator, regulator, vendor and technical support organizations. Process and responsibilities defined for review and understanding of information supplied by vendor during construction. Training programmes for regulators, operators and technical specialists defined including process for information exchange with design specialists. Evidence of how staff has acquired the necessary knowledge in nuclear safety covering national and international standards, nuclear safety good practices, for example, as set out in IAEA Safety Standards. Evidence that the categorization of safety importance of systems structures and components and the implications for quality and safety assessment is understood. Evidence that the safety requirements to ensure criticality safety during handling of nuclear material are understood and that processes are in place to ensure compliance with requirements.	Some roles and responsibilities for operating and regulatory organizations are defined in the comprehensive nuclear law, "A Federal Law by Decree No. 6 of 2009, 'Concerning the Peaceful Uses of Nuclear Energy'". (See also 5.1 with regard to responsibilities of the Environmental Agency of Abu Dhabi.) With respect to "technical support organizations" the Law addresses the operating organization maintaining responsibility when work is contracted. Regarding the regulatory body, there was no provision related to TSO; however, it did state in Article (6) "the Authority shall be exclusively responsible for issuing all licenses." …. Further, the roles and responsibilities are clearly defined within the contracts between FANR and its contractors. Of note is FANR's implementing arrangements with the Ministry of Education, Science and Technology (MEST) and the Korean Institute of Nuclear Safety (KINS) (regulatory support in the vendor country). The protocol for interactions between operator and contractors (goods and services) are addressed in the contract with the prime contractor and the operating organization's management system. The management system is described in the applicant's safety analysis report submitted as part of the construction license application, to be reviewed by FANR. FANR described its own management system that governs its procurement of services, among other things. FANR is provided with the authority to inspect manufacturers; however, their emphasis is on ENEC's management system and its implementation in this area. The process and responsibilities for review and understanding of information supplied by the vendor will be addressed by the management system for the operating organization. The responsibility for controlling contracted work is in the Law, itself. ENEC described how its staff worked directly with its vendor in the development of the construction license application (CLA), including the preliminary safety assessment report (PSAR) from the reference plant, into a submission to satisfy UAE regulations. Both FANR and ENEC have established training plans – FANR using IAEA TECDOC 1254. Training programs are discussed in more detail in Issue 10, Human Resource Development. Regarding evidence for staff acquiring knowledge of nuclear safety and categorization of systems, structures and components, this is demonstrated through both FANR and ENEC's approach to human resource development – initial reliance on external hiring of experienced experts. From an implementation aspect this is addressed through issuance of regulations and guides (FANR) and preparation of construction license. The safety requirements to ensure criticality safety are understood. FANR has planned for this activity within the overall project schedule.

	With respect to acceptance of the Global Nuclear Safety Regime, as committed to in the "Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy," UAE has committed to the adoption of all required international agreements and strict abidance with the resulting obligations. UAE has become party to the Nuclear Safety Convention. Its first report has been submitted to support the 5th Review Meeting in April 2011. **Condition 2.1: Reached Milestone 2.** **Major Gaps: No major gaps identified**.

EVALUATION Condition 2.1

ACTIONS NEEDED

Significant	**Minor**	**No X**

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

2. **Nuclear Safety** **Condition 2.2: Safety culture evaluated**	**Phase 2**

Basis for Evaluation	**Review Observations**
Operation feedback process defined involving all relevant organizations, including the review of international events. Report summarizing steps taken to ensure safety culture, review of effectiveness and future plans to maintain a high level of safety culture.	Operational feedback process is addressed through several vehicles. Principally, operational experience is required to be addressed within the design phase. ENEC has become a member of WANO and INPO. In addition, FANR participates with the IRS, is benefiting from the Multinational Design Evaluation Programme (MDEP), and supportive of NEA's ongoing efforts associated with the development of a construction experience database. Regarding safety culture, there were extensive discussions in this area. The Director General of FANR identified this as an area of continued emphasis and importance. FANR described the implementation of their safety culture. In addition, FANR described how they were using cultural experience to help provide context for safety culture. In the SER, ENEC Policy encourages workers "to strive for excellence in safety, to raise safety concerns with the management, and to identify concerns internally or to the appropriate regulatory authorities without any fear of possible reprisal." ENEC has also performed a program-wide assessment of safety culture. In addition, ENEC described its approach to safety culture -- ENEC's 8 Principles of Culture of safety and the integration of nuclear safety, industrial safety, and radiological safety -- and its implementation of a Condition Reporting System. Lastly, there is a Nuclear Safety Review Board providing an independent focus on safety. **Condition 2.2: Reached Milestone 2.** **Major Gaps: No major gaps identified.**

EVALUATION Condition 2.2

ACTIONS NEEDED

Significant	**Minor**	**No**	**X**

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

GP-2.2 No. 1 : FANR's and ENEC's implementation of safety culture throughout their respective organizations constitutes a good practice, specifically FANR's approach to applying cultural aspects to the principles and ENEC's training of its senior management, see GP-10.1 No. 1.

2. Nuclear Safety **Condition 2.3: Long term relationship with supplier established**	Phase 2

Basis for Evaluation	Review Observations
Planned contract defining required levels of support from vendor and mechanisms for information exchange, training, technical support, etc.	The Self-Assessment states that the Invitation to Tender clearly defined the long-term relationship required between operator and vendor. The approach was described during an Alternative Contracting and Ownership consultancy meeting held at the IAEA. Specifically, the tender included a level of equity partnership. From an implementation standpoint, the Tender included staffing requirements for operations and maintenance. **Condition 2. 3: Reached Milestone 2.** **Major Gaps: No major gaps identified.**

EVALUATION Condition 2.3
ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

3. Management **Condition 3.1: BIS Available**	**Phase 2**

Basis for Evaluation	**Review Observations**
Documented Bid Invitation Specification (BIS) available.	• Considering the complexity and the first-of-a-kind instance of building a NPP, ENEC developed an innovative approach towards procurement and developed a Bid Invitation Specification that had an owner's-requirements approach. • The BIS was successfully issued and well received by the respondents supporting its success. **Condition 3.1: Reached Milestone 2.** **Major gaps: No major gaps were identified.**

EVALUATION Condition 3.1

ACTIONS NEEDED

Significant	**Minor**	**No X**

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

3. Management **Condition 3.2: Adequate staff to prepare for and analyse bids available**	**Phase 2**
Basis for Evaluation	**Review Observations**
a) Description of organization including roles and responsibilities of departments and individuals with respect to Bid assessment, supervision of NPP construction, development of knowledge base, understanding of O&M requirements. b) Evidence that NPP Owner staff members are trained/qualified	• A well defined staffing plan was prepared for the procurement process identifying the various areas of technical, commercial, legal, project management, etc and the required technical expertise, qualifications and experience. • Existing staff possessing these qualifications and experience were allocated with specific scopes. • Gaps were filled through procuring services of expert consultants. • When required, independent reviews on specific topics were used to validate ENEC's evaluation and analysis. **Condition 3.2: Reached Milestone 2.** **Major gaps: No major gaps were identified.**

EVALUATION Condition 3.2
ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS :
None

SUGGESTIONS:
None

GOOD PRACTICES:
None

3. Management **Condition 3.3: Bid evaluation criteria determined**	**Phase 2**
Basis for Evaluation	**Review Observations**
a. Clear description of how bids will be evaluated. Evidence that criteria include any country specific requirements, safety and security aspects, the complete fuel cycle requirements, as well as financial, legal, technical and commercial aspects. b. Bid evaluation criteria, including weights, to be included in the BIS	The evaluation criteria were developed well in advance during the early stages of tender development and were progressively elaborated and refined in view of value adding inputs from lessons learned from experts. **Condition 3.3: Reached Milestone 2.** **Major gaps: No major gaps were identified.**

EVALUATION Condition 3.3
ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

3. Management **Condition 3.4: Contracting strategy established**	**Phase 2**

Basis for Evaluation	**Review Observations**
Document reviewing contracting strategies and justifying the chosen approach. Approval that chosen strategy is consistent with national legislation. Implications recognized and plan to fulfil necessary requirements in place.	The contracting strategy was initially outlined broadly in the Roadmap to Success and evolved into firm shape through the periods of bidders, prequalification and tendering phase, mainly due to the complexity of the nuclear procurement process. The updated version of the strategy was implemented in the development of the draft contract. **Condition 3.4: Reached Milestone 2.** **Major gaps: No major gaps were identified.**

EVALUATION Condition 3.4
ACTIONS NEEDED

Significant	**Minor**	**No** **X**

RECOMMENDATIONS:
None

SUGGESTIONS:
None

GOOD PRACTICES:
None

3. Management **Condition 3.5: Project management organization established**	**Phase 2**

Basis for Evaluation	**Review Observations**
a) Justification of adequate staffing (numbers, skills, experience). b) Roles and responsibilities within the organization clearly defined, particularly with respect to control of work and acceptance. c) Project reporting mechanisms defined. d) Acceptance procedures and criteria defined. e) Plans to acquire/develop required commissioning skills. f) Interfaces with other organizations defined and agreed on.	• ENEC developed a Program Management Organization structure defining clear roles and responsibilities for each functional unit. • The main role of the ENEC Project Management Team (Prime Contractor Oversight Management–PCOM), reporting to the ENEC Chief Program Officer (CPO), is to supervise the Prime Contractor activities. This team has around 200 positions (60% local staff, on the job training). Later, at the beginning of the commissioning, about 50% of PCOM are likely to be transferred to NPP Operation, reporting to ENEC Chief Nuclear Officer (CNO). • ENEC PCOM is also responsible for the NPP licensing activities, with the technical support of KEPCO. For example, NPP Construction License Application package was analyzed by ENEC PCOM and verified in detail for particular changes from the Reference Plant (environmental issues, electrical frequency changes). • All the interfaces of ENEC PCOM with the Prime Contractor (KEPCO) were identified and associated procedures were produced and agreed between Parties. • The training program for the local staff required for NPP commissioning is defined and included in the commercial contract with the Prime Contractor. The local staff of PCOM has already started the familiarization program with the Reference Plant. • ENEC "Project Management Information System-PMIS" was developed to ensure planning, execution and monitoring of all NPP Project activities. **Condition 3.5: Reached Milestone 2.** **Major gaps: No major gaps were identified.**

EVALUATION Condition 3.5
ACTIONS NEEDED

Significant	**Minor**	**No X**

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

3. Management **Condition 3.6: Management systems established**	**Phase 2**

Basis for Evaluation	**Review Observations**
All participating organizations (including the regulatory bodies) established and have documented management systems which promote strong safety safeguards and security culture. Management systems are consistent with IAEA recommendations.	• ENEC has developed an integrated management system (referred to as the ENEC Management Model) based on guidance from IAEA Safety Standard GS-R-3, *Management System for Facilities and Activities*, and best practices in nuclear utilities. The system consists of policies, program requirements, process descriptions and implementing tools (procedures, forms, databases, etc.). • The Management Model is an integrated management system, consisting of a systematic and hierarchal set of controlled documents. • ENEC "Project Management Information System-PMIS" was developed to ensure planning, execution and monitoring of all activities. • ENEC Delivery Management System (EDMS) serves to inform the program staff on how the work is done in different functional areas and provides easy access to the related forms, instructions and contact persons. • ENEC established and has started to implement a performance measurement system based on the Key Performance Indicators (KPI). • FANR has established a management system in accordance with international standards and IAEA GS-R-3, "*The Management System for Facilities and Activities".* • FANR IMS provide the integrated processes and supporting procedures that enable the Authority to implement and demonstrate its actions in an efficient and transparent way. • During development of FANR IMS, consultation with ENEC took place, taking into account the ENEC role (applicant). • FANR IMS is already implemented, verified (assessed) and reviewed based on the feedback from FANR employees. **Condition 3.6: Reached Milestone 2.** **Major gaps: No major gaps were identified.**

EVALUATION Condition 3.6
ACTIONS NEEDED

Significant	**Minor**	**No X**

RECOMMENDATIONS
None

SUGGESTIONS
None

3. Management **Condition 3.6: Management systems established**	**Phase 2**
Basis for Evaluation	**Review Observations**

GOOD PRACTICES

GP-3.6 No. 1: Development and implementation of the Management Systems starting with the initial stage of the newly created organisations (nuclear regulatory body-FANR and NPP Owner/Utility-ENEC), will support the implementation of the appropriate level of safety culture in these involved organisations in National Nuclear Power Program.

GP-3.6 No. 2: Good cooperation exists between nuclear regulatory body (FANR) and NPP Owner/Utility (ENEC), without compromising the nuclear regulatory body's independence.

4. Funding and Financing **Condition 4.1: Strategy for management of financial risks available**	**Phase 2**

Basis for Evaluation	**Review Observations**
a) Document identifying level of borrowing intended and nature of guarantees. b) Risk Management Plan identifying all the key financial risks, their owner, likelihood, consequence, how they are being controlled and mitigated, including the nature of any guarantees. These need to cover the impact of a significant event on: prolonged shutdown, public liabilities, delays in construction, regulatory delays, government/public intervention	• At this stage, NPP project funding is based on the state budget provision. The alternative arrangements (including potential equity suppliers and loans) are under analyses by ENEC and its finacial consultants, for further optimisation of the NPP Project financing and funding. • The risk related to the arrangement of the financing for the UAE Nuclear Program is mitigated because the Abu Dhabi government (rated AA/ Stable/A-1+ by S&P) is willing to back 100% of the NPP project. • The financial risks will be managed via a comprehensive financial model, amongst other risk mitigation strategies. • ENEC's finance team will ensure systematic financial planning and risk management. • ENEC will use best in class financial management practices at all times, and will be able to draw on external, objective experts as necessary to ensure optimal performance. **Condition 4.1: Reached Milestone 2.** **Major gaps: No major gaps identified.**

ACTIONS NEEDED

EVALUATION Condition 4.1

Significant	**Minor**	**No X**

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

4. Funding and Financing **Condition 4.2: Funding and financing plan available**	**Phase 2**

Basis for Evaluation	**Review Observations**
a) Means of funding the regulatory body established. b) Report comparing financial performance against the financing plan approved at Milestone 1 in order to demonstrate a sound budgeting, monitoring and control process. The identified funding at Milestone 1 was made available during Phase 2. The document should also clearly identify lessons learned and actions taken. c) Phase 3 Financing Plan for selected NPP site matched to vendors plan including all national commitments for participation in construction, for operator costs, Regulatory Body costs, other stakeholders and emergency planning. d) For each element and for the aggregated requirements, demonstrate a ratio of financing achievement approaching 90%. i.e: Mobilized/committed financial resources > 90%. Resource requirements estimated and committed.	• The UAE civil nuclear energy program; including the Nuclear Safety Regulator (FANR), NPP Owner/Operator, security and related infrastructure projects, has the complete support of the Government. • Currently ENEC is looking at various alternatives for financing the program, including equity investment from Prime Contractor (as per contractual arrangement), Export Credit Agency and commercial bank financing to complement the equity investment by the owners. • The owner/operator funding and financing plan will be refined as ENEC confers with its financial advisors. • Future actions required to complete the financing process include completing analysis of total program cost and other requirements necessary to insure a bankable transaction, completing the due diligence process required by the ENEC financial advisors and the lending banks, and completing the Power Purchase Agreement with the Abu Dhabi Water & Electric Company (ADWEC). **Condition 4.2: Reached Milestone 2.** **Major gaps: No major gaps identified.** Specific ENEC actions are already planned for the optimization of the financing process and funding mechanism for the NPP Project.

EVALUATION Condition 4.2
ACTIONS NEEDED

Significant	**Minor**	**No** **X**

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

5. Legislative Framework **Condition 5.1:International Legal Instruments governing nuclear activities in force**	**Phase 2**

Basis for Evaluation	Review Observations
Evidence that the State has adopted relevant international legal instruments governing nuclear activities in particular: a) The Convention on Early Notification of a Nuclear Accident b) The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. c) The Convention on Nuclear safety d) The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste management e) The Convention of Physical Protection of Nuclear Materials and its Amendment f) The Vienna Convention on Civil Liability for Nuclear Damage, the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage and the Convention on Supplementary Compensation for Nuclear Damage g) Comprehensive Safeguards Agreement between the State and the IAEA[1] h) Revised Supplementary Agreement concerning the provision of Technical Assistance by the IAEA	The UAE has adhered to all of the relevant international legal instruments with the exception of those related to the civil liability for nuclear damage (nuclear liability). The UAE policy paper includes a commitment to adhere also to these latter instruments. In this context, it was observed that a study of the Vienna Convention and associated national implementing legislation was launched in February 2010. The study is expected to make significant progress in the late 2011/early 2012 timeframe, at which point it is envisioned that the ratification of the 1997 Vienna Convention and accompanying national legislation would be submitted in a single package to the Government. It was observed that the UAE has also initiated a study of the Convention on Supplementary Compensation (CSC). However,, as the ratification of the CSC by the UAE would not be sufficient for entry into force of the CSC, its ratification would be considered further at an appropriate time. The Additional Protocol to the Comprehensive Safeguards Agreement was brought into force in December 2010. **Condition 4.2: Reached Milestone 2.** **Major gaps: No major gaps identified.** It was recognized that a plan is in process to adopt a nuclear liability regime; however this had not been finalized at the end of Phase 2, and was considered a minor gap.

EVALUATION Condition 5.1

ACTIONS NEEDED

Significant	Minor X	No

RECOMMENDATIONS

R-5.1 No. 1: The UAE is recommended to adopt the relevant nuclear liability instruments and promulgate implementing national legislation.

SUGGESTIONS

None

[1] The IAEA encourages Member States to consider concluding the Additional Protocol.

4. Funding and Financing **Condition 4.2: Funding and financing plan available**	**Phase 2**
Basis for Evaluation	**Review Observations**
GOOD PRACTICES **None**	

5. Legislative Framework **Condition 5.2: A comprehensive nuclear law is enacted and in force**	**Phase 2**

Basis for Evaluation	**Review Observations**
Evidence that the State has promulgated the national nuclear legislation including the following main elements; a) Establishing an independent regulatory body with clear functions b) Establishing an authorization system responsibilities of the operator, inspection and enforcement c) Formulation of principles and requirements (for each subject area, e.g. radiation protection, radiation sources, nuclear installations, radioactive waste management and spent fuel, decommissioning, mining and milling, emergency preparedness, transport of radioactive material) d) Establishing compensation mechanisms for nuclear damage e) Implementing IAEA safeguards f) Implementing import and export controls of nuclear material and items g) Formulation of security principles including physical protection of nuclear material and facilities	The UAE has promulgated a nuclear law (Federal Law No. 6) which covers safety, security and safeguards but not civil liability for nuclear damage. Implementing regulations, for the CSA and the Additional Protocol, are under preparation. Import and Export implementing regulations are in an advanced stage of preparation by FANR, in cooperation with the national office responsible for import/export administration. For safeguards and Import/Export regulations, progress is consistent with the level of development of the programme. **Condition 5.2: Did not reach Milestone 2.** **Major gaps: No major gaps identified.** It was recognized that a plan is in process to develop specific legislation for nuclear liability.

EVALUATION Condition 5.2
ACTIONS NEEDED

Significant	**Minor X**	**No**

RECOMMENDATIONS

See Recommendation R-5.1 No. 1

SUGGESTIONS

None

GOOD PRACTICES

None

5. Legislative Framework **Condition 5.3: All legislation dealing with the nuclear power programme developed, promulgated and in force**	**Phase 2**
Basis for Evaluation	**Review Observations**
Evidence that the State has adopted other laws relevant to a nuclear power programme, in particular in the following areas: a) Environmental protection b) Emergency preparedness and management c) Occupational health and safety of workers d) Protection of intellectual property e) Local land use controls f) Foreign investment g) Taxation h) Roles of national government, local government, stakeholders and the public i) Financial guarantees Further detail is available in the IAEA Handbook on Nuclear Law	It was observed that the UAE surveyed existing laws for relevance to a nuclear power programme when the Roadmap was prepared, and before the Federal Law 6 was drafted. It was explained that the legal system works in such a way that new laws supersede previously promulgated laws, and that federal laws supersede local. Some practices are followed which help ensure awareness and compliance with other relevant laws: The FANR licensing process requires compliance with all other laws. ENEC engages in regular consultation with other federal and local Government stakeholders through its stakeholder working groups; through these interactions, additional legal requirements from non-nuclear laws can surface. (See also stakeholder involvement.) Similarly, it was observed that FANR also maintains relationships with other government offices, and an example was given regarding cooperation with the authority for nuclear import/export regulations. It was observed that the UAE is aware that Federal Law 24 establishes the Environmental Agency of Abu Dhabi as the competent authority for environmental assessment, including the nuclear program, and certain responsibilities regarding ionizing radiation and nuclear waste could overlap with the authority given to FANR in Federal Law 6. There have been discussions between EAD, FANR and ENEC that have resulted in agreements concerning environmental assessments of the nuclear program. EAD has also vacated any role in the regulation of radiation materials. There are plans to codify this understanding that FANR has responsibility for nuclear aspects and EAD for non-nuclear aspects via a Memorandum of Understanding. The MOU is expected to be completed in 2011. It was noted that a senior official from EAD is a member of FANR Board of Management. **Condition 5.2: Did not reach Milestone 2.** **Major gaps: No major gaps identified.** It was recognized that a plan is in process to codify the understanding between EAD and FANR through an MOU, although an amendment of the two laws, 24 and 6, to clearly delineate responsibilities in the longer term should be considered

5. Legislative Framework **Condition 5.3: All legislation dealing with the nuclear power programme developed, promulgated and in force**	**Phase 2**
Basis for Evaluation	**Review Observations**

EVALUATION Condition 5.3

ACTIONS NEEDED

Significant	Minor X	No

RECOMMENDATIONS

None

SUGGESTIONS

S-5.3 No. 1: It is suggested to complete a formal arrangement to clarify roles and responsibilities between FANR and EAD, as planned. It is also suggested to consider amending the two laws to clearly delineate responsibilities in the longer term.

GOOD PRACTICES

None

6. Safeguards **Condition 6.1: Terms of international safeguards agreement in place**	**Phase 2**

Basis for Evaluation	Review Observations
Comprehensive safeguards agreement and associated subsidiary arrangements with the IAEA in force. (a)	Comprehensive Safeguards Agreement and Additional Protocol are in force (2003; 2010). Subsidiary Arrangements (General Part) are under preparation. **Condition 6.1: Reached Milestone 2** **Major Gaps: No major gaps were identified**

EVALUATION Condition 6.1
ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

6. Safeguards **Condition 6.2: SSAC established and operational**	**Phase 2**

Basis for Evaluation	Review Observations
Evidence of an established and technically competent SSAC, including designation of national authority and definition of role, responsibilities and reporting methods. Plans to maintain the technical competence and provision of necessary resources to the SSAC to match the development of the nuclear power programme. Evidence through information exchange with the IAEA that the SSAC has a good understanding of the principles of safeguarding a nuclear power plant, including the type of equipment the IAEA may install in the facility.	The SSAC is being established. FANR, the State SSAC regulatory authority, has been designated and its roles, responsibilities and reporting methods defined. FANR is building its capabilities to match the nuclear power programme development, strengthening its safeguards competence and increasing its resources to fulfill the State's obligations under full scope CSA (without SQP) and additional protocol. Based on the recent communication/consultations with the IAEA (SG Dep.), FANR is continuously increasing its understanding of the principles of implementing safeguards based on the requirements of full scope CSA (without SQP) and additional protocol, including safeguarding a nuclear power plant. An IAEA training course is scheduled in the UAE in March 2011, which provides an opportunity for training on implementing full scope CSA (without SQP) and AP requirements. **Condition 6.2 (Phase 2): Reached Milestone 2** **Major Gaps: No major gaps were identified**

EVALUATION Condition 6.2
ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS

None

SUGGESTIONS

S-6.2 No. 1: To further strengthen the establishment and maintenance of the SSAC, FANR might consider requesting the IAEA SSAC Advisory Service (ISSAS mission).

GOOD PRACTICES

GP-6.2 No. 1: Submission to FANR of a Preliminary Safeguards Plan within the application for Braka Units 1 and 2 construction license (addressing the safeguards requirements at this early stage of construction).

6. Safeguards **Condition 6.3: Early safeguards relevant information provided to IAEA**	**Phase 2**

Basis for Evaluation	Review Observations
Information on technology and list of designs being included in the BIS. If a design had already been chosen, design information submitted to the IAEA with any specific national variations.	The very early Braka NPP design information was submitted to the IAEA in 2010. However, since ENEC has recently applied for the Braka units 1 and 2 construction license, the submitted design information might be significantly updated. **Condition 6.3 (Phase 2): Reached Milestone 2** **Major Gaps: No major gaps were identified**

EVALUATION Condition 6.3
ACTIONS NEEDED

Significant	**Minor**	**No X**

RECOMMENDATIONS

None

SUGGESTIONS

S-6.3 No. 1: Despite the fact that the Subsidiary Arrangements have not been completed, FANR should consider the appropriate timing for submission to the IAEA an updated early design information of Braka NPP ~ preliminary version of DIQ reflecting the status of "Pre-Construction (Design and Planning) Phase".

GOOD PRACTICES

None

6. Safeguards **Condition 6.4: Specific legislation and relevant safeguards procedures in place**	**Phase 2**

Basis for Evaluation	Review Observations
Legislation reviewed by the IAEA and any outstanding actions implemented.	Federal Law on Peaceful Use of Nuclear Energy by Decree No. 6 (2009) and Federal Law on Export and Import Control No. 13 (2007) are in place. The UAE believes that Law No 6 sufficiently provides for fulfilling the obligations of the additional protocol and does not consider any amendments necessary; rather issuance of implementing regulations would be sufficient to achieve this purpose. Several FANR regulations (e.g. on nuclear material accounting and reporting and export control) are under preparation. During discussions and interviews with the INIR team, FANR clearly demonstrated understanding of the necessity of finalizing these regulations that allows full scope implementation of CSA (without SQP) and additional protocol including the development of the nuclear power programme. The level of their readiness presented by FANR justifies its expectation to have the regulations approved within few months. Given its situation, the progress in this issue is consistent with the level of its programme at the time of the INIR mission. **Condition 6.4 (Phase 2):** Reached Milestone 2 **Major Gaps:** No major gap was identified.

EVALUATION Condition 6.4
ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS

None

SUGGESTIONS

S-6.4 No.1: FANR may consider requesting the IAEA to review the draft safeguards related regulations, as planned.

S-6.4 No. 2: The necessary safeguards related regulations for the full scope implementation of CSA and additional protocol requirements should be finalized.

GOOD PRACTICES

None

7. Regulatory Framework **Condition 7.1: Independent nuclear regulatory body established**	**Phase 2**
Basis for Evaluation	**Review Observations**
A report evaluating the relevant regulatory functions against those described in IAEA Safety Requirement GS R 1 [6] and the criteria defined in the IAEA Integrated Regulatory Review Service (IRRS) methodology. Information available should include: a. clear description of roles, responsibilities, organization structure, staffing requirements, areas requiring expert and consultant services b. documented formal management system c. training plans to provide required SQEP staff for all roles d. plans for the development and maintenance of an appropriate safety, security and quality structure e. links established with other international regulatory bodies, regional and international regulator forums f. clear definition of information requirements at each stage of construction and definition of hold points and process for clearance g. agreed process for certification of operators h. agreed policy and process with respect to public availability of information including dealing with commercially sensitive information i. process for keeping of records j. preconstruction safety report assessed or clear evidence that there is sufficient competence to complete assessment prior to construction of chosen design	This peer review does not make an attempt to evaluate conformance with IAEA safety functions – that would be done in a more in-depth IRRS mission. This report represents a more broad overview. The Federal Law No 6 of 2009 establishes the Federal Authority for Nuclear Regulation (FANR) as the UAE's nuclear regulatory body. The Law establishes the responsibilities of FANR. The organizational structure of FANR is available on their website. Their staffing plan was described and their approach to having all competencies represented within the staff, and their approach to technical support. b) The law requires FANR to apply Quality Assurance principals to all procedures related to its functions. In the initial stage of development, FANR implemented a management system in accordance with IAEA Safety Standard, GS-R-3. This programme is comprehensive and governs the development and implementation of all regulatory functions. C) the Self-Assessment describes training plans for ENEC and FANR, these are discussed in detail under issue 10, "Human Resources." d) plans for appropriate safety, security, and quality structure are included as part of the management system and part of FANR's integrated approach to safety culture. e) FANR website identifies bilaterals with KINS (regulatory support in the vendor country of origin) and the NRC. Strong relationship with IAEA and has initiated discussions with OECD/NEA. f) Regulations issued on information of construction license. Guidance refers to NRC RG 1.206 for contents of SAR. Authorization steps in the Law and review procedures were developed within the management system. G) Regulation for "Certification of Operations Personnel" is identified as under development on the FANR website, this is planned as a near term activity—first half 2011. H) Transparency and availability of information is addressed as one of FANR's Core Values. It is also addressed within the national law. FANR is currently developing its implementing procedures for this. I) Record keeping requirements are addressed within the LAW and the FANR management system. In addition, the self-assessment states that FANR is in process of developing IM/IT infrastructure for a comprehensive document management system. This is a high priority activity with expected implementation in the first half 2011. J) FANR stated they have the competencies in place and provided the staffing plan to support the active reviews (i.e., CLA review).

7. Regulatory Framework **Condition 7.1: Independent nuclear regulatory body established**	**Phase 2**

Basis for Evaluation	Review Observations
k. codes and standards to be used listed for each area. Evidence of understanding of requirements. Justification of mix of national, foreign and international standards and codes. Areas covered should include: i. transport, storage and handling of nuclear and radioactive material ii. radiation protection including remediation iii. site licensing iv. siting v. environmental protection vi. design vii. construction viii. commissioning ix. decommissioning x. security and safety xi. waste management xii. emergency planning ne approach to reviewing the above is to request an IAEA Safety Review Service (Graded IRRS).	They will also utilize technical support to augment their review .k) FANR has issued or is in process of developing regulations addressing these areas. FANR is in the process of developing regulatory guidance that directly support ongoing licensing reviews. FANR described a gap analysis between their regulations and IAEA safety standards and offered to make this available to the IAEA. The UAE has tentatively scheduled an IRRS Mission to be conducted late in 2011. **Condition 7.1: Reached Milestone 2.** **Major gaps: No major gaps identified.** Note, there are several activities described above that should be completed to support licensing activities in progress—corresponding to Phase 3.

EVALUATION Condition 7.1

ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS

None

SUGGESTIONS

S-7.1 No. 1: FANR should finalize/implement its regulatory guidance, document management system, and the process related to the public availability of information that would directly support the licensing activities.

GOOD PRACTICES

On the implementation of management systems see GP-3.6 No. 1.

8. Radiation Protection **Condition 8.1. Actions to prepare adequate radiation protection programs undertaken**	**Phase 2**

Basis for Evaluation	**Review Observations**
Radiation monitoring and protection programmes in place for occupational exposure of workers, the public and environment, and capable of dealing with construction and any training of staff at other locations. An environment monitoring programme in place. The ´preliminary results will constitute the 'finger print' to be used in comparing with the values to be recorded during the commercial operation. The appropriate equipment and systems for radiation monitoring are included in the BIS. The owner/operator plan for radiation protection has been submitted to the regulator for review.	Radiation monitoring and protection programmes of ENEC have been developed and submitted to FANR as part of the CLA. ENEC has, in cooperation with the Korean counterpart, prepared a training program on radiation protection. The regulatory framework for radiation protection is in place following FANR' s issuing three regulations in the second half of 2010: 1. Radiation Dose Limits and Optimization of Radiation Protection for Nuclear Facilities 2. Radiation Protection and Pre-Disposal Radioactive Waste Management in Nuclear Facilities 3. Basic Safety Standards for Facilities and Activities involving Ionizing Radiation Other Than in Nuclear Facilities. FANR has adopted the Code of Conduct on the Safety and Security of Radioactive Sources in its regulatory practices and recognises the need to formalize the full implementation. FANR has an approved training program for professional (and support) staff. The level of training of professional staff is verified according to FANR management system. Following the BIS the Prime Contract scope includes requirements for a radiation protection program. FANR has already started the implementation of the National Early Warning System (two measuring points established). Active cooperation with IAEA is ongoing in this area. **Condition 8.1: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 8.1
ACTIONS NEEDED

Significant	**Minor X**	**No**

RECOMMENDATIONS

None

SUGGESTIONS

S-8.1 No. 1: The UAE should formalize the full implementation of Code of Conduct on the Safety and Security or Radioactive Source.

8. Radiation Protection **Condition 8.1. Actions to prepare adequate radiation protection programs undertaken**	**Phase 2**
Basis for Evaluation	**Review Observations**
GOOD PRACTICES **None**	

8. Radiation Protection **Condition 8.2: Expansion of appropriate infrastructures planned**	**Phase 2**

Basis for Evaluation	**Review Observations**
Evidence that all relevant organizations have analysed skill requirements associated with implementing a nuclear power programme Requirements for expansion of regulatory and specialist organizations defined, funded and recruitment/training plans in place	FANR clearly presented its plans to improve UAE radiation protection infrastructure covering: a) the licensing approach; b) building laboratory capacity; c) establishing national source and dose registers; and d) developing source recovery capability. The FANR Board is currently discussing the role of the Radiation Protection Committee. Cooperation with the IAEA for the establishment of a secondary standard dosimeter laboratory is ongoing. The Prime Contract scope includes requirements associated with a radiation protection program for ENEC. ENEC skill requirements were analysed and addressed related to training (condition 8.1. above) needs for the radiation monitoring and radiation protection programs. ENEC capabilities are being developed consistent with the plans submitted to FANR as part of the CLA. Necessary funds for foreseen programs are available. **Condition 8.2: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 8.2
ACTIONS NEEDED

Significant	**Minor**	**No**	**X**

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

9. Electrical Grid **Condition 9.1: Detailed studies to determine grid expansion, upgrade or improvement undertaken**	**Phase 2**

Basis for Evaluation	**Review Observations**
Plans to address the grid requirements associated with the inclusion of the NPP. The plans should include: a) enhancement and/or expansion compatible with the increased generating capacity b) achieving the overall grid stability and reliability requirements for safe operation c) justification of the reliability/capacity of the 'off site power' for the NPP. Redundant independent 'off site lines' should be considered d) provision of grid specifications into the BIS e) plans and programmes to train regional and national grid controllers covering the installation of an NPP in the grid.(behaviour, transients, etc.) f) plans to define a procedure addressing the interactions between the NPP and the grid including protocols to be agreed with the controller covering connection and disconnection of the plant and urgent and emergency procedures.	An electrical grid study was performed by external consultant KEMA. Their work resulted in a detailed study report "Final Report", issued in February 2009, which confirmed an initial acceptance and circumstances of bringing NPP into the planned electrical grid developments. The study recommended: 1. additional detailed system and technical studies to be done under the auspices of electrical grid company at a later date, 2. enabling coordination of power and water generation planning with NPPs in the electrical grid in the future, 3. review and upgrade of the relevant codes to account for the nuclear power generation and its operating specifics review and refine connection rules for the Emirates National Grid (ENG) & Gulf Cooperation Council (GCC) interconnection networks. The redundant power supply to the NPP design has been agreed to with electricity transmission company and adequate transmission line corridors have been selected. Transmission technical specifications and requirements for the high voltage switchyard and interface between the NPP and electrical grid were included in the BIS. Plans on training on grid controllers will be considered as outcome of TRANSCO consultant activities on electricity system stability. **Condition 9.1: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 9.1
ACTIONS NEEDED

Significant	**Minor**	**No** **X**

RECOMMENDATIONS
None

9. Electrical Grid **Condition 9.1: Detailed studies to determine grid expansion, upgrade or improvement undertaken**	**Phase 2**
Basis for Evaluation	**Review Observations**
SUGGESTIONS **None**	
GOOD PRACTICES **None**	

9. Electrical Grid **Condition 9.2. Plans, funding and schedule for grid enhancement available**	**Phase 2**

Basis for Evaluation	**Review Observations**
Evidence that funding and schedules for grid enhancements, compatible with the foreseen construction, testing and commissioning have been approved and that delivery times of towers, lines and components, substations and switch yards are consistent with the construction schedule.	ENEC is coordinating NPP requirements with the electricity transmission company (TRANSCO) and specifying planning, funding and construction in line with NPP schedules. A Memorandum of Understanding was prepared to define all necessary steps by both parties and plans agreed with the parties. Requirements for power during construction and commissioning has been defined and provided to TRANSCO, who has hired consultant to finalize the requirements on system stability. KEPCO has hired a consultant to define detailed interfaces with the NPP and the grid. Work is in progress with the relevant government departments and companies to ensure that all necessary supporting infrastructure and utilities required for early stages of the NPP program are in place and will be executed by the required time, including all local permits and approvals. Work has started with TRANSCO to formally include the NPP requirements into the work development plan and budgeting forecast for the required work for the initial NPP start up. Plans on grid enhancements are being finalized. **Condition 9.2: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 9.2
ACTIONS NEEDED

Significant	**Minor**	**No x**

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

10. Human Resources **Condition 10.1: Knowledge and skills needed in organizations for Phase 3 and operational phase identified**	**Phase 2**
Basis for Evaluation	**Review Observations**
Evidence that staff have appropriate skills and experience particularly in: a) types of proven designs of NPP and potential suppliers b) main technical characteristics of potential plants c) nuclear and radiation safety d) owner/operator technical and legal inputs (funding and financing, legal framework, site, regulations, licensing process, grid characteristics, etc.) e) contracting methodologies f) project Management g) national and local participation capabilities and targets h) public information and communications. Evidence that appropriate staff have visited operating plants similar to those being considered. Evidence that all the skills required to write bid specifications and evaluate submitted information are in place. This should cover technical, management and commercial issues. An analysis of the competences needed in all organizations involved in Phase 3 and initial operational phase. The analysis should: a) include contributions from each of the organizations b) reflect realistic expectations regarding the owner's scope of supply and that of other organizations	FANR and ENEC have selected several nuclear experience contractors and placed key personnel into the organization. Personnel with previous skills and experience in nuclear plant regulation, operation and construction supplement their own staff. Also, essential supporting functions such as public information, legal and financing affairs and HR management are included in this concept. The ENEC Program Office staff has over 1000 years of nuclear industry experience to date; comparable support exists in FANR. 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. Fourteen senior leaders in ENEC, including the CEO, have attended the Executive Nuclear Management Course at MIT. 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.

10. Human Resources **Condition 10.1: Knowledge and skills needed in organizations for Phase 3 and operational phase identified**	**Phase 2**
Basis for Evaluation	**Review Observations**
c) ensure an appropriate balance of skills between operating organization, regulator and specialist organizations with adequate training in each d) include consideration of a remuneration structure that will ensure that all organizations are adequately staffed e) address the needs of support organizations (e.g. for maintenance, refurbishment, replacement) including appropriate training programmes f) address requirements for changes to national education infrastructure. Recruitment and training programmes covering: a. technical requirements (including nuclear specific technical capabilities) b. business requirements c. public relations requirements d. fuel procurement e. construction management and commissioning f. operation and maintenance	ENEC and FANR have demonstrated an active coordination of the various activities being undertaken in the different organisations, to ensure an integrated approach to the development of required workforce and competence, including utilization of the infrastructure available in the country and abroad. Arrangements are in place for all organizations, that staff members become familiar with the plant design, the operation, regulatory and other administrative practices in the country of design origin. Extensive visits and other means of information gathering have already been completed and the program will continue in phase 3. Recruitment of staff is according to plan in ENEC and FANR, and completed as needed for the time being. **Condition 10.1: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 10.1
ACTIONS NEEDED

Significant	Minor	No x

RECOMMENDATIONS
None

SUGGESTIONS
None

10. Human Resources **Condition 10.1: Knowledge and skills needed in organizations for Phase 3 and operational phase identified**	**Phase 2**
Basis for Evaluation	**Review Observations**
GOOD PRACTICES **GP 10.1 No. 1: The UAE has taken a pragmatic approach to rapidly building the national capabilities needed to implement the Nuclear Power Project and long-term sustainability through development of a national workforce through "Emiratization". The concept is based on a mix of senior advisors, support companies and national staff which supports the efficient transfer of knowledge.** **GP 10.1 No. 2: The Participation of top management from ENEC in an Executive Nuclear Course demonstrates the full commitment to the values of Nuclear Competence Development and Safety Culture.** **GP 10.1 No. 3: The active coordination in human resource development undertaken in the different organisations, especially between the utility, the regulatory body and the education community, is a model for the effective use of resources. It also helps ensure an integrated approach to the development of required workforce and competence.**	

10. Human Resources **Condition 10.2: A plan to develop and maintain the human resource base in organizations for Phase 3 and operational phase is developed**	**Phase 2**
Basis for Evaluation	**Review Observations**
Adequate training programmes for maintenance and operation and technical support personnel. Evidence of sufficient competence in key organizations to specify training requirements. Evaluation of the need for training abroad at operating plant similar to those being considered. Any necessary language training started or planned. Programmes in place for involvement of future operation and maintenance personnel with the construction and commissioning groups. Evidence that licensing requirements have been taken account of in training programmes, in order to remove the risk of start up delays due to lack of licensed personnel. A human resource development plan that identifies the requirements of the owner and other key stakeholders during Phase 3 and initial plant operations. The plan should address the resources that are available, those that are expected to be recruited/developed nationally and the external resources needed to augment national resources. Key stakeholder organizations have participated in the development and review of the above plan. The BIS addresses what is required from the supplier with respect to the training and development of resources to carry out the owner and support responsibilities during commissioning, and initial plant operations. The BIS includes the provision of simulator training requirements.	A nuclear operations organization structure was developed in order to estimate needed capabilities and includes a nuclear operations staffing model to calculate staffing needs from 2009 until 2022. This staffing model summarizes and charts the numbers of positions and qualifications for Nuclear Operations in numerous ways including: • Number of people over time and qualification for each department • People in positions by year • People in departments by power plant • Professional engineering versus technicians by year • Distribution of technical level staff • Summary of positions by qualifications Competence Matrixes and Training Need analysis had been completed within ENEC and FANR to the extent needed for the time being and for the development and implementation of training programs in phase 3. Further detailed analysis will be executed within phase 3 Prime Contract has KEPCO providing 271 qualified individuals to support NPP organization positions and includes the training and qualification of 272 ENEC personnel to fill NPP organizational positions. The contract also includes the use of the System Approach to Training (SAT) for the development of training programs. In anticipation of operator licensing requirements, training programs based on the systematic approach to training, including simulator training needs, and anticipated licensed operator and non-licensed operator staffing numbers have been included in the Prime Contract. Inclusion of early simulator development and delivery are recognized as needed to support the required operator training programs. FANR is in the final stage of issuing requirements related to the Qualification of NPP Personnel (expected in 2011) **Condition 10.2: Reached Milestone 2.** **Major gaps: No major gaps identified.**

10. Human Resources **Condition 10.2: A plan to develop and maintain the human resource base in organizations for Phase 3 and operational phase is developed**	**Phase 2**
Basis for Evaluation	**Review Observations**

EVALUATION Condition 10.2
ACTIONS NEEDED

Significant	**Minor**	**No X**

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

GP 10.2 No. 1: The consequent use of the Systematic Approach to Training (SAT) in all organizations involved namely ENEC and FANR and the consideration of SAT as a requirement for the development of all training programmes within contracts is considered a good practice.

11.Stakeholder Involvement **Condition 11.1: Public information and education programme developed**	Phase 2
Basis for Evaluation	**Review Observations**
For each of the main organizations (government, regulator, and operator), a clear statement of the role and responsibilities in proactive stakeholder management covering: public, local government, industry, media, NGOs (Non-government organizations), opposition groups, neighboring countries. An inter-organization stakeholder management strategy, evidence of regular review meetings and integrated stakeholder management plans for each organization. Evidence of training and experience of spokespersons. Material produced in a range of media formats addressing all key stakeholder groups. Records of stakeholder meetings held and follow up actions taken. Evidence that local issues have been identified and addressed. Consultative Committee representing local interests established. Statement of regulator policy regarding availability of information to the public. Evidence that the role of the regulator is understood by stakeholders and that they are perceived as competent and independent. Evidence of ongoing government communications regarding energy policy, the benefits of nuclear power and response to issues raised. Review of public acceptance through means such as opinion polls or meetings. Evidence of communications from operator and regulator explaining technology being used, why chosen and why safe.	The UAE has a well developed, proactive public information and education programme in which the government, FANR and ENEC all perform activities that are appropriate to their role and the current stage of the country's nuclear power programme. FANR and ENEC both have detailed communication strategies in place, which form part of their wider management strategy. Active government communications are currently based mainly on statements by senior officials, disseminated largely through the media, while information on the government's energy policy and choice of nuclear power is available through ENEC and FANR. Coordination between the three entities on public information is conducted informally on an ad hoc basis as required and appropriate. Senior officials and communication professionals are highly experienced. Training programmes are in place on an ongoing basis at both FANR and ENEC, particularly prepare any other media-facing staff (such as inspectors). A wide range of relevant stakeholdersare identified by both FANR and ENEC. Most are well served by a combination of direct contacts and a broad selection of information materials and channels, including websites, printed and video materials, press releases, news conferences, advertising etc. Communication with neighbouring countries regularly takes place through the GCC. Both FANR and ENEC have conducted extensive meetings with stakeholders. ENEC has developed a very detailed system for identifying business-related stakeholders and logging contacts and further actions. FANR has also developed a similar stakeholder database which will be further developed in early 2011. ENEC has initiated an ongoing programme of ENEC Forum public meetings in both Abu Dhabi and the Western Region, which have been well attended. FANR is initiating its own Public Forum in the Western Region, planned for early 2011. Public concerns have been noted on issues such as safety, security and the environment, and have been addressed with factual information. No direct opposition to the nuclear power programme has yet been noted. ENEC is in the process of setting up a Citizens Advisory Panel representing all major elements of the Abu Dhabi community, to advise on communication issues and community relations. FANR has a clear statement of openness and transparency, rooted in law. Based on that, FANR has held several public information sessions on licensing of radioactive materials in both Abu Dhabi and Dubai (to cover the northern Emirates). These sessions have resulted in media coverage of the regulator indicating that it is perceived as competent and independent. FANR has also actively sought the public's review and comments on its draft regulations and regulatory guides through its website. An opinion poll conducted in 2009 showed public support for nuclear energy in UAE, with an emphasis on safety. ENEC is currently contracting for a follow-up opinion poll during 2011. Both FANR and ENEC provide public information on the technology and safety issues involved in nuclear power, linking from their websites to other authoritative sites (such as the IAEA's) where relevant. Overall, the UAE meets or surpasses all the main Phase 2 requirements, with no major gaps identified. The mission encourages more attention to be paid to stakeholder involvement, specifically at the national level, ie beyond the boundaries of Abu Dhabi itself. FANR notes that as a federal entity itself, many of its stakeholder organisations are themselves federal. ENEC has focused mainly on Abu Dhabi in its public outreach efforts so far, but plans to hold ENEC Forum meetings in all the UAE's Emirates during 2011. The INIR mission encourages the Abu Dhabi entities to further strengthen these efforts, for example, by including representation from other Emirates (especially Dubai) on ENEC's Citizens Advisory Panel. **Condition 11.1: Reached Milestone 2.** **Major gaps: No major gaps identified.**

11.Stakeholder Involvement Condition 11.1: Public information and education programme developed	Phase 2
Basis for Evaluation	Review Observations

EVALUATION Condition 11.1
ACTIONS NEEDED

Significant	Minor X	No

RECOMMENDATIONS

None.

SUGGESTIONS

S-11.1 No. 1: ENEC is encouraged to include representatives from Emirates other than Abu Dhabi on its Citizens Advisory Panel, to ensure involvement and feedback from across the UAE.

GOOD PRACTICES

GP-11.1 No. 1: ENEC produces public information materials not only in Arabic and English, but in seven other languages widely used in the UAE, ensuring that all main sectors of the Abu Dhabi community can have access to basic information.

GP-11.1 No. 2: ENEC and FANR have both established a detailed stakeholder tracking system to identify relevant parties, log contacts and identify future action.

GP-11.1 No. 3: ENEC is developing a Nuclear Energy Education website, separate from its corporate site, to serve as a neutral education tool and stimulate debate on nuclear energy issues. The site would be taken over in future by an entity other than ENEC, which would reinforce its independence and therefore its credibility.

12. Site and supporting facilities **Condition 12.1: Detailed site characterization completed**	**Phase 2**

Basis for Evaluation	**Review Observations**
Evidence that the site(s) identified in the BIS are owned/available for use to the organization issuing the BIS. Report demonstrating ranking of possible sites and basis of the chosen site or sites. Evidence that the site(s) meets all siting requirements and the necessary characterization studies have been completed. These should cover: a) integration into the grid b) geology and tectonic c) seismology d) heat removal capability e) hydrology f) demography g) meteorology h) environmental issues i) external Hazards j) local Infrastructure k) access l) legal issues m) security. Evidence that local legal, political and public acceptance issues have been identified and resolved or their resolution planned. Analysis of sites required for fuel interim storage, and for waste conditioning, storage and, where appropriate, disposal. Evidence that transport between sites has been satisfactorily addressed.	Official documents confirming availability of the site: • Land ownership approval from the Urban Planning Council • Notice of Intent (NOI) process and advanced No Objection Certificate (NOC) procedures. Legal boundaries have been surveyed and set. • Urban Planning Council approval for the area of the Operators Village. After applying exclusionary, avoidance, and suitability criteria to each candidate site, the ranking scores were summarized to identify the preferred and alternate sites. After the final candidate sites were determined, ENEC conducted site characterization studies to validate construction suitability and identify site-specific design criteria. In accordance with the Site Selection License issued by FANR, ENEC completed site characterization activities. ENEC has completed field studies and development of engineering documents for the submittal of a Non-Nuclear Environmental Impact Assessment (NN-EIA) to EAD. Further site investigation was done to support the development of the Nuclear EIA submitted to EAD in December 2010. ENEC Construction License Application for Braka NPP including a full technical description of the site (Site Envelope, PSAR) was submitted in December 2010. Government and public acceptance issues identified and approved by direct involvement of relevant authorities in the project. To target public acceptance, enhanced communication activities on civil nuclear power program were performed and are on-going. The Abu Dhabi government has conducted a public opinion polling in the UAE, the public opinion research will be updated in 2011. Conditions for fuel interim storage conditions are linked to an approval of the strategy for the back-end of the fuel management. **<u>Condition 12.1:</u> Reached Milestone 2.** **<u>Major gaps:</u> No major gaps were identified.**

EVALUATION Condition 12.1
ACTIONS NEEDED

Significant	**Minor**	**No X**

12. Site and supporting facilities **Condition 12.1: Detailed site characterization completed**	**Phase 2**
Basis for Evaluation	**Review Observations**
RECOMMENDATIONS **None**	
SUGGESTIONS **None**	
GOOD PRACTICES **None**	

12. Site and supporting facilities **Condition 12.2: Site ready for construction**	**Phase 2**
Basis for Evaluation	**Review Observations**
Infrastructure either exists or is planned to support construction, e.g. access, workforce housing, water and construction materials. Any outstanding work is planned to meet construction requirements. Existing and planned site facilities are clearly described in the BIS.	A conceptual master plan for infrastructure at the site has been completed. Interfaces were established between ENEC and the various UAE agencies and authorities for power, water, roads, ports and the establishment of the construction camps. Based on the Conceptual Master Plan, ENEC developed infrastructure parts of the BIS documents and supported the Prime Contractor selection throughout the tendering process. After the selection of the Prime Contractor (contract signed) the site preparatory work started, in accordance with Site Preparation License issued by FANR. **Condition 12.2: Reached Milestone 2.** **Major gaps: No major gaps were identified.**

EVALUATION Condition 12.2
ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

13. Environmental Protection **Condition 13.1: Environmental studies for selected sites performed**	**Phase 2**
Basis for Evaluation	**Review Observations**
An Environmental Impact Assessment completed in accordance with National Requirements	National Requirements are given by Federal Law No.24 of 1999. Following the requirements, Non-Nuclear Environmental Impact Assessment (EIA) study was submitted to EAD in April 2010. Nuclear Environmental Impact Assessment EIA was submitted to Environmental Agency – Abu Dhabi in December 2010. **Condition 13.1: Reached Milestone 2.** **Major gaps: No major gaps were identified.**

EVALUATION Condition 13.1
ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

13. Environmental Protection **Condition 13.2: Particular environmental sensitivities included in BIS**	**Phase 2**

Basis for Evaluation	**Review Observations**
Information related to site specific environmental issues included in the BIS, including: a) pathways for transport of effluent into the environment defined and characterized b) local population demographics and trends c) predominant plant and animal life and relevant radio-ecological sensitivities d) predominant land use e) data relevant to justifying heat removal capability f) sites and means for disposal of hazardous waste g) local environment issues affecting construction.	Information related to site environmental issues were included in BIS. **Condition 13.2: Reached Milestone 2.** **Major gaps: No major gaps were identified.**

EVALUATION Condition 13.2
ACTIONS NEEDED

Significant	**Minor**	**No X**

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

13. Environmental Protection **Condition 13.3: Clear and effective regulation of environmental issues established**	**Phase 2**

Basis for Evaluation	**Review Observations**
a. Environmental regulatory role clearly established either within nuclear regulator or within existing environment regulator. b. Adequate skills and resources to assess acceptability of design information and inspect activities during construction. c. Plan for developing environmental monitoring capability. d. Plan for creating the site baseline information.	a. Environmental regulatory role established by: • Federal Law 24/1999 empowering EAD with responsibilities of the environmental regulator for Abu Dhabi • Federal Law by Decree No 6 of 2009 allows FANR to conduct independent radiological monitoring around any Nuclear Facilities. The EAD and FANR roles and responsibilities are being clarified and a specific Memorandum of Understanding (MOU) on this subject should be agreed in 2011. b. Long term partnership agreements between EAD and its consultant (RTI International) have been established. Based on this, the consultant shall provide technical services, inspections and guidance, supporting EAD's environmental regulatory work. Inspection capabilities are also available in FANR. Coordination of inspection activities will be covered by MOU. c. See b above. d. The measurment plan and program was included in the Nuclear EIA study, already sybmited to FANR in December 2010. See also Legislative Framework. **Condition 13.3: Reached Milestone 2.** **<u>Major gaps:</u> No major gaps were identified.**

EVALUATION Condition 13.3
ACTIONS NEEDED

Significant	**Minor**	**No X**

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

14. Emergency Planning **Condition 14.1: Detailed approach to emergency planning being implemented**	**Phase 2**
Basis for Evaluation	**Review Observations**
Basic regulations developed and communicated to all relevant organizations Clear roles and responsibilities for each organization involved. Clear chain of command for emergency response management established. Identification of the size and type of accident to be covered by the plan (i.e. threat assessments performed). Outline plans prepared and discussed between organizations. Any impediments to sheltering or evacuation have been identified. Procedures have been defined and agreed on or there is a commitment to develop them before operation, covering: a) protection of emergency workers b) dissemination of information to the public c) medical response d) immediate and long term environmental protection e) non-radiological consequences Relevant demographic information has been collated and studied by appropriate organizations Plan showing development, approval and testing of emergency plan and procedures completed before the first nuclear fuel arrives on site. Evidence showing plans for relations and communications with neighbouring countries and the IAEA	Regulations have been developed and communicated to relevant organizations. The following are applicable: Based on Federal Law by Decree No 6 of 2009 Regulation for Emergency Preparedness for Nuclear Facilities (FANR-REG-12) and Regulation for an Application for a Licence to Construct a Nuclear Facility (FANR-REG-06). The major organizations involved are FANR, ENEC, and National Crisis and Emergency Management Authority (NCEMA). There are two coordination committees involved – one at the national level led by NCEMA that focuses on the national emergency preparedness infrastructure and the other led by ENEC for emergency planning implementation at the NPP. Through these committees there is good coordination of all of the relevant organizations. At the CLA stage, ENEC has addressed the size and type of accident to be covered as well as identification of no impediments for implementation. ENEC provided detailed plans necessary for the implementation of the Emergency Plan. The plan will be reviewed (including drills/exercises) during the operating license application review; therefore, the Milestone for EP basis for evaluation criteria are identified, planned and will be addressed through the implementation of the licensing process. It was noted that ENEC's initial approach to implementation of emergency planning is based on the Korean model (vendor country of origin). UAE has demonstrated commitment for international coordination by being party to conventions on early notification and assistance in case of a nuclear accident or radiological emergency. **Condition 14.1: Reached Milestone 2.** **Major gaps: No major gaps identified.**

14. Emergency Planning **Condition 14.1: Detailed approach to emergency planning being implemented**	**Phase 2**
Basis for Evaluation	**Review Observations**

EVALUATION Condition 14.1
ACTIONS NEEDED

Significant	**Minor**	**No X**

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

14. Emergency Planning **Condition 14.2: Emergency planning for existing radiation facilities and practices in place**	**Phase 2**
Basis for Evaluation	**Review Observations**
If an EPREV of existing arrangements has been undertaken, confirmation by IAEA that recommendations of EPREV are implemented and capabilities and arrangements for emergency preparedness and response are in place..	UAE has not requested an EPRev. **Condition 14.2: Reached Milestone 2.** **Major gaps: No major gaps identified.** The conduct of an EPRev is not the only means to review the stage of the readiness of Emergency Preparedness. Readiness is measured in Condition 14.1.

EVALUATION Condition 14.2
ACTIONS NEEDED

Significant	**Minor**	**No X**

RECOMMENDATIONS

None

SUGGESTIONS

S-14.2 No.1: It is suggested that UAE request the IAEA to perform an EPRev Mission during Phase 3 to have a detailed peer review of UAE's Emergency Planning compared to IAEA safety standards.

GOOD PRACTICES

None

14. Emergency Planning **Condition 14.3: Actions from earlier reviews completed**	**Phase 2**

Basis for Evaluation	**Review Observations**
Completion of all actions from any previous audit or review of existing systems against international requirements such as those in GS-R-2 [12] and GS-G-2.1 [13]	As noted in Condition 14.1, ENEC's initial approach to emergency preparedness is based on the Korean model. **Condition 14.3: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 14.3
ACTIONS NEEDED

Significant	**Minor**	**No**	**X**

RECOMMENDATIONS
None

SUGGESTIONS
See S-14.2-1

GOOD PRACTICES
None

15. Security **Condition 15.1: Legislation promulgated**	**Phase 2**
Basis for Evaluation	**Review Observations**
Arrangements and draft of agreements covering protocols and programmes for local and national law enforcement assistance.	The Federal Law by decree No 6 and Law No 14, respectively, establish roles and responsibilities of FANR and CNIA regarding nuclear security. In particular, Law No 14 establishes CNIA for protection of critical facilities, to include Power Plants. CNIA is also responsible to establish and to define requirements concerning protection of sensitive information and trustworthiness. Concerning physical protection of nuclear material and nuclear facilities FANR has established nuclear security regulation (REG 08) which conforms to IAEA INFCIRC 225 Rev 5 (currently in publication process). In addition, FANR has design requirements to assess plant performance due to the impact of large commercial aircraft and other threats that could result in large fire and explosion. Taking the above into account, FANR has completed the drafting of several Regulatory Guides on security plan, physical barriers, access control, cyber security, target set identification. CNIA and ENEC will ensure all regulatory requirements are met. FANR will verify that all security requirements are implemented. According to the Law No 14, CNIA is responsible for the protection of all critical infrastructure in Abu Dhabi; responsibility may be extended to other Emirates by agreement. CNIA has established a nuclear security program[2] and is finalizing Memorandums of understanding with relevant entities, such as ENEC and FANR. ENEC has arrangements with CNIA (management system, logistic aspect, management of areas, etc.). An interagency coordination group, including FANR, ENEC and CNIA, was established in 2009, chaired by CNIA, with the aim to coordinate activities on nuclear security issues. Concerning nuclear security of radioactive material and associated facilities UAE has not yet made commitment to the Code of Conduct of the nuclear safety and security of radioactive sources or its implementing guide on import/export. However, associated measures have already been implemented. According to the Law by Decree No 6, FANR is in charge of regulating the security of radioactive materials. FANR has already prepared a draft Regulation No 23 for nuclear security of radioactive sources, based on the IAEA Nuclear Security Recommendations on radioactive sources and associated facilities. These requirements will be applied for categories 1 to 3 as defined by IAEA. It is expected to publish Regulation 23 during the first half of 2011.

[2] It was noted that the CNIA functions do not cover "safeguards" as defined by the IAEA, and to provide clarity in this regard, confusing terminology was eliminated from the previous program title when it was renamed to be the Nuclear Security Program. See safeguards issue 6 for further description of responsibilities.

15. Security **Condition 15.1: Legislation promulgated**	**Phase 2**
Basis for Evaluation	**Review Observations**
	Concerning qualifications and experience of staff, there is a clear policy to use foreign senior experts and UAE Nationals to launch the program, train new experts from the related organizations, and provide the means for knowledge transfer and management. Experts from UAE participated at several IAEA events, such as Consultancy Meetings and Technical Meetings on the development of Nuclear Security Recommendations. **Condition 15.1: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 15.1
ACTIONS NEEDED

~~Significant~~	~~Minor~~	No X

RECOMMENDATIONS

None

SUGGESTIONS

S-15.1 No. 1: To consider requesting IAEA services to support further development in this area, specifically, an IAEA mission to review nuclear security.

GOOD PRACTICES

GP-15.1-1: Creation of a coordination group on nuclear security issues with all relevant entities, especially FANR, ENEC and CNIA, and integration of safety and security approaches to ensure that changes in one do not adversely affect the others.

GP-15.1-2: The UAE was one of the first countries to adopt INFCIRC 225, Rev 5, and requested IAEA review of its draft Regulation on Physical Protection of Nuclear Materials and Nuclear Facilities.

15. Security **Condition 15.2: DBT defined**	**Phase 2**

Basis for Evaluation	**Review Observations**
The design basis threat defined and outline of security requirements included in the BIS.	An unclassified Design Basis Threat (DBT) was first established by the interagency coordination group in 2009. Then the classified DBT capabilities document was established by CNIA and communicated to ENEC & FANR. As a part of the Construction License Application, ENEC has already submitted the Physical Protection Plan of Braka NPP on 27 December 2010, in accordance with FANR REG 08. **Condition 15.2: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 15.2
ACTIONS NEEDED

~~**Significant**~~	~~**Minor**~~	**No X**

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

15. Security **Condition 15.3: Security requirements defined**	**Phase 2**

Basis for Evaluation	**Review Observations**
Security requirements and desirable features planned for the site. Evidence that best practise for security at the nuclear power plant is understood.	The Regulation No. 8, issued by FANR on physical protection requirements, concerns the different phases of building of a nuclear power plant. CNIA has already implemented physical protection measures to be set in place during the construction of the nuclear power plant. Some measures have already been implemented: perimeter, surveillance, monitoring, access credentials and associated procedures. After the contract was signed, FANR Regulation identified the need for physical protection measures to be set in place during the construction of the nuclear power plant. CNIA & ENEC are implementing these measures. **Condition 15.3: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 15.3
ACTIONS NEEDED

~~**Significant**~~	~~**Minor**~~	**No** **X**

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

15. Security **Condition 15.4: Sensitive information defined**	**Phase 2**
Basis for Evaluation	**Review Observations**
Procedures for the definition and protection of sensitive information. Penalties for violation available and supported by legislation.	General rules for protection of sensitive information already exist in UAE. The CNIA has already established classification categories regarding nuclear security sensitive information to be implemented by ENEC, FANR and CNIA. This draft and the draft of associated guidelines are currently used for exchange of sensitive information and will be approved soon after review by stakeholders. **Condition 15.4: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 15.4
ACTIONS NEEDED

~~**Significant**~~	~~**Minor**~~	**No X**

RECOMMENDATIONS	**None**
SUGGESTIONS	**None**
GOOD PRACTICES	**None**

15. Security **Condition 15.5: Physical protection by trained on-site security staff provided**	**Phase 2**
Basis for Evaluation	**Review Observations**
Security requirements during construction defined, including on site civil security personnel and a policy on whether armed, and a plan for their implementation.	CNIA is providing all site security to include access control, armed guards and response forces. CNIA has developed nuclear security training for the non-nuclear construction phase and nuclear construction phase. Specialized training capabilities, at national and international levels, will be used (see condition 15.1.). **Condition 15.5: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 15.5
ACTIONS NEEDED

~~**Significant**~~	~~**Minor**~~	**No**	**X**

RECOMMENDATIONS

None

SUGGESTIONS

S-15.5 No. 1: To organize specific training of the off-site response forces for intervention at NPP (knowledge of the facility and vital areas, radiation protection and restriction areas)

GOOD PRACTICES

None

15. Security **Condition 15.6. Programs for selection/qualifications of staff with access to facilities are in place**	**Phase 2**
Basis for Evaluation	**Review Observations**
Adequate screening programs for recruitment and selection of personnel with access to facilities and classified documentation.	The screening of persons from ENEC and FANR is done by a specific security governmental entity, before access is granted to specified post. CNIA is developing access authorization requirements for personnel of relevant entities, especially ENEC. **Condition 15.6: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 15.6
ACTIONS NEEDED

~~Significant~~	~~Minor~~	No X

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

15. Security **Condition 15.7. Security culture promulgated**	**Phase 2**
Basis for Evaluation	**Review Observations**
Evidence of the promulgation of a security culture, recognizing the importance of nuclear material, within all key organizations involved in the nuclear power programme	ENEC, CNIA and FANR have developed policy statements and plans for the implementation of nuclear security culture, based on the IAEA Nuclear Security Series guidance publication (NSS No 7). FANR has a security awareness program for the employees and the first session was completed in October 2010. **Condition 15.7: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 15.7

ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS	**None**
SUGGESTIONS **S-15.7 No. 1: UAE may consider requesting an IAEA National Training Course on nuclear security culture.**	
GOOD PRACTICES	**None**

[+]Note that security considerations include physical protection and also need to include adequate consideration of safety needs and vice versa.

16. Nuclear Fuel Cycle **Condition 16.1: Fuel cycle strategy decided**	**Phase 2**

Basis for Evaluation	**Review Observations**
A completed nuclear fuel cycle planning document applying the NEPIO knowledge of the steps and approaches, defining a realistic nuclear fuel cycle strategy at a level of detail appropriate for milestone 2. Evidence that basic decisions needed for milestone 2 have been made for both front and back ends of the nuclear fuel cycle. These include a decision on the number of reloads to be requested with the first core and a short and long term purchasing strategy for the fuel services (natural uranium, conversion, enrichment, fuel manufacturing, fuel take back), on-site spent fuel storage capacity and a strategy for purchasing/building this capacity (e.g. capacity of reactor pools). An integrated plan for bidding and construction of fuel cycle facilities consistent with the power plant construction programme and the national non-proliferation commitment.	The UAE has developed a good understanding of the technological challenges and non-proliferation considerations related to the nuclear fuel cycle, and has adopted a clear policy to not enrich and reprocess fuel in the UAE. The Nuclear Fuel Management Strategy and Implementation, developed by ENEC, addresses the front-end of the fuel cycle including uranium product market analysis, fuel inventory for security of supply, fuel fabrication and performance and engineering calculation methods. In the appendix fuel storage and disposal are also discussed. This Strategy has been established. Recommendations for implementation are being prepared for ENEC Board in 2011. The front-end of fuel cycle is well elaborated and planned. The Prime Contractor's scope includes fuel supply for first three cycles. Fuel sourcing strategy after the third reload has been developed and is being implemented now (contracts for the fuel supply will be awarded after ENEC Board approval). Wet storage for spent fuel with the capacity for 20 years will be supplied by the Prime Contractor as part of the Prime Contract. Dry storage of spent fuel on the site is considered as an interim option (for 60 years) and special request has been made for the nuclear power plants and site design to assure on-site dry storage ability. **Condition 16.1: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 16.1
ACTIONS NEEDED

Significant	**Minor**	**No**	**X**

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

17. Radioactive Waste **Condition 17.1: Handling the burdens of radioactive waste considered**	**Phase 2**

Basis for Evaluation	**Review Observations**
A defined national waste management organization. A strategy document prepared by the waste management organization to implement the national policy for the management of all kinds of radioactive waste, considering regulatory and implementation infrastructures, allocation of responsibilities, technical approaches and capabilities, financing schemes, etc. Regulatory capabilities established able to license, regulate, assess, control and enforce safety requirements for radioactive waste management including further disposal options. A completed radioactive waste planning document applying the NEPIO understanding of the significant implications of radioactive waste at a level of detail appropriate for milestone 2 (e.g. volumes and isotopic content of waste have been estimated). An integrated plan for bidding and construction of waste facilities consistent with the power plant construction programme.	A White Paper on the Policy of the UAE on the Evaluation and Potential Development of Peaceful Nuclear Energy addresses basic aspects of Spent Fuel and Radioactive Waste Management. The Federal Nuclear Law assigns the responsibility for the long-term SF and RWM to a special entity identified by the Cabinet. ENEC, as the implementer of national policy and responsible party for the predisposal management of radioactive waste, has drafted "Low and Intermediate Level RW Disposal Strategy" which is addressing necessary components of RWM infrastructure for LILW originating from NPPs. It includes also the recommendation for early siting studies for near surface disposal sites in UAE. The strategy is being finalized for senior management review and will serve as an input for national policy and decisions on SF and RW disposal and related regulations. Waste processing facilities and waste storage facility for at least a 10-year period will be supplied by the Prime Contractor. Federal Nuclear Law also mandates the establishment of the Decommissioning Trust Fund for covering the costs of construction, operation and closure of waste management facilities, decommissioning of a nuclear facility, regulatory oversight of RWM activities, and management of the trust fund. Considerations of such a fund are at early stage. Regulatory capabilities are sufficient to meet the current needs in the area of SF and RWM. A training programme is in place to address future needs. The progress of the establishment of the UAE infrastructure regarding waste management is consistent with the level of the programme's overall development. Further actions are encouraged to allow progress in the next Phase. **Condition 17.1: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 17.1

ACTIONS NEEDED

Significant	**Minor**	**No**	**X**

RECOMMENDATIONS

None

17. Radioactive Waste **Condition 17.1: Handling the burdens of radioactive waste considered**	**Phase 2**
Basis for Evaluation	**Review Observations**
SUGGESTIONS **S-17.1 No. 1: For the future development of nuclear programme, it is suggested that the Government further develop the national strategy on long-term radioactive waste and spent fuel management including the early establishment of a state entity for the disposal of SF and LILW, and to proceed with planning for LILW disposal.** **S-17.1 No. 2: The nuclear programme in the UAE is progressing rapidly, is well accepted and supported in the UAE. It would be prudent to initiate the siting of LILW disposal facility in the near term.**	
GOOD PRACTICES **None**	

17. Radioactive Waste **Condition 17.2: Implementation plan for ultimate high level waste disposal in preparation**	**Phase 2**
Basis for Evaluation	**Review Observations**
A planning document completed based on the established national policy/strategy and recognizing options for the management and final disposal of high level radioactive waste. Responsibility assigned for monitoring international efforts and progress on high level waste disposal.	ENEC has drafted the "Nuclear Fuel Management Strategy and Implementation" report which addresses the disposal options for HLW or spent nuclear fuel in its Appendix 4. The strategy is being evaluated and recommendationswill serve as an input for national policy and decisions on SF and RW disposal and related regulations. The international efforts and progress on high level waste disposal are followed by FANR, ENEC, and the Federal Government. **Condition 17.2: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 17.2

ACTIONS NEEDED

Significant	Minor	No X

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

18. Industrial Involvement **Condition 18.1: Realistic assessment of the national and local capabilities carried out**	**Phase 2**

Basis for Evaluation	**Review Observations**
A realistic assessment of the national and local supplier capabilities for either nuclear or non-nuclear safety related activities based on the national policy recommended by the NEPIO. Extent of national industrial participation agreed and established and desired targets for local and national industrial involvement included in the BIS.	ENEC and the Prime Contractor will evaluate the capabilities of local service and equipment purchases. ENEC has advised a few suppliers on changes required to their existing ISO 9001 program to meet nuclear quality assurance standards. **Condition 18.1: Reached Milestone 2.** **Major gaps: No major gaps identified. .**

EVALUATION Condition 18.1
ACTIONS NEEDED

Significant	**Minor**	**No** **X**

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

18. Industrial Involvement **Condition 18.2: Ability to meet schedule and quality requirements analyzed**	**Phase 2**

Basis for Evaluation	**Review Observations**
Requirements for industries to be added to the approved vendor/service suppler list together with procedures for audits of the management systems (including quality control and assurance) of the approved vendor/supplier.	ENEC recognises the stringent nuclear QA requirements and will complete the development of a UAE sourcing strategy. Through the Prime Contractor contract, assignment criterion is not of major relevance. KEPCO is keeping and updating the approved vendor list. **Condition 18.2: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 18.2
ACTIONS NEEDED

Significant	**Minor**	**No X**

RECOMMENDATIONS
None

SUGGESTIONS
None

GOOD PRACTICES
None

[+]Typically the first NPP is constructed with very limited local industrial involvement. This can be introduced gradually as national experience increases and the programme develops

18. Industrial Involvement **Condition 18.3: Plans and programmes to transition to national and local suppliers in place**	**Phase 2**
Basis for Evaluation	**Review Observations**
If the national policy for industrial involvement supports the involvement of industrial involvement in construction or support services, clear plans and programmes identifying: a) specific industrial involvement in future construction, maintenance or operational support services b) audits of the progress of industrial preparation and ability to meet the requirements for addition to the approved supplier c) short term and long term programme (including future projects) to develop the ability to produce items initially being supplied by foreign suppliers d) consideration of mechanisms to be agreed with the awarded main supplier to convert national items into foreign supplied items and vice versa, in case of supply problems having major impact on the construction schedule.	The Prime Contractor will provide the required nuclear-grade items for the first, second, and possibly other units from qualified foreign sources. The Prime Contractor is committed to working with ENEC to build local supplier capacity to support the long-range needs of the UAE civil nuclear power program. ENEC and the Prime Contractor will work to develop a detailed sourcing strategy which identifies specific long-range targets for UAE supplier development. ENEC has established a Supplier Development department within ENEC to assist suppliers in key sectors. International trade missions have visited the UAE. Currently, ENEC plays the role of "national industry forum", but will gradually transition this role to industry. There is no specific target for local industry involvement, however ENEC has a strong commitment to developing local industry capabilities. Considering the Prime Contract signature and commitment of KEPCO, plans are adequate at this stage. **Condition 18.3: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 18.3
ACTIONS NEEDED

Significant	Minor	No	X

RECOMMENDATIONS

None

SUGGESTIONS

S-18.3 No.1: Consider developing a target for national industry participation for future units.

GOOD PRACTICES

None

19. Procurement **Condition 19.1:Owner/operator competence to carry out nuclear procurement evident**	**Phase 2**

Basis for Evaluation	**Review Observations**
Evidence of a suitably qualified and experienced procurement team with competence in: a) bid requesting and bid evaluation b) awarding, issue of purchase orders c) letter of credit d) quality programmes e) surveillance and follow up of items under manufacturing f) inspection, hold points and stopping work during manufacturing g) corrective actions to be taken when quality or schedule requirements are under risk h) manufacturing schedule and delivery time i) testing and reception j) non conformance report and acceptance procedure established (accepted as is, refurbishment necessary, rejected) k) transportation and insurance l) taxes m) customs clearing. Evidence of an informed decision about need for procurement office close to main supplier. Plans to participate in appropriate 'owners group'.	Effective Prime Contractor procurement performed. Further, ENEC is currently developing its supplier qualification and supplier management programs. The supplier qualification program will be a structured, tiered process that begins with the licensing of suppliers and that leads to full qualification of the supplier to provide nuclear-grade goods and services. ENEC is developing the tools to provide effective oversight of the Prime Contractor, and is present in the Prime Contractor's home office (in the areas of technical, procurement, contract, safety, and quality). KEPCO is keeping and updating the approved vendor list. **Condition 19.1: Reached Milestone 2.** **Major gaps: No major gaps identified.**

EVALUATION Condition 19.1
ACTIONS NEEDED

Significant	**Minor**	**No** **X**

RECOMMENDATIONS

None

SUGGESTIONS

S-19.1. No.1: In Phase 3, ensure successful knowledge transfer from Prime Contractor to ENEC for the preparation of NPP operation.

19. Procurement **Condition 19.1:Owner/operator competence to carry out nuclear procurement evident**	**Phase 2**
Basis for Evaluation	**Review Observations**
GOOD PRACTICES **GP-19.1 No. 1: Effective procurement process utilising experienced consultants enabled the successful signing of the Prime Contract.**	

19. Procurement **Condition 19.2: Procurement programme consistent with national policy for industrial participation established**	**Phase 2**

Basis for Evaluation	**Review Observations**
A procurement programme clearly described in the bid BIS that delineates the scope of supply for specific equipment and services. If the national policy for industrial involvement supports local involvement in construction or support services, evidence of a procurement team competent in: a) filing of: design descriptions, technical specifications, drawings of items to be procured b) quality levels to be assigned, depending the relevance of the item c) standards and codes ruling the item d) environmental qualification of the item (including storage conditions on the shelf, expiry dates, etc.) e) stock policy to be adopted (max/min levels). f) urgent procurement procedures Formal equipment and services specifications have been developed by the owner/operator. Approved vendor list has been developed and a routine auditing program is in place. A schedule identifying purchase orders placement dates and site arrival dates.	Scope of supply defined in the BIS including Responsibility Assignment Matrix and an Interface Control process, and the Prime Contract signed. Further, ENEC is currently developing its supplier qualification and supplier management programs. The supplier qualification program will be a structured, tiered process that begins with the licensing of suppliers and that leads to full qualification of the supplier to provide nuclear-grade goods and services. The UAE has recognised the advantage of local industry participation in the nuclear power plant project. Currently two UAE companies have received KEPCO acceptance as qualified suppliers. Prime Contractor bids were evaluated for supply chain capability. National industry participation target to be defined for future units. Prime Contract signed. **Condition 19.2: Reached Milestone 2.** **Major gaps: No major gaps identified.** .

EVALUATION Condition 19.2

Significant	**Minor**	**No**	**X**

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

ATTACHMENT 2: LISTS OF THE INIR TEAM AND HOST PERSONS CONTACTED

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ATTACHMENT 3: ACRONYMS

CLA	Construction Licence Application
CNIA	Critical National Infrastructure Authority
EAA.	The Executive Affairs Authority
EAD	Environmental Agency of Abu Dhabi
ENEC	Emirates Nuclear Energy Corporation
FANR	Federal Authority for Nuclear Regulation
ICRP	International Commission of Radiological Protection
KEPCO	Korea Electric Power Corporation
NCEMA	National Crisis and Emergency Management Authority
NEPIO	Nuclear Energy Program Implementation Organization
NPP	Nuclear Power Plant
SSAC	State System of Accounting for and Control of Nuclear Material

ATTACHMENT 4: REFERENCES

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