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Potential Nuclear Power Plant Siting Issues in the UAE

CNRA International Workshop on
"New Reactor Siting, Licensing and Construction Experience"
Prague, Czech Republic
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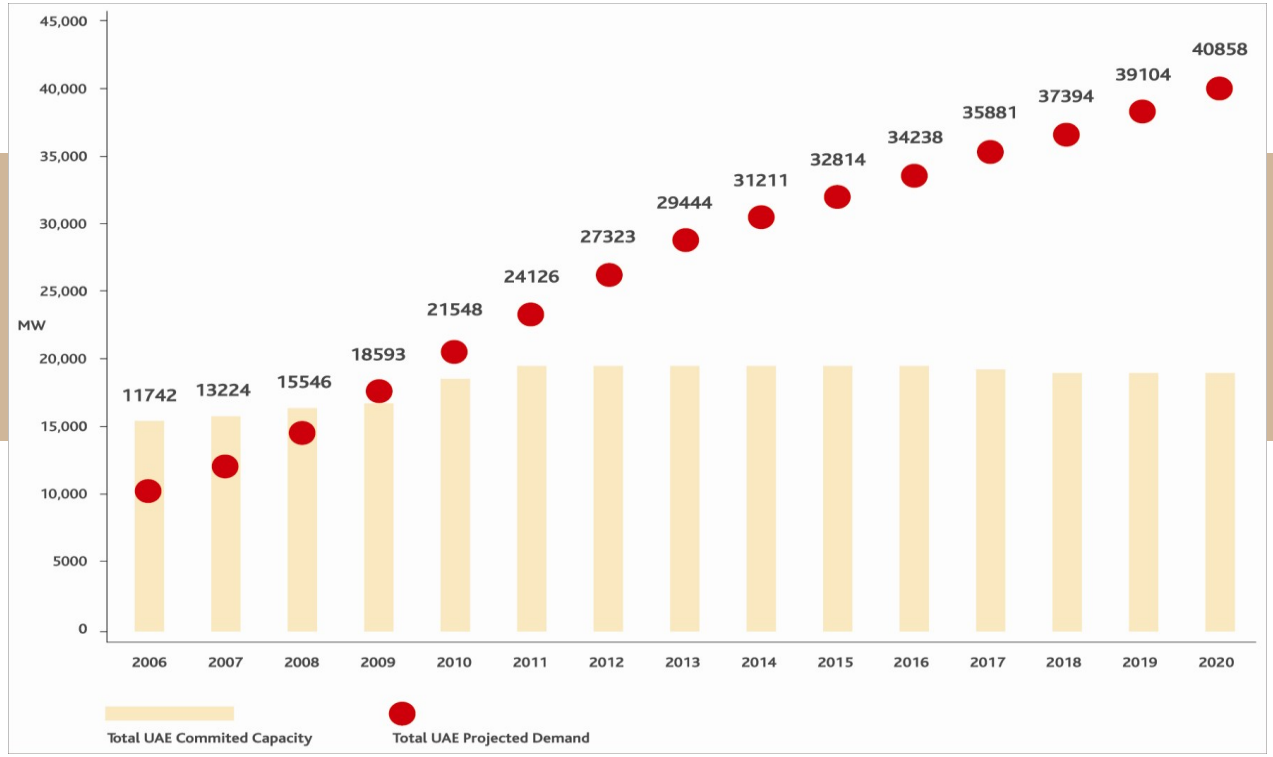
BACKGROUND



- Spring 2008: "**White Paper" on the "*Evaluation and Potential Development of Peaceful Nuclear Energy*"**
- Sept. 2009: "**Nuclear Law" established "*Federal Authority for Nuclear regulation (FANR)*"** as an independent federal regulatory authority charged with regulation of all nuclear activities in the state

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Requirements by the Law: Facility Licensing

- **Prohibition (Article 23)**
  - **No one shall conduct any Regulated Activity in the State unless licensed to do so by the Authority.**
- **Regulated activities (Article 25)**
  - **Selection of a Site for the Construction of a Nuclear Facility;**
  - **Preparation of a Site for the Construction of a Nuclear Facility;**
  - **Construction of a Nuclear Facility;**
  - **Commissioning of a Nuclear Facility;**
  - **Operation of a Nuclear Facility;**
  - **Closure or a change in the Closure date of any Nuclear Facility;**
  - **Decommissioning of a Nuclear Facility**
- **Application for License (Article 28)**
  - **Prior to the granting of a License, the applicant shall submit detailed evidence of Safety**

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License Application Review Principles

FANR will perform integrated safety assessments: a combination of deterministic and probabilistic, performance-based approaches"Country-of-Origin" Approach: Use information available from previous regulatory authority approvals (where applicable) to support the assessment of whether the proposed facility complies with all FANR requirements. This is done through

- **FANR collaboration with other regulatory authorities to understand their practices**
- **Implementing a graded approach in Application reviews to demonstrate that FANR regulations are met.**
- **Providing more in-depth, independent FANR review of the following:**
  - **Areas where it cannot be demonstrated that FANR requirements have been met based on other regulatory authorities assessments**
  - **Changes made to the proposed UAE design after the design was approved by other regulatory authorities**
  - **Site characteristics unique to the UAE**
  - **New technology**
  - **Operating experience gained after approval by other regulatory authorities**

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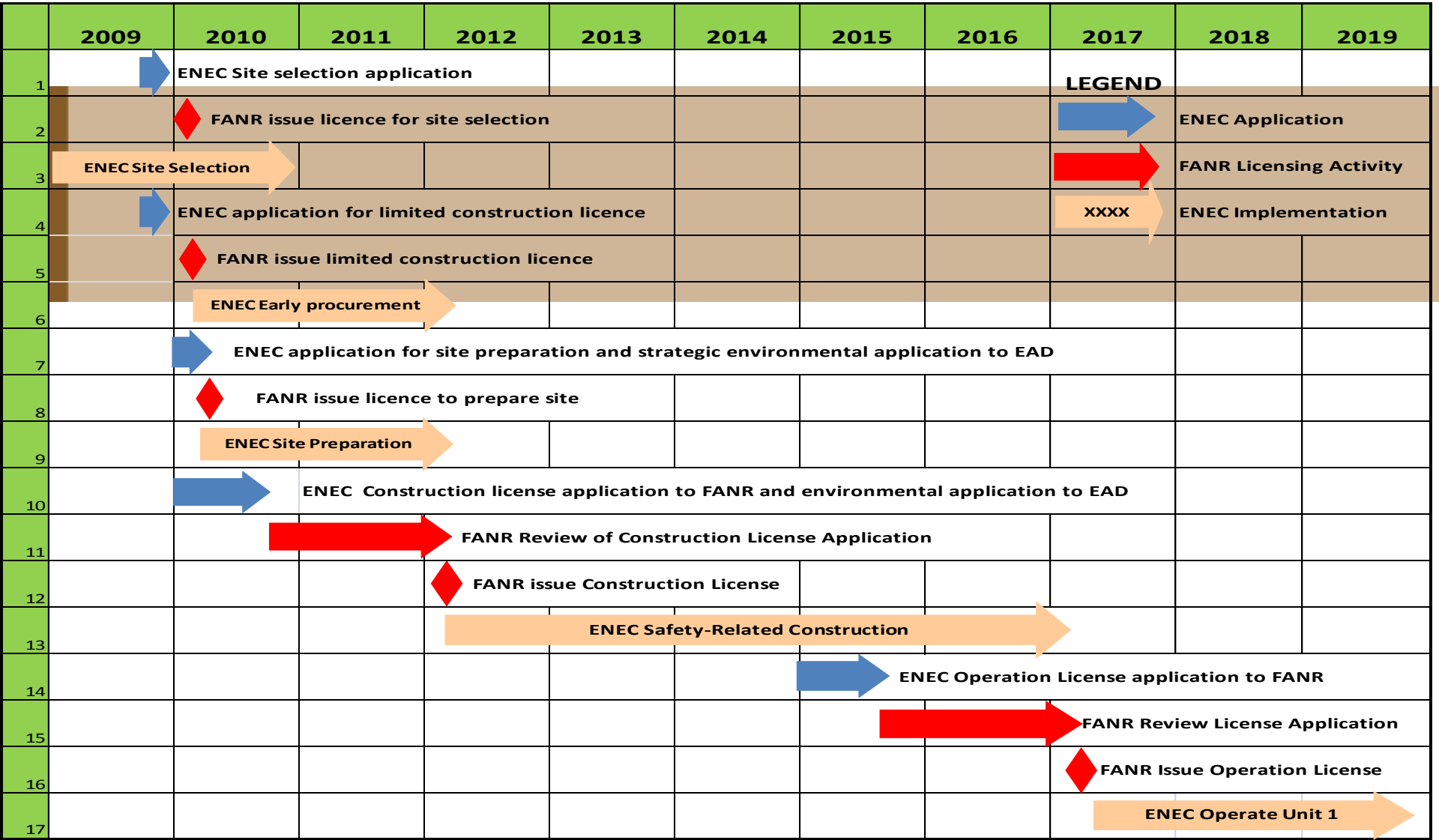

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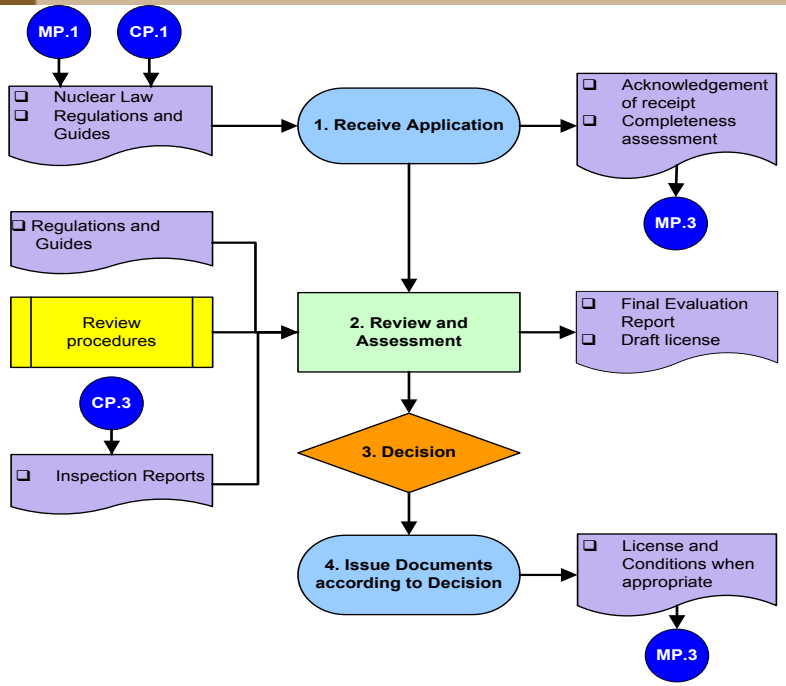
Licensing Flow Diagram (CP.2)



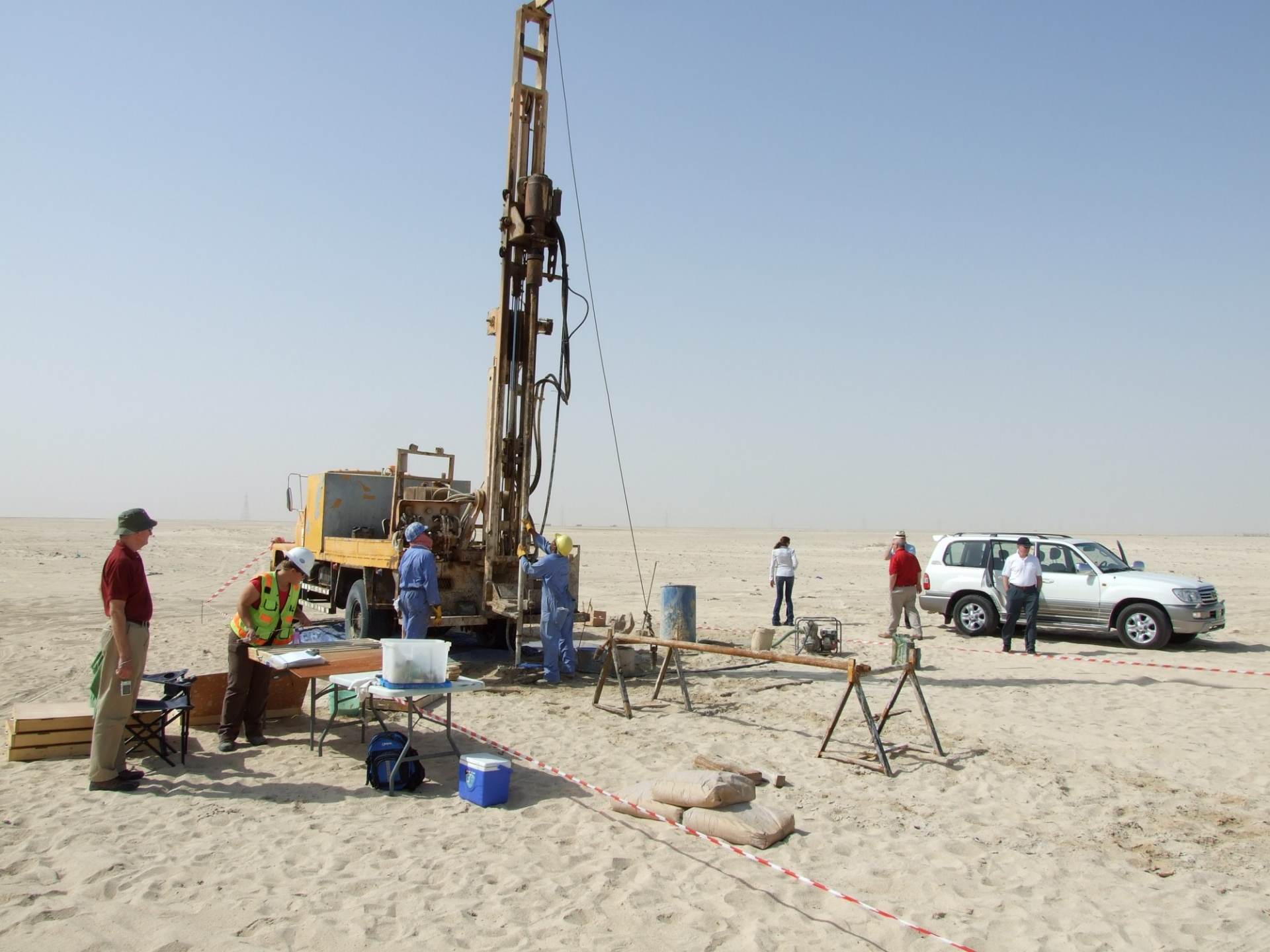
1. FANR receives Application, issues communication to Stakeholders

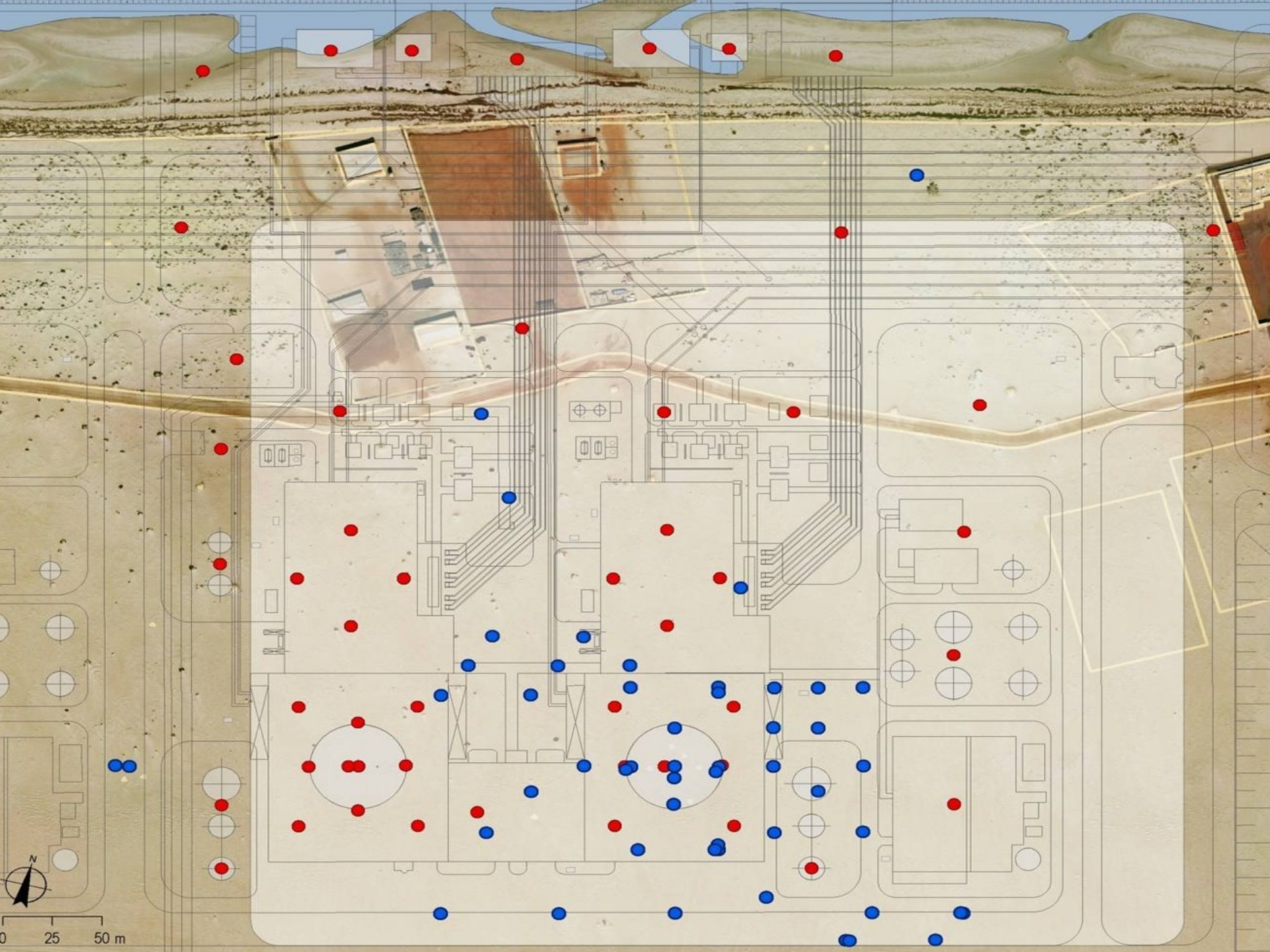
2. FANR conducts Review and Assessment of Application

3. Board decision to grant or refuse a License

4. FANR issues documents according to Board decision, issues communication to Stakeholders

CP.1 = Core Process "Manage the Regulatory Framework for Ensuring Safeguards, Safety and Security"
CP.3 = Core Process "Assure Compliance"
MP.1 = Management Process "Direct and Manage the Organization";
MP.3 = Management Process "Manage Corporate Communication"

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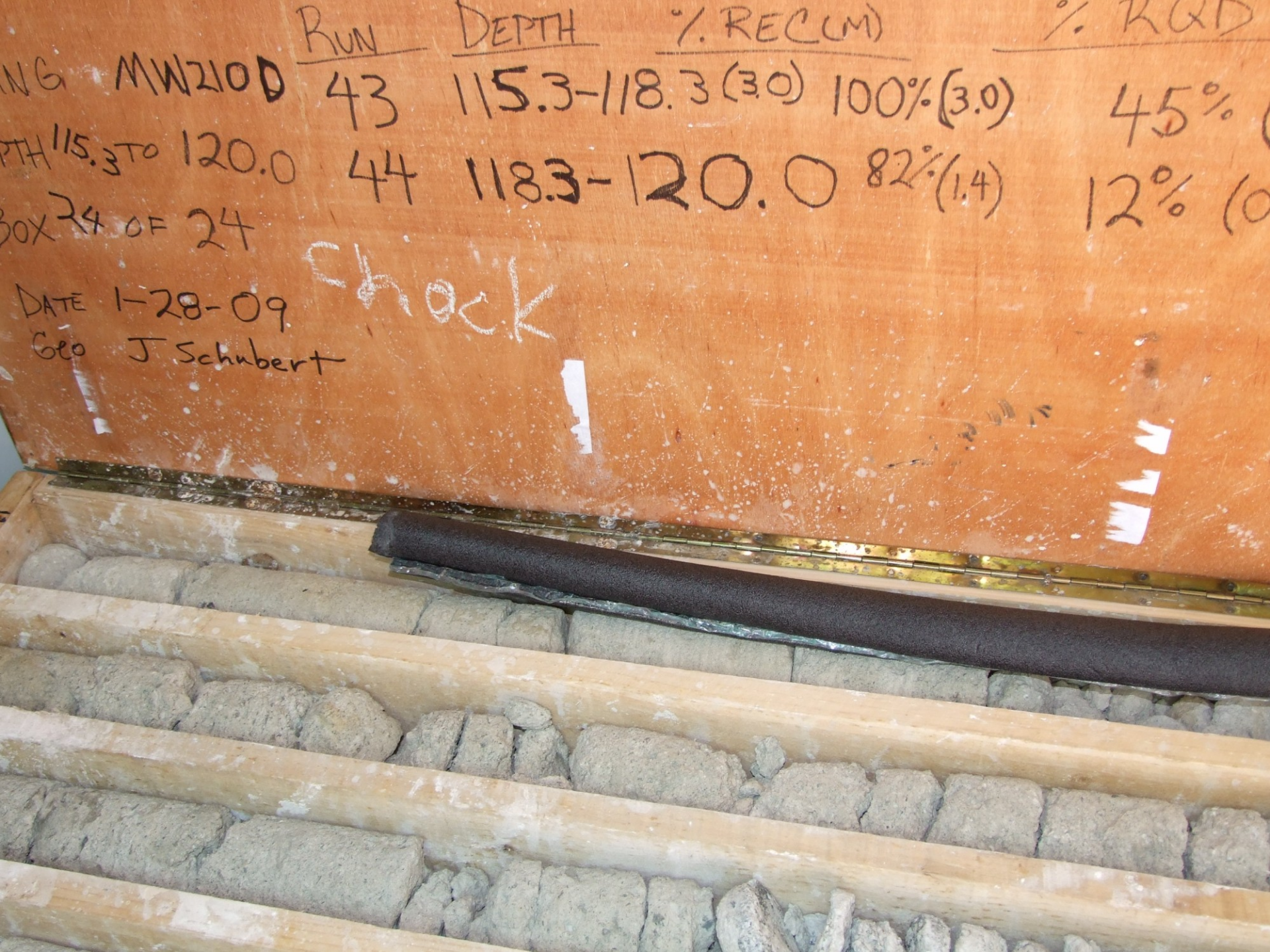
NG MW210D
PTH 115.3 TO 120.0
BOX 24 OF 24
DATE 1-28-09
GEO J Schubert
RUN
DEPTH
% REC (M)
% RQD
43 115.3-118.3 (3.0) 100% (3.0) 45%
44 118.3-120.0 82% (1.4) 12%
chock

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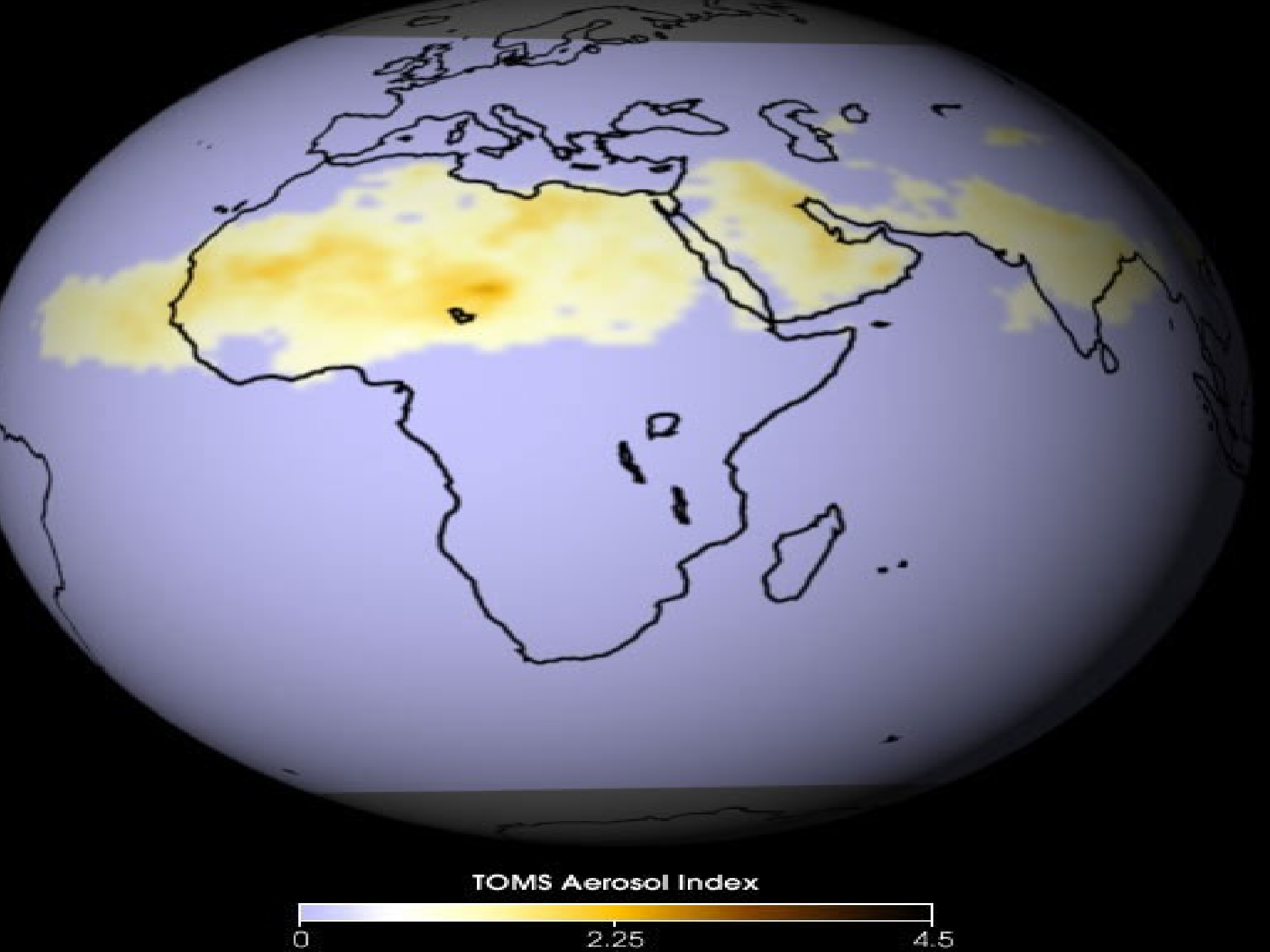
Site-specific characteristics

❖ Dust/sandstorm appears as an event to be dealt with in the design of a Nuclear Power Plant (NPP) in the United Arab Emirates (UAE)

❖High cooling water temperature, and Sabkha (or *Evaporites*) ground soil are site-specific characteristics of the region of the proposed NPP


TOMS Aerosol Index
0
2.25
4.5

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Dust/Sandstorm Characterization

DIFFERENT TYPES OF PHENOMENA

- According to the analysis of dust/sandstorms characteristics it turns out that "dust/sand" cannot be considered as a single phenomenon but includes different types of phenomena

- **Sandstorm**

  Sandstorm with dust generated by local high winds and characterized by the presence of both sand and dust particles (heavy sand particles at a low altitude and dust in a potentially very high cloud) and a limited duration (less than a day)

- **Dust phenomenon**

  Driven from distant regions by more or less high winds, not necessary correlated with high winds at the site, and characterized by the presence of dust particles and a duration that might be long

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Site-specific characteristics: Dust/Sand storms

Four main requirements:

- Parametric characterization: data collection and analysis of the characteristics of dust/sandstorm (description, intensity, duration, physical particles displaced…)
- Identification of the NPP vulnerabilities to SS/DS
- Identification of Structures, Systems and Components (SSCs), in particular those pertaining to the safety functions
- Identification of the interaction with other independent internal and external events (fog, humidity, salt content in the air and in surrounding sabkha, temperature, electrostatics, …) to be considered in the design
- Consider other Industries practices such as oil and gas industry

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Three Main Categories Of Dust/Sandstorms Effects

Dust/sand "accumulation effects": clogging-up, excessive stresses, modification of electrical/thermal/hydraulic properties, reduced accessibility

"Abrasive/corrosive effects": wearing of moving parts (especially in case of grease or oil leak), leaks, reduction of mechanical/electrical properties

"Mixture in the atmosphere": reduced visibility, reduction of waves communication efficiency, interaction with radioactive particles

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Principles for protection (design stage)

- The protection against dust/sandstorm could be ensured:
  - Either by means of passive barriers (ex: leaktight buildings)
  - Or by adequate specification/qualification of SSCs to dust/sandstorm conditions
- Specific concern with:
  - Openings
  - Ventilation systems
  - Electric and electronic devices
  - Instrumentation
  - Emergency diesel generator sets / gas turbines
  - Warning system
  - On-site management - Communications
  - Specific systems to cope with dust/sandstorms

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Radiological / Environmental aspects

- **Dust/sandstorms may modify: sedimentation process (particles weight) and transport of radioactive particles (wind)**

<u>Monitoring of radioactivity in the environment:</u>

- Important to check that radioactivity monitoring devices around the NPP are available during dust/sandstorms, notably in the event of a radiological incident or accident.

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Conclusion 1

➢UAE have embarked on a nuclear power programme to meet high demand for electricity to sustain the rapid growth of its economy

➢UAE's Federal Law by Decree No. 6 of 2009, Concerning the Peaceful Uses of Nuclear Energy, created the Federal Authority for Nuclear Regulation (FANR)

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Conclusion 2

- Challenges facing FANR:
  - Environmental issues specific to the area. Dense fog and severe "dust/sand" storms are the two most site-specific and potentially most safety-relevant meteorological phenomena.
  - Main potential effects of dust/sandstorms: corrosion, abrasion, plugging, and clogging of filters, electric/electronic circuits and rotating parts of the systems, structures and components of the NPP
- Existing experience in other industrial sectors shall be capitalized on

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Thanks For Your Attention

Questions