



A NEWCOMER'S REGULATORY RESPONSE to the FUKUSHIMA ACCIDENT

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Presentation Outline

- Introduction
 - Construction License Application
- Fukushima Lessons Learned Action: FANR
 - Strengthening Safety and Emergency preparedness
- ENEC Approach
- FANR Evaluation Findings



Construction Licence Application



Construction Licence Application

- Construction License Application (CLA) received December 2010
 - Preliminary Safety Analysis Report (9000+ pages)
 - Physical Protection Plan for construction
 - Preliminary Safeguards Plan
 - Preliminary Probabilistic Safety Assessment Report summary
 - Severe Accident Analysis Report
 - Aircraft Impact Assessment
- Less than 3 months into the CLA review, Fukushima accident



Post-Fukushima Action

- 30 March 2011, FANR requested ENEC to develop a plan to evaluate and apply lessons
- Approach is largely based on actions taken by international organizations, e.g., USNRC, ENSREG, WENRA; Korean actions reviewed
- ENEC and KEPCO formed a Safety Review Task Force(SRTF)
- FANR Established a Fukushima Lesson Learned Task Force to support ongoing national and international activities



FANR Requirements

- Siting and design Issues external hazards, e.g., earthquakes, floods, tsunami, sand storms, oil spills
 - Potential impact of loss of large areas of the facility due to fires and explosions
 - Robustness of the design
- Severe accident sequences, consequences and mitigation SAMG, mobile equipment
 - Command and Control Organization (personnel, procedures, etc.)
- Consequential Loss of Safety Functions; SBO, UHS
 - Enhancement of power system against CCF
 - Multiunit site-sharing items important to safety



ENEC Fukushima Report

- Fukushima lessons learned addressed in supplementary report; provided to FANR, 31 December 2011.
- The report has been reviewed by FANR as a part of ENEC CLA for Barakah NPP 1&2
- Make margin-enhancement-focused changes consistent with reference plant in South Korea
- Use design changes to limit analytical justifications



Earthquake Assessment

- Barakah site PGA is 0.14g
- Barakah NPP design PGA/SSE is 0.3g
- Margin evaluation is ongoing to determine the seismic capacity of SSCs
 - High Confidence Low Probability of Failure [HCLPF]
- Provisions to increase plant robustness
 - Seismically qualified display in MCR
 - Enhanced seismic qualification of AAC building to PGA of 0.14g being considered (FSAR)



Flooding Assessment

- Barakah site is designed to be a dry site
- Elevations are selected to protect against surge waves, tsunami, and plausible combinations
- Provisions to increase plant robustness
 - Watertight doors/gates for entrances, penetrations, and openings of the auxiliary building
 - Protection of outdoor tanks (barriers)
 - Mobilization of additional diesel fuel (FSAR)



Sand Storms

- Sand and dust storms, dust events, and dust haze are considered for the design of the Barakah plants
- Examples of design/procedural features *under consideration (FSAR)*:
 - Outside penetrations at > 6.0 m above site grade
 - Mainly indoor switchyard
 - Debris filter
 - Protection of out door electrical and electronic devices
 - Additional operational procedures



Oil Slick Assessment

- Distance from potential spill locations
 - Shallow coastal waters of Gulf prevent large ships from approaching and provide time for alerting and response
- Cooling water intakes draw from deep water below floating products
- Very low water velocity in the intake channel
- Use of oil absorbent material, oil booms, air bubblers and skimmers are under consideration (FSAR)



SFP Inventory and Cooling

- Time to reach the top of fuel in the SFP is:
 - > 20 hours assuming a pipe break
 - > 35 hours with no pipe break
- Provisions for increased robustness
 - External SFP fill line
 - Safety-related redundant SFP temperature instrument
 - PAR(s) in SFP building



Severe Accident Management Improvements

- Operating procedures, EOPs and SAMGs will be developed. Fukushima lessons learned will be incorporated (FSAR)
- Decisions on supply/storage & use of external equipment, such a fire engines, pumps, mobile DGs, etc. (FSAR)
- Emergency Plan lessons learned will be incorporated (FSAR)

Key Committed Design Enhancements Summary

- 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



Concluding Remarks

- FANR review concluded that the Barakah 1 & 2
 Fukushima lessons learned assessment report
 provides reasonable assurance of the plant
 capabilities to cope with challenges posed by
 extreme natural and man-made events CL stage
- FANR will continue to assess lessons learned as they become available and review additional submittals during the construction phase and as part of the operating license review