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FANR Licencing/Inspection of the Construction of a Nuclear Facility in the UAE

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United Arab Emirates

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FEDERAL AUTHORITY FOR NUCLEAR REGULATION

FANR Licencing/Inspection of the Construction of a Nuclear Facility in the UAE

The IAEA Nuclear Energy Policy Management School
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Requirement in the Nuclear Law

Licensing (1 of 2)
(Articles 23 – 31)

- Conducting any Regulated Activity in the UAE (including Free Zones) is prohibited without a Licence from FANR (Art. 23).

- Regulated Activities (Art. 25)

  - Activities applying to Nuclear Facility:

  Selection of site; Preparation of a site for construction; Construction; Commissioning; Operation; Closure (or change in closure date); Decommissioning ; Modifications significant to Safety

  - Activities applying to Regulated Material (Radioactive Material, Radioactive Waste, Spent Nuclear Fuel etc):

  Possession, Use, Manufacture or Handling; Import & Export; Transportation; Storage; Disposal

Licensing (2 of 2)
(Articles 23 – 31)

- **Licence:**
  - applicants must submit detailed evidence of Safety
  - extent of review will be proportionate to potential magnitude & nature of hazard
  - Licence issued determines conditions, measures and requirements

    (**N.B.** as per Article 26(2) BoM may exempt Facilities & Activities from Licence conditions provided there is no significant risk to safety)
  - FANR approve or reject Licence application
  - rejected applicants may seek review of decision from BoM

Inspection (1 of 2)
(Articles 32 – 37 & 65)

- Nuclear Law provides appropriate legal powers for FANR to conduct inspections & monitor compliance of applicant or Operator
- Monitoring: FANR review & assess applicant or Operator technical information to ensure Facility or Activity complies with Safety measures
- Inspection: FANR carries out inspection in accordance with a "*planned and systematic inspection programme*" (Art. 35)
  - enter relevant sites & Facilities
  - both routine announced & unannounced inspections
  - immediate inspection on short notice if unusual incident

- FANR Inspectors' powers & qualifications (currently 12 inspectors):
  - granted powers of judicial officers to prove violations pursuant to Ministry of Justice ("**MoJ**") resolution (Art. 65)
  - prepare reports on which FANR takes actions
  - In-house training and qualification exam
  - MoJ training

Inspection (2 of 2)
(Articles 32 – 37 & 65)

- Enforcement in event of violation
  - FANR empowered to take Enforcement Action & to ensure corrective measures on Operator, and compel Operator to take corrective actions
  - Board has power to suspend or revoke Licences
  - Board may impose administrative fines & penalties

  N.B. Administrative penalties regulation under development - to be approved by UAE Cabinet as per Article 11(4)(h)

- FANR Enforcement Procedure
  - Nuclear Facilities:

    Five Non-Cited Violations (NCV); six issues of concern; one deviation.
  - Regulated Material:

    One Notice of Violation (NOV) issued in line with FANR CP.3 Enforcement Procedure.

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FANR Assessment of ENEC's Construction Licence Application of 2 APR-1400 Reactors

Construction Licence Application

Construction Licence Application

- Application Letter + 4 enclosures

Key portion: Preliminary Safety Analysis Report (9000 pages)

- 21 Chapters covering Safety, Safeguards and Physical Protection and 2 Supplements

And

- Physical Protection Plan for construction
- Preliminary Safeguards Plan
- Preliminary Probabilistic Safety Assessment Report summary
- Severe Accident Analysis Report

Authorization requested

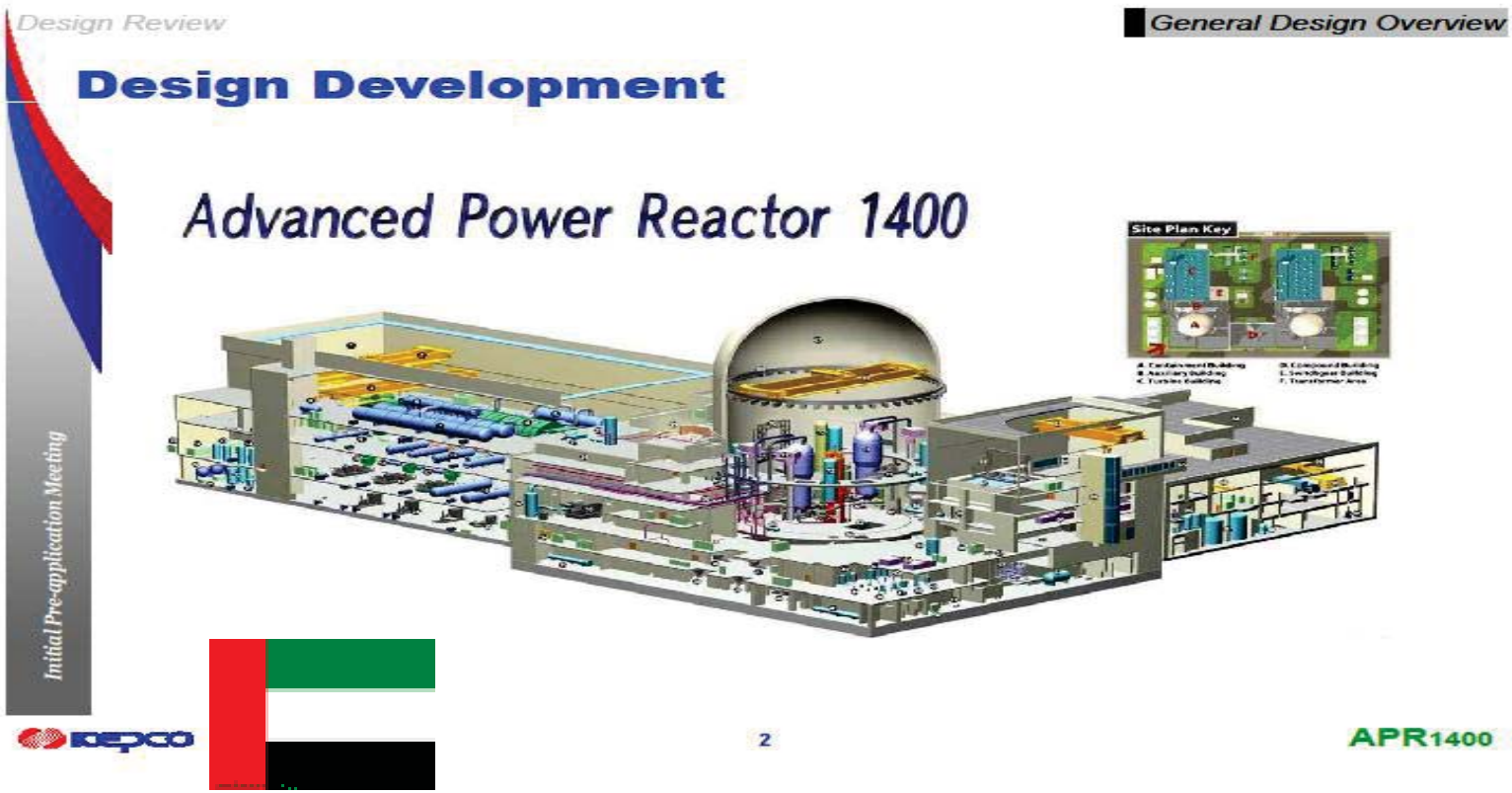
"…the manufacture, possession, use, transport, import, storage, installation and testing of structures, systems and components comprising BNPP1&2, including supporting and auxiliary equipment and associated facilities."

and,

"…the transfer of technology and software and materials subject to reporting per the list of Nuclear Material, equipment and Technology in IAEA INF/CIRC/254/ Rev 9 Part 1 and Part 2 Rev 7."

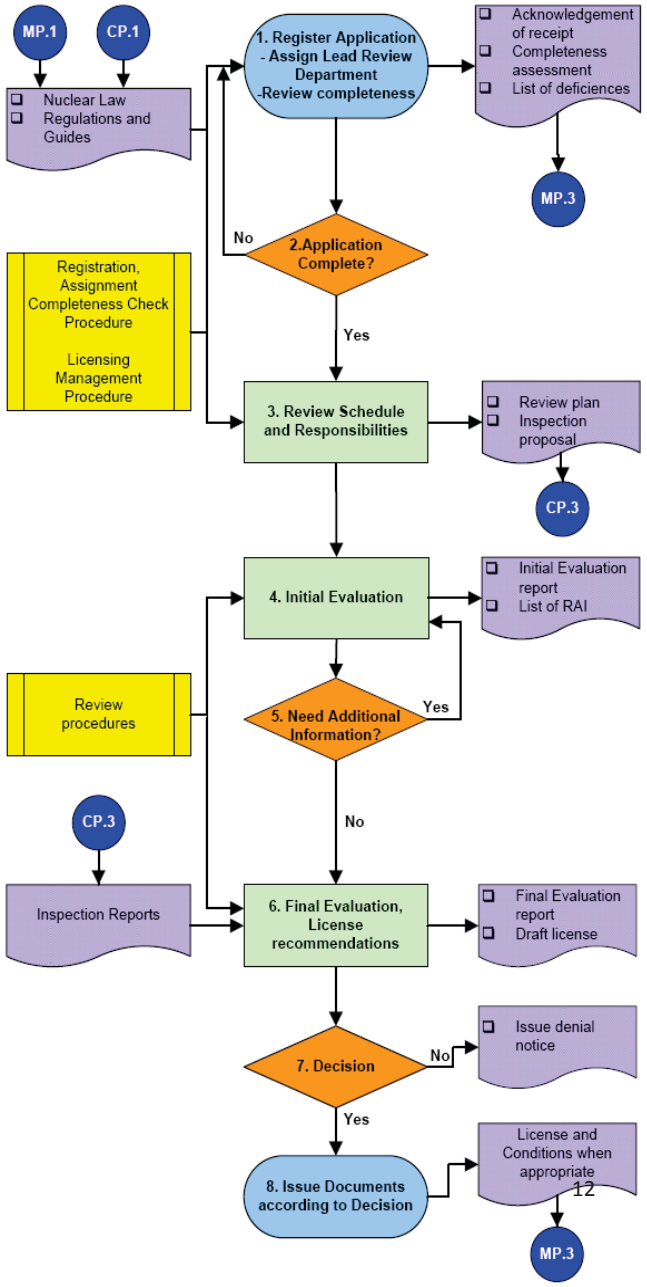
UAE Nuclear Power Plant

- Korean Advanced Power Reactor 1400
- Evolutionary advanced LWR
- Based on Combustion Engineering System 80+ certified by US NRC
- APR1400 standard design approval in Korea
- Reference plant licensed and in construction



FANR Licensing Process

- Part of FANR Integrated Management System
- Governs process:
  - Receipt of application
  - Technical review
  - Preparation of Safety Evaluation Report
  - Licensing recommendations to FANR Board of Management
- Licensing Management Procedure describes steps and topical review instructions



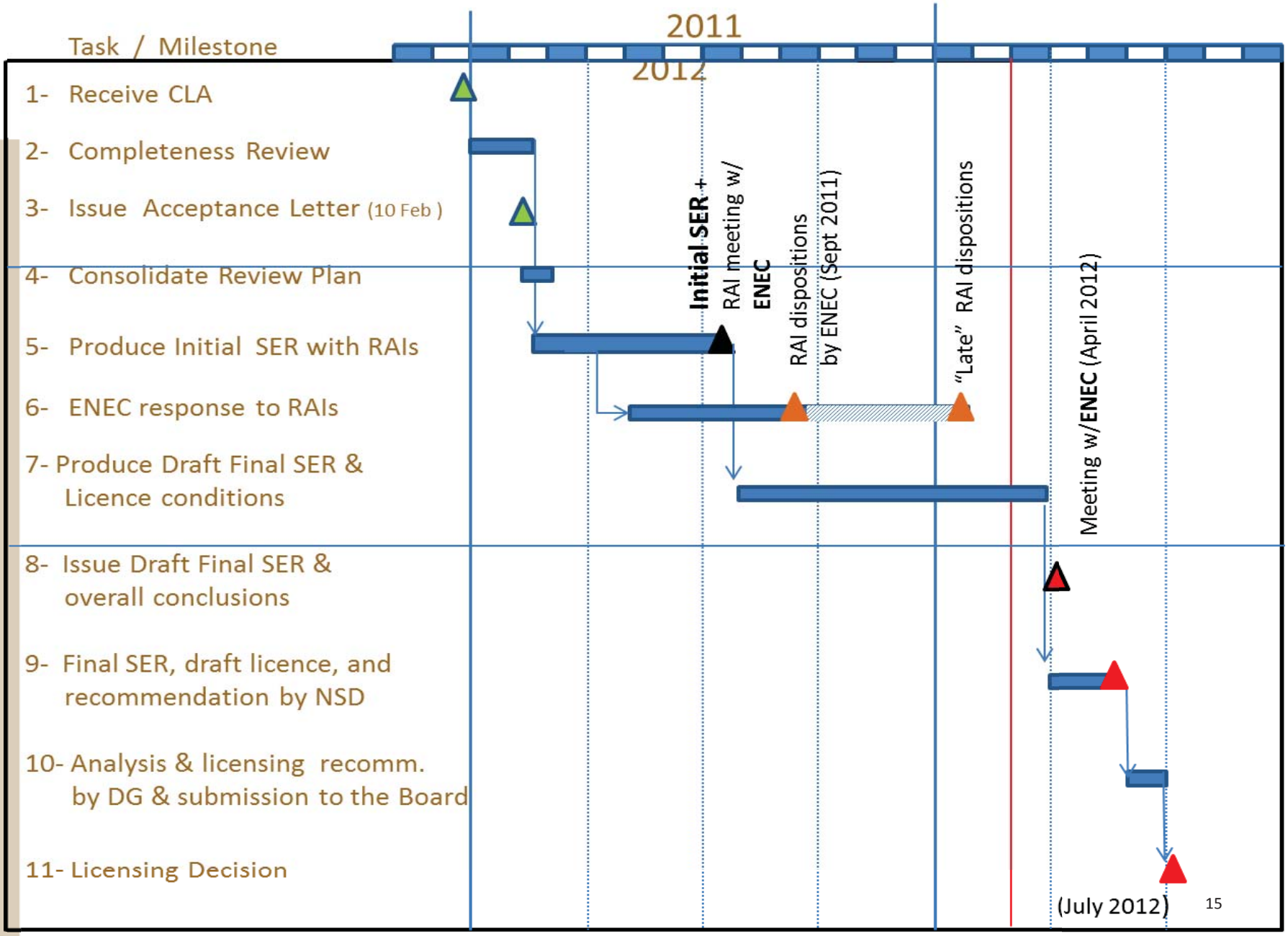
Using Safety Information from Korea Country of Origin

- FANR used safety evaluations by Korean regulatory body to support review of the construction licence application in the UAE.
- FANR conducted independent review where:
  - it cannot be shown that UAE requirements have been met based on another regulatory body's assessments
  - The proposed UAE design differs from that approved by the other regulatory authority
  - site characteristics are unique to the UAE
  - operating experience since other regulatory authority's approval
- Review plan identified review categories

Technical Support Organizations Approach

- FANR engaged three TSOs in the US and Europe to support review and assessment of CLA to augment in-house resources
- FANR provided alignment and direction to TSOs ensuring consistency across the CLA review.
- FANR retains responsibility for regulatory decisions, through its in-house team of seasoned staff.

BNPP1&2 CLA review Project Schedule



Review –Facts and Figures

PSAR chapters/pages	21/9000
Requests for additional information FANR to ENEC	1599
Safety Evaluation Report Sections	223
Safety Evaluation Report	Part 1: Summary (70 pages) Part 2: Detailed SER (2500 pages)
IAEA IRRS	- *"FANR has regulations and a review process for effectively conducting the review of the application."* - *"Review and assessment in FANR with the support of TSOs is organizationally a well arranged and managed process ."*

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Summary of Evaluation Findings

Topics and Examples of Main Focus Areas of FANR

- Reference Facility – departures from Shin-Kori NPP
- Site – major topic of FANR evaluation, unique UAE characteristics, to establish suitability for siting Nuclear Power Plant (IAEA site evaluation mission requested)
- Facility Design – changes due to site & UAE characteristics
- Radwaste, Radiation protection – waste facilities onsite
- Safety Analysis – PRA and Severe Accidents
- Management Systems & Quality Assurance – Requirements in line with IAEA SS and QA program approval

Topics and Examples of Main Focus Areas of FANR

- Construction Inspection and Test Plan – Overview Plan and conformance with Korean practices
- Safeguards, Physical Protection and Aircraft Impact Assessment – Confidential information
- Use of Operational Experience – how OE has been taken into account, lessons learnt from Fukushima

Fukushima Lessons Learned

FANR Request to ENEC (4 July 2011):

- FANR requested ENEC undertake an assessment to determine how experience at Fukushima and lessons learned so far may be applied to the proposed Braka Nuclear Power Plants Units 1 and 2.
- FANR directed ENEC to follow the European “stress test” specification
- The assessment covers Nuclear Safety and Radiation protection only.
- A detailed report compiling the results of the assessment was provided to FANR in December 2011.

Committed Design Enhancements

Similar to Korean reference plant

- Waterproof doors to protect plant from extreme flood
- Enhancement to emergency electrical power supplies
- Unit cross tie design of EDGs and AAC DG for emergency Power Supply
- Battery Duty Extension
- Class 1E power backup for communication system
- External water injection for: Steam Generators, Reactor Coolant System, Spent Fuel Pool
- PARs in Spent Fuel Pool
- Spent Fuel Pool instrumentation
- Severe accident and emergency management procedures

Conclusion of Assessment

- FANR staff conducted a thorough review and assessment of ENEC's application for a licence to construct the first two units of nuclear facility at the Barakah site
- The staff found that the information submitted by ENEC is sufficient to demonstrate that the proposed facility complies with FANR regulations, and satisfies the relevant principles, objectives and criteria for safety, radiation protection, nuclear security and non-proliferation as required by Law .
- The review is documented in the Safety Evaluation Report

Follow up actions

- During its evaluation FANR identified requirements for a number of follow-up submittals from ENEC
- “Conditional Acceptance”
  - Update PSAR
  - Additional submissions to confirm technical solutions meet FANR requirements
  - Fukushima follow up actions
  - FSAR commitments

Issuance of the Construction Licence

- FANR Board of Management decided on 17 July 2012 to empower the DG to issue a licence authorising ENEC to carry out the construction of units 1&2 and related regulated activities.
- The licence contains several conditions
  - Compliance with the law, regulations and application
  - Fulfillment of commitments
  - Reporting of modifications and unplanned events
  - Import of components for reactors 1 and2 (see later)

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FANR Oversight of

ENEC and KEPCO Performance and Interaction

ENEC Management of Suppliers

- ENEC is responsible as FANR's licensee for design, procurement, construction, inspection and testing.
- ENEC provided in the PSAR a description of its organisational arrangements, management system, QA programme and safety culture arrangements, including oversight of contractors
- FANR staff evaluated ENEC's arrangements and found they comply with FANR requirements

ENEC Management of Suppliers (cont.)

- ENEC has delegated many elements to the PC (KEPCO) QA programme, which ENEC has reviewed and released.
- Design changes and disposition of nonconforming items are reviewed and approved by the PC design organisation or other organisations authorized by the PC
- Safety related non-conformances as well as significant trends are reported to ENEC
- ENEC's Quality Surveillance Group monitors the implementation of the PC's non-conformance processes during construction

FANR Inspection: Scope

- ENEC and Prime Contractor
- Vendor inspection
- Site Construction

Pressuriser lower head (photo: Doosan)

FANR Inspection: Objective and Principles

- Safety-related facilities and equipment meet requirements
- The construction, manufacturing and installation of SSCs are conducted in accordance with regulatory requirements;
- The operator's management system and procedures for quality assurance and inspection are adequate to ensure the conformance of equipment to technical specifications
- The as-built configuration of SSCs is in conformity with the assumptions made in the safety analysis report
- The facility can be operated in accordance with the assumptions and safety goals described in the safety analysis report and the FANR safety evaluation and regulatory requirements.

FANR Inspections conducted in 2012 to date

- **Inspections conducted per 2012 Annual FANR Inspection Plan**
  - Site Inspections: 11
  - Vendor Inspections: 3
  - ENEC MS/QA Inspections: 2
- **Remaining Inspections for 2012**
  - Site inspections: target 2 per month
  - Vendor inspections: KEPCO, KEPCO E&C (A/E and S/D)
- **Staffing of FANR inspection teams**
  - FANR HQ inspectors
  - FANR Specialists
  - TSO consultants
  - KINS observers/consultants

Summary of Findings
(Status in October 2012)

- Statistics for 2012
  a. ENEC – 17 findings
  b. BNPP site – 10 findings
  c. Vendors – 19 findings
- Findings to date are mostly “non-cited violations”, judged as low impact on safety

Concluding Remarks

- Major Licencing Activities Completed in accordance to Plan set by FANR in January 2011
- Implementation of follow-up of ENEC commitments on-going
- Extensive oversight programme on-going