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**Joint ICTP-IAEA School on Nuclear Energy Management**

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# Role of the Regulatory Authority

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# Role of the Regulatory Authority

# –

# The Development of the Regulatory Process for the Peaceful Nuclear Energy Programme in the UAE

**The IAEA School of Nuclear Energy Management**
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Trieste – Italy

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United Arab Emirates

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- Introduction
- The Nuclear Policy of the UAE
- The UAE Nuclear Energy Programme
- The Nuclear Law
- International Commitments
- The UAE Nuclear Regulator (FANR)
- The Application of IAEA Standards and Guidelines
- IAEA Specific Support
- Concluding Remarks

# Some introductory remarks

- Dangerous powers in nuclear power reactors
  - Large amount of radioactive substances dangerous to health
  - Releases have to be prevented – the radioactive substances need to be retained in the core of the reactor
- Prevention by multiple barriers and defense in depth
- Role of licencee is to maintain this prevention and the regulator to ensure the licencee takes this responsibility
- Plant construction need to be
  - Reliable and operation stable
  - Systems/components testable
  - Proven solutions
  - Adapted to human capabilities and to disturbances

# Introduction

- Nuclear safety a national responsibility, but with strong international ties
  - Within the State the prime responsibility for nuclear safety is with the licencee
  - The regulator has to ensure regulation and oversight
    - Regulation includes issuing “rules” to be followed, incl. regulations and licenses, and taking enforcement measures,
    - Oversight includes the performance of active inspections, review of events.

# Introduction

- International instruments
  - Binding and non-binding international instruments
    - Binding are e.g. Conventions ratified by the State
    - Non-binding are e.g. safety standards issued by IAEA (if not made binding by national regulator), and Codes of Conduct
  - Examples of binding instruments are, Convention on Nuclear Safety, Joint Convention, Early Notification Convention, Assistance Convention, etc., if ratified by the State
- International Organisations
  - IAEA, NEA, WANO, ..
- Regional Organisations
  - EU
  - WENRA
  - Etc
- Bilateral agreements

# Introduction

- More than 400 nuclear power reactors in operation in 30 countries
- Several hundreds research reactors
- Hundreds of other types of nuclear facilities
- Many countries are building new reactors, e.g. China, ROK, India, Finland, France, UAE.
- Illustrate Role of Regulator by using my experience from setting up FANR in the UAE where no nuclear infrastructure existed

# United Arab Emirates

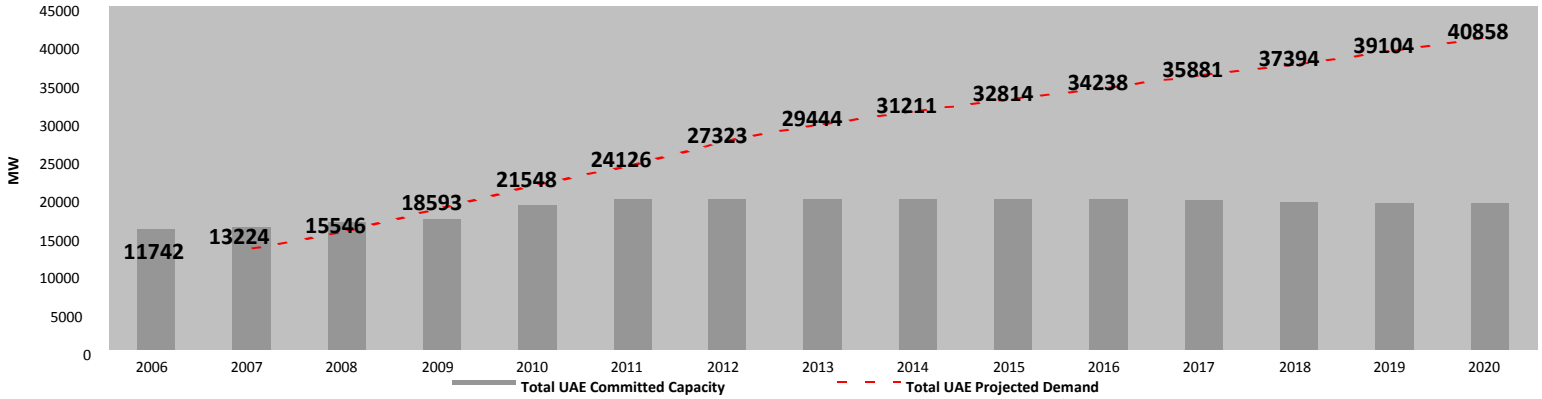
# دولة الإمارات العربية المتحدة

# United Arab Emirates

# دولة الإمارات العربية المتحدة

- **UAE:**
- Established in 1971 as independent state
- 8 million people
- 7 emirates
- 77,000 km2
- 650 km coast line
- Hot and dry climate
- Oil and gas are main industries
- Member of GCC

# Rational for Nuclear Energy in the UAE




- Tremendous projected growth by the year

- **Nuclear power is a proven, environmentally attractive and cost-competitive electricity-generation option which could contribute significantly to a diversified and secure basket of future electricity-generating assets**

# Program Development

- **IAEA documents used**
  - "Milestones" document
  - Safety Fundamentals
  - Safety Standards
  - Security guidance
  - Non-proliferation rules
  - Nuclear law handbooks
  - INSAG reports
  - International Instrumer

# UAE Policy Formulation - follow IAEA Guidance on infrastructure supported by other IAEA advise

- 19 Elements assessed

- National position
- Nuclear safety
- Management structure
- Legislative framework
- Regulatory framework
- Financing
- Human Resource Development
- Safeguards
- Security and physical protection
- Emergency planning
- Radiation protection
- Nuclear Fuel cycle
- Nuclear waste
- Environmental protection
- Site and supporting facilities
- Industrial involvement
- Procurement
- Electric grid
- Stakeholder involvement

A *Roadmap* document was designed to translate the milestones of a successful nuclear power program (as identified by the IAEA) into an implementation plan customized to meet the needs of the UAE

# Fundamental Safety Principles

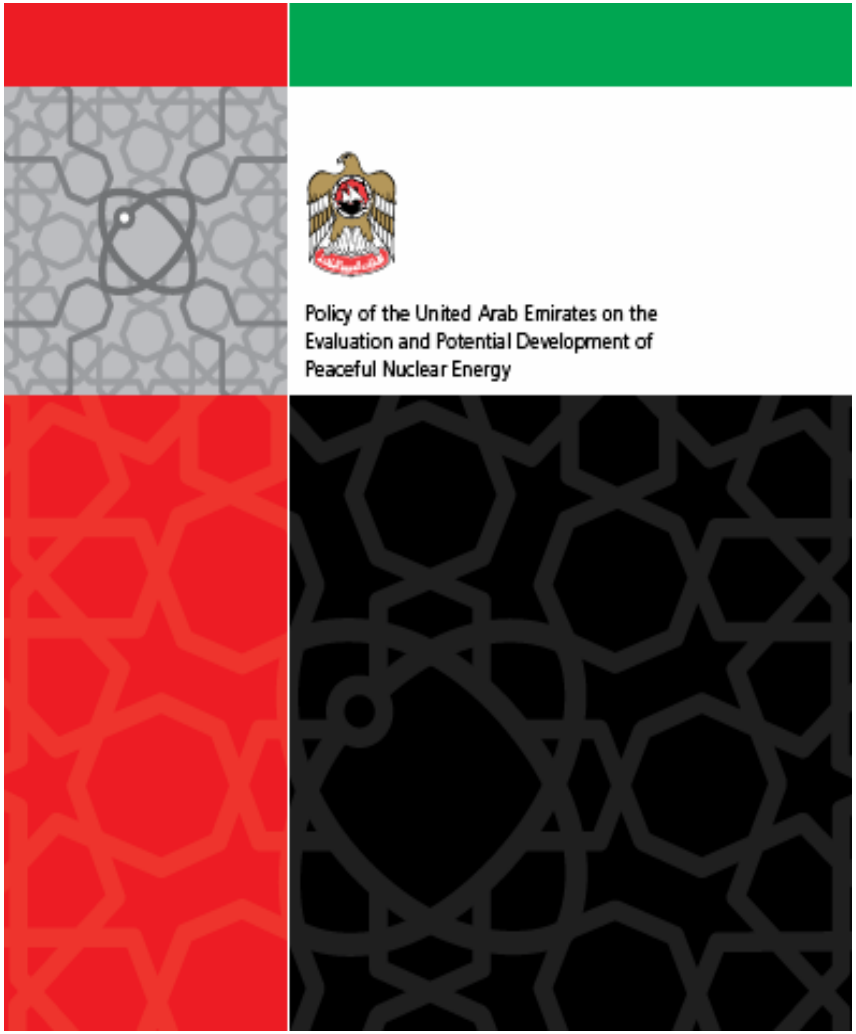
- **The fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation. Safety and security must be designed and implemented in an integrated manner**
  - The Licensee is the prime responsible
  - An effective legal and regulatory framework and the independence of the Regulator
  - Effective leadership and management for safety
  - Overall benefit must outweigh the harm
  - Protection must be optimised
  - Limitation of risk
  - Protection of present and future generations
  - Accident must be prevented and mitigated
  - Emergency preparedness and response
  - Protective actions to reduce existing risks

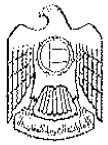
# UAE Policy Formulation (Pre-feasibility Study)

- Determination that peaceful nuclear energy represents a potentially valuable option for the UAE
- Development of guiding principles by UAE Government
- Establishment of NEPIO
- Wide consultation process
- UAE Nuclear Energy policy launched in *April, 2008*
  - *Make clear its peaceful and unambiguous objectives*
  - *Nuclear power represent only one of several alternatives to meet future energy needs*
  - *Denouncement of enrichment and reprocessing in the UAE*
  - *Hope to establish a new model for the introduction of nuclear energy with full support and confidence of the international community*


- Complete operational transparency
- Highest standards of non-proliferation
- Highest standards of safety and security
- Close cooperation with the IAEA
- Partnership with governments and firms of responsible nations
- Long-term sustainability

# The Nuclear Policy and the Nuclear Law



**مرسوم بقانون إتحادي رقم ( 6 ) لسنة 2009**
**في شأن الاستعمالات السلمية للطاقة النووية**

نحن خليفة بن زايد آل نهيان رئيس دولة الإمارات العربية المتحدة،

- بعد الإطلاع على الدستور،
- وعلى القانون الاتحادي رقم (1) لسنة 1972 بشأن اختصاصات الوزارات وصلاحيات الوزراء والقوانين المعدلة له،
- وعلى القانون الاتحادي رقم (8) لسنة 1984 في شأن الشركات التجارية والقوانين المعدلة له،
- وعلى قانون المعاملات المدنية الصادر بالقانون الاتحادي رقم (5) لسنة 1985 والقوانين المعدلة له،
- وعلى قانون العقوبات الصادر بالقانون الاتحادي رقم (3) لسنة 1987 والقوانين المعدلة له،
- وعلى قانون الإثبات في المعاملات المدنية والتجارية الصادر بالقانون الاتحادي رقم (10) لسنة 1992 والقوانين المعدلة له،
- وعلى القانون الاتحادي رقم (24) لسنة 1999 في شأن حماية البيئة وتنميتها والقوانين المعدلة له،
- وعلى القانون الاتحادي رقم (1) لسنة 2002 في شأن تنظيم ورقابة استخدام المصادر المشعة والوقاية من أخطارها والقوانين المعدلة له،
- وعلى القانون الاتحادي رقم (13) لسنة 2007 بشأن السلع الخاضعة لرقابة الاستيراد والتصدير والقوانين المعدلة له،
- وعلى المرسوم بقانون إتحادي رقم (11) لسنة 2008 بشأن الموارد البشرية في الحكومة الاتحادية،
- وعلى المرسوم الاتحادي رقم (38) لسنة 1996 في شأن انضمام دولة الإمارات العربية المتحدة لمعاهدة عدم انتشار الأسلحة النووية لعام 1968،
- وعلى المرسوم الاتحادي رقم (84) لسنة 2000 في شأن اتفاقية الحظر الشامل للتجارب النووية لعام 1996 والبروتوكول الملحق بها،
- وعلى المرسوم الاتحادي رقم (66) لسنة 2003 في شأن انضمام دولة الإمارات العربية المتحدة

# Program Management Structure

- Based on IAEA guidance and best international practices gleaned from consultations and cooperation programs with established nuclear states:
  - **Federal Authority for Nuclear Regulation**
    - Regulations, licensing, inspections, accounting and control of nuclear material
  - **ENEC**
    - Promotion and development of required infrastructure for nuclear power program in UAE
  - **Ministry of Foreign Affairs**
    - Policy coordination and International Cooperation framework arrangements
  - **Other entities are assigned with specific responsibilities( CICPA, Khalifa University. …etc)**
    - CICPA : responsibilities for implementing physical security
    - Khalifa U: Human Capacity building

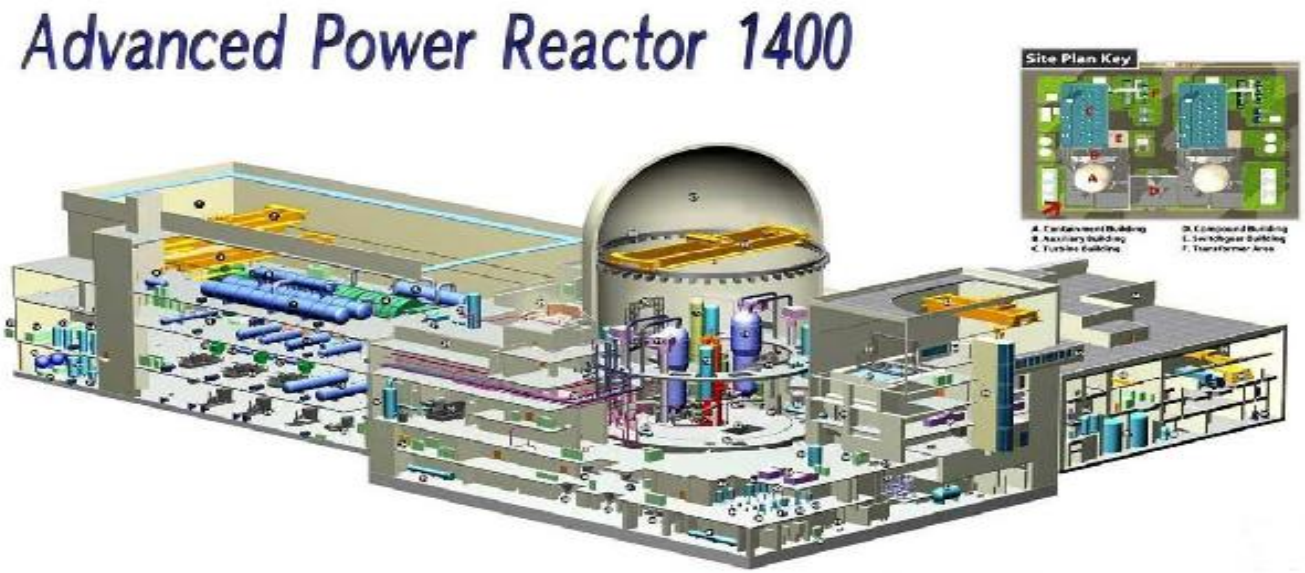
# Site: Barakah

# The Prime Contract Award

- Prime Contract awarded to team led by Korean Electric Power Corporation on December 27, 2009
- Award followed a year-long, intense evaluation of bids from worldwide industry leaders
- Decision criteria:
  - Safety
  - Deliverability
  - Contract Compliance
  - Human Resource Development
  - Commercial Competitiveness

# The APR1400

- Based on proven technology from the US
- “Reference Plant” in Shin Kori under construction
- South Korea has continually upgraded the reactor design
- South Korean operating record is among the world’s best

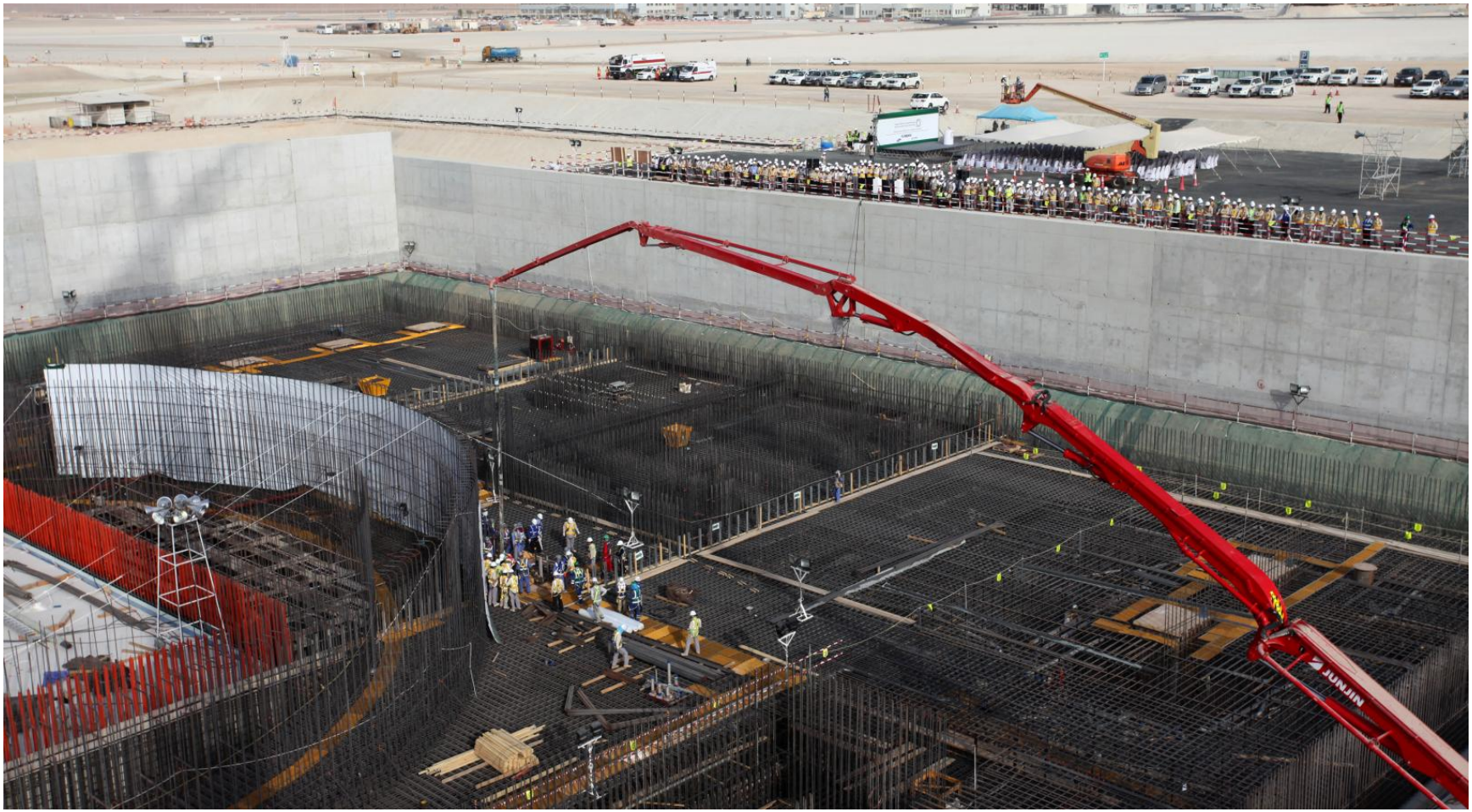


# Construction License Application Approved

- Following an 18-month review, on July 17 2012, the UAE Federal Authority for Nuclear Regulation approved the Construction License for Barakah Units 1 and 2

- More than 200 FANR staff members and international experts spent more than 150 person-years reviewing the 9,000-page application

# July 18, 2012



# Issuance of Nuclear Law

- As per UAE Policy on the Evaluation and Potential Development of Peaceful Nuclear Energy issued in April 2008 ("**UAE Policy**") the:

  - UAE to draft a comprehensive, national nuclear law to govern the nuclear sector
  - UAE to establish a fully independent nuclear regulatory authority to safeguard and sustain operational transparency in the nuclear energy sector

- In line with the UAE Policy & international treaties, the Federal Law by Decree No (6) of 2009, Concerning The Peaceful Uses of Nuclear Energy (the **"Nuclear Law"**) was issued by the President in September 2009 to:

  - develop & control UAE nuclear sector towards peaceful purposes
  - ensure Nuclear Safety & Security, and Radiation Protection
  - prohibit Enrichment & Reprocessing Facilities in UAE

# Establishment of FANR

- Article (2) of the Nuclear Law established the Federal Authority for Nuclear Regulation ("**FANR**") as the regulatory body of the UAE Nuclear Sector with independent legal personality, full legal capacity and financial & administrative independence

- FANR independence:
  - the sole issuer of Licences and regulations to conduct Regulated Activities (Art. 6)
  - Board Members are prohibited from engaging directly or indirectly in a Regulated Activity (Art.10)

- FANR aims (Art. 2) to:
  - control & supervise UAE Nuclear Sector and achieve Nuclear Safety & Security, Radiation Protection & Safeguards
  - fulfil obligations under international treaties, conventions & agreements entered into by UAE
  - prevent use of Nuclear Facilities & Regulated Materials for non-peaceful purposes

# Provisions of Nuclear Law

- **11 Chapters - 72 Articles**

- Chapter 1: Definitions – Scope
- Chapter 2: Establishment of FANR and its Objectives
- Chapter 3: Management of FANR
- Chapter 4: Financial Affairs of FANR
- Chapter 5: Licences
- Chapter 6: Monitoring & Inspection
- Chapter 7: Regulations, Guidelines & Safeguards
- Chapter 8: Radioactive Waste and Decommissioning
- Chapter 9: Management of Nuclear Safety & Quality Assurance
  - (Physical Protection - Emergency Planning - Preparedness & Response)
- Chapter 10: Civil & Criminal Liabilities
- Chapter 11: Final Provisions

# FANR Functions and Responsibilities

- issue regulations
- issue, amend, suspend, revoke & reject applications for Licences to conduct Regulated Activities (listed in Art.25)
- carry out Safety Assessments on Operators before & after receipt of Licence
- carry out Inspection & control – at any time
- establish, maintain a State System of Accounting & Control of Nuclear Materials subject to IAEA Comprehensive Safeguard Agreement (CSA) & Additional Protocol (AP)
- establish framework for Physical Protection, Emergency Preparedness & response for Nuclear Facilities & Activities, etc.
- cooperate with national and international entities (MOUs, arrangements, etc)
- determine Enforcement Actions

# FANR Functions and Responsibilities

- coordinate with competent authorities to ensure nuclear non-proliferation
- develop a strategy for Radiation Protection of Orphan Sources
- cooperate & advise Government entities about Nuclear Safety, Radiation Protection & other Safety matters
- apply Quality Assurance principals to procedures
- ensure & maintain a transparent relationship with both the Operator & the public

# Transparency

- An important goal of the UAE Policy and part of FANR's obligations as per the Nuclear Law.

  - Article (9) of the Nuclear Law:

    •*"The Authority shall maintain the highest standards of transparency whilst performing its function, and toward this, it shall facilitate the public's access to all relevant information to its activities…"*

      •e.g. Licences, Licence applications, regulations and guides, summaries of inspections, penalties etc

      e.g. International commitments: IAEA peer reviews, technical information exchange etc

      e.g. national consultations: MoUs, regulations, seminars, Radiation Protection Committee and other working groups etc

  - Exception: FANR may in the public's interest restrict, conceal or amend any document or information it considers confidential or may prejudice Nuclear Safety, Physical Protection, Nuclear Security or contains proprietary or classified information.

# Management of FANR

- **Board of Management ("BoM")**
  - FANR shall be managed by a BoM of not less than five members plus Chairman & Deputy Chairman
  - BoM appointed by UAE Cabinet for three years (renewable)
  - members: qualified Emiratis who must not engage in a Regulated Activity & must not have conflicting personal interests with FANR
  - shall meet every two months

- **Main authorities of BoM**
  - approves FANR strategic plans, policies, budget
  - authorises issuance of Licences and approves regulations
  - proposes Licence & services fees for Cabinet approval
  - Forms advisory boards and specialised technical committees
  - appoints Director General

# Management of FANR

- **Director General (“DG”)**

  - appointed by the BoM
  - manages FANR business & oversees its financial, administrative and technical affairs under BoM control
  - proposes draft strategic & operational plans, organisational structure, working regulations, recommends Licences etc for BoM approval
  - implements BoM decisions
  - appoints FANR staff (HR Policy)

# Financial Matters

- FANR resources

  - funds allocated by the UAE Government
  - income generated from carrying its activities (Licence fees & services)
  - grants, gifts, loans approved by BoM must not conflict with FANR objectives

- BoM shall appoint an independent auditor to audit FANR accounts.

# Regulations & Guides

- BoM shall issue regulations specifying requirements that all Operators must comply with.
  - Regulations are issued to establish the requirements in all 3S areas (i.e. Safety, Security & Safeguards)

- FANR shall issue Regulatory Guides to provide Licensees with guidelines on how to meet requirements set in regulations.

- In developing regulations & guides, FANR must take into consideration:
  - feedback from stakeholders
  - information made available by experts
  - internationally recognised standards and recommendations such as IAEA Safety Standards

- FANR benefits from existing standards and guides by foreign regulators and IAEA in most areas.

# Safeguards

- BoM shall issue a decision for the establishment of a national State System of Accounting & Control of Nuclear Materials subject to IAEA Safeguard Agreement (CSA) & Additional Protocol

- FANR shall carry out inspection in accordance with CSA

- Licensees shall maintain accounting and operational records of Nuclear Materials and submit reports with this data to FANR

# Radioactive Waste & Decommissioning

- Licensees are responsible for the safe management and Storage of Radioactive Waste pending Disposal

- UAE Cabinet to establish policy for long-term management & Disposal of Spent Nuclear Fuel and Radioactive Waste, and to identify an entity in charge of implementing said policy

- Requirement for Licensees managing a Nuclear Facility that produces Radioactive Waste to contribute to a Decommissioning Trust Fund in accordance with UAE Cabinet resolution

# Managing Nuclear Safety

- A fundamental principle of Nuclear Law.

Art. 43 (1): *"Each Licensee shall be responsible for taking all steps necessary to reduce the risk of an Accident to a level that is as low as reasonably achievable"* – ALARA

- **<u>Quality Assurance</u>**:
  - Licensee shall prepare management Safety system and Quality Assurance programme for FANR's approval (Art. 44)

- **<u>Physical Protection</u> (Arts. 45 – 48):**
  - FANR is required to regulate Physical Protection of Nuclear Materials & Facilities according to requirements of international treaties entered into by the UAE
  - Licensees must prepare Physical Protection plan & obtain FANR's approval
  - Competent authorities in the UAE shall provide security to Facilities and areas declared vital by the UAE Cabinet

# Managing Nuclear Safety

- **<u>Emergency Preparedness</u> (Arts. 49 – 55):**

  - competent authorities (e.g. National Emergency Crisis and Disasters Management Authority – NCEMA) and Licensee shall establish measures for Emergency Preparedness & Emergency Response (on site & off site)
  - Licensee shall submit an on site Emergency Plan to FANR and competent authorities before Commissioning a Nuclear Facility
  - FANR also required to cooperate and advise government agencies responsible for Emergency Preparedness

  - Pursuant to Art. (67) BoM formed the Radiation Protection Committee in July 2011 to provide advice on the Radiation Protection infrastructure in the UAE - includes other agencies as members (environment and health agencies; NCEMA; customs authority; Emirates Nuclear Energy Corporation - ENEC; Khalifa University; Ministry of Interior; UAE Armed Forces)

  - FANR & NCEMA MOU signed

# Civil & Criminal Liability

- **Civil liability**
  - Art. (58):

  • *"The civil liability for nuclear damage shall be determined according to the provisions of the international treaties and agreements entered into by the State and the relevant legislations issued in this regard. The Operator shall be solely responsible for compensating any damages that may occur to individuals or properties as a result of its own negligence in operating the Nuclear Facility or not following the Safety and Nuclear Safety requirements according to the international treaties and agreements and the relevant legislations."*

  • **N.B.** Civil Nuclear Liability Law issued in October 2012

- **Criminal liability**
  - Arts. 60 – 64 provide for criminal offences and penalties (imprisonment and fines)

# UAE International Commitments before 2008, i.e. before deciding on Nuclear Power

- **UAE Party to**
  - Nuclear Non-Proliferation Treaty, 1995
  - IAEA Comprehensive Safeguards Agreement, 2003
  - Convention on Physical Protection of NM, 2003
  - UN Comprehensive Test Ban Treaty, 2000
  - UN Security Council Res. 1540, 2004
  - UN Convention for the Suppression of Acts of Nuclear Terrorism, 2005
  - Early Notification & Assistance Conventions, 1987

# Additional International Commitments following the decision to utilize Nuclear Power for Electricity Prod.

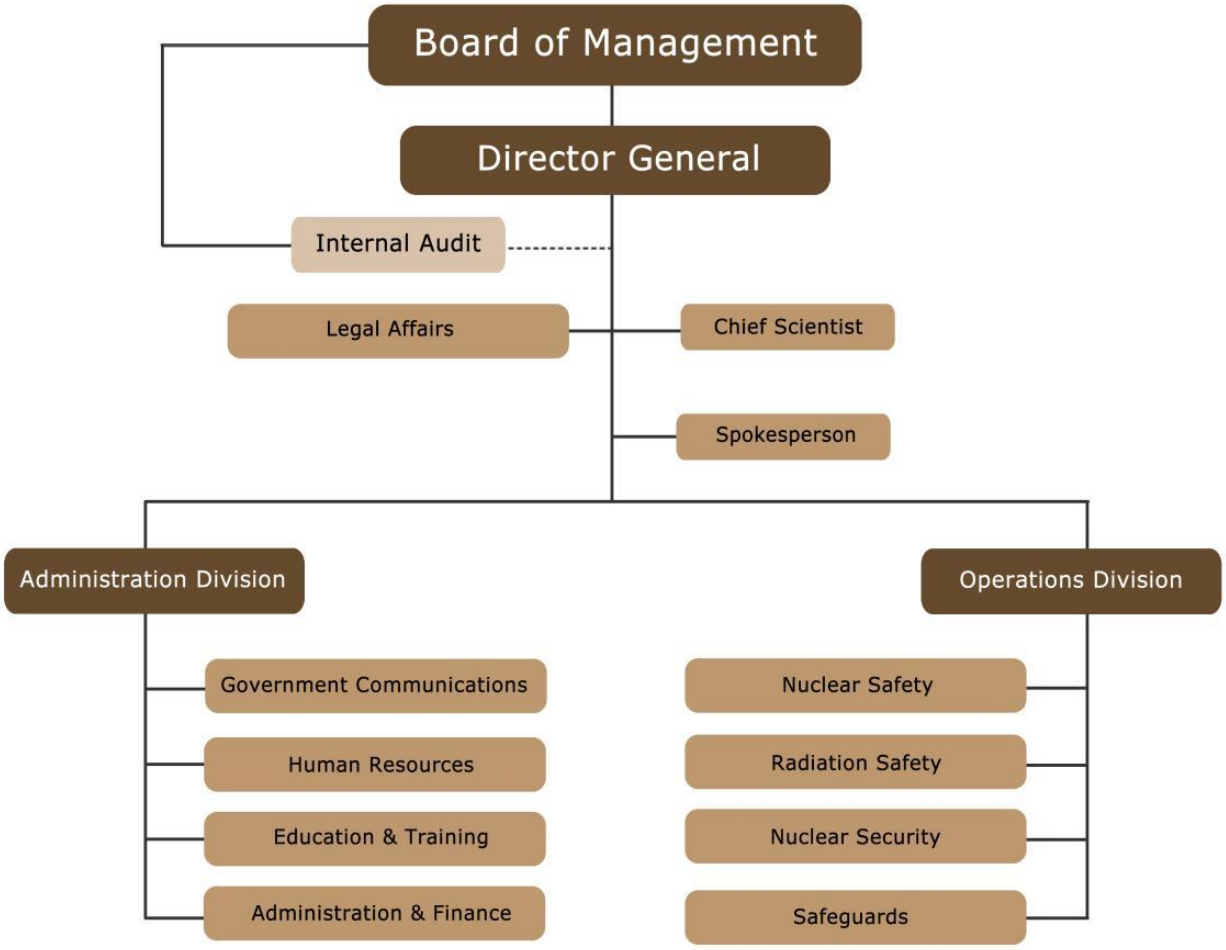
To meet the Policy commitments on transparency and international cooperation the UAE has:

- Ratified the Additional Protocol to the safeguards agreement, 2010;
- Become a party to:
  - Amendment to Convention on the Physical Protection of Nuclear Material;
  - Convention on Nuclear Safety;
  - Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management
  - Illicit Trafficking Data Base of the IAEA
- Adhered to Amendment Protocol to Vienna Convention on Civil Liability for Nuclear Damage for 1997 and the Joint Protocol on Implementing Vienna Convention and Paris Convention for1988
- Issuance of UAE Nuclear Liability Law, October 2012
- Follows guidance of Code of Conduct on the Safety and Security of Sources
- Take active part in IAEA development of standards for safety and security
- Supports IAEA International Peer Review Services

# International Cooperation Framework

- Policy puts a great emphasis on working directly with IAEA and responsible nations of expertise to develop the nuclear energy program
- UAE program has been well received by the international community as a model for pursuing the development of peaceful nuclear energy.
- Government-to-Government
  - Bilateral agreement with the France, Republic of Korea, US, and UK, and other countries
  - Regional cooperation through GCC
- Appropriate arrangements with international expert organizations
- FANR has entered into Technical Cooperation Agreements with NSSC, KINS, KINAC, USNRC, STUK, ASN

# FANR Organization



# FANR Integrated Management System

- Comprises
  - IMS Manual
  - Process Descriptions (Core, management and support processes)
  - Procedures and Instructions

# Regulations

- FANR-REG-01. Management Systems for Nuclear Facilities
- FANR-REG-02. Siting of Nuclear Facilities
- FANR-REG-03. Design of Nuclear Power Plants
- FANR-REG-04. Radiation Dose Limits & Optimisation of Radiation Protection for Nuclear Facilities
- FANR-REG-05. Probabilistic Risk Assessment Application at Nuclear Facilities
- FANR-REG-06. Application for a Licence to Construct a Nuclear Facility
- FANR-REG-08. Physical Protection for Nuclear Facilities
- FANR-REG-10. System of Accounting for & Control of Nuclear Material and Application of Additional Protocol
- FANR-REG-11. Radiation Protection & Radioactive Waste Management
- FANR-REG-12. Emergency Preparedness at a Nuclear Facility
- FANR-REG-13 Safe Transport of Radioactive Materials
- FANR-REG-17 Certification of Operations Personnel
- FANR-REG-23 Security of Radioactive Sources
- FANR-REG-24 Basic Safety Standards for Facilities and Activities involving Ionising Radiation other than in a Nuclear Facility (pending BOM approval of Arabic version)

# Regulations

- **Being developed:**
  - Application for a Licence to Operate a Nuclear Facility
  - Operational Safety including Testing, Surveillance & Reporting
  - Administrative Penalties
  - Import/ Export of Nuclear Material

- **A number of regulatory guides have been issued to support application of regulations:**

  - FANR-RG-001 Content of Nuclear Facility Construction and Operating Licence Applications
  - FANR-RG-002 Application of Management Systems for Nuclear Facilities
  - FANR-RG-003 Probabilistic Risk Assessment: Scope, Quality and Applications
  - FANR-RG-004 Evaluation Criteria for Probabilistic Safety Targets and Design Requirements
  - FANR-RG-006 Transportation Safety Guide
  - FANR-RG-007 Radiation Safety (draft in public consultation)

# IAEA Support - Examples

- **Legal and Regulatory Framework**
  - Consultations with the Agency (e.g. nuclear law, FANR regulations on physical protection, safeguards)
  - Benefit from IAEA standards and guidance in establishing FANR regulations and guides

- **Licencing**
  - Direct support and advice, e.g. site assessment mission in 2011

- **Infrastructure and capacity building**
  - Training events within or outside TC cooperation
  - Expert advice in variety of areas
  - Provision of technical support, e.g. monitoring, laboratory equipment
  - Use of IAEA systems/data bases, IRS, ITDB, ..
  - Security infrastructure, INSSP

- **Safeguards implementation**

- **Peer reviews**
  - INIR Review (January 2011)
  - IRRS (December 2011

- **FANR contributes to IAEA**
  - Safety/security standard committees
  - Host international conferences (2010, 2013)
  - Contribute our experience

# Integrated Nuclear Infrastructure Review – INIR

- **INIR in January 2011**

•The UAE, ENEC, FANR and MoFA, the parties most directly involved in the INIR program, found the process to be a valuable, comprehensive and methodical way to ensure that the country was fulfilling its commitments and requirements as outlined in the IAEA's Milestones approach to implementing a nuclear power program

•The value derived is due in no small part to the fact that the UAE relied extensively upon the Milestones Approach as it developed its Roadmap for Success, the extensive document that laid out the path the UAE would take to implement peaceful, civil nuclear power.

•The mission team recognized that the UAE infrastructure is progressing rapidly and is well advanced. The Team also made some recommendations supporting the on-going development of the program

# Integrated Regulatory Review Service - IRRS

- IRRS in December 2011
- The UAE opted for a full scope mission, which covers all the 10 core modules
- In addition, the UAE decided to have three additional Modules covering
  - Medical exposure control
  - Occupational exposure control, and
  - Safety and Security of Radioactive Sources
- Plus three policy discussions
  - Response to the Fukushima accident
  - Capacity building and sustainability
  - Regulatory body in the country of origin

# Benefits of INIR-IRRS

- **Chief benefits:**
- Served as a benchmark for the nuclear infrastructur of the UAE program and the work that the agencies need to do
- Identified a number of good practices for others to learn from
- Identified improvement needed and suggestions for continuous improvements of processes and practices
- Ensured that UAE is in line with the safety standards of the IAEA and the international community
- Served as yet another means of fulfilling the UAE's commitment to complete operational transparency

# UAE Nuclear Safeguards are acting in accordance with International agreements concluded

- Nuclear Non Proliferation Treaty NPT, ratified 1995
- UAE - IAEA Comprehensive Safeguards Agreement (CSA) ratified 2003
- Additional Protocol to the CSA agreement ratified December 2010.
- FANR established as SSAC, State System for Accounting for and Control of Nuclear Material
- FANR has issued regulations on Safeguards

# Concluding Remarks

- UAE has put in force a comprehensive legal & regulatory framework conforming to IAEA standards/guidance to regulate the nuclear sector
- Key international instruments are adhered to
- FANR is a functioning independent nuclear regulator providing enhanced controls on safety, security and non-proliferation
- UAE benefits from strong international support, incl. IAEA and first hand access to Korean organizations and practices
- Active capacity building programme, human and technical
- Peer reviews shows UAE regulatory system aligned with good international practices