FORO

Foro Iberoamericano de Organismos Reguladores Radiológicos y Nucleares

Ibero-American Forum of Radiological and Nuclear Regulatory Agencies, FORO

Convention on Nuclear safety, 6th Review Meeting
Side Event
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Actions taken as Stress Tests results in the NPPs Belonging to the FORO Member Countries

FORO

what it is

an **Association of Iberoamerican Radiological & Nuclear Regulatory Authorities** created in 1997. **Initially based on** similarities among the **nuclear programs** in place, similar **languages** and similar **cultural features**

its aim

to promote **radiological and nuclear safety and security** at the **highest level** in the region

its official language

Spanish

Who we are

Argentina		Autoridad Regulatoria Nuclear
Brazil		Comissão Nacional de Energia Nuclear
Chile		Comisión Chilena de Energía Nuclear
Cuba		Centro Nacional de Seguridad Nuclear
Mexico		Comisión Nacional de Seguridad Nuclear y Salvaguardias
Spain		Consejo de Seguridad Nuclear
Peru		Instituto Peruano de Energía Nuclear
Uruguay		Autoridad Reguladora Nacional en Radioprotección

Summary

- A number of technical areas have been established to develop by the FORO
  - Nuclear safety
    - Stress Test of NPPs.
    - Project PREEV “Regulatory Practices on Ageing and Life Extension” (2009-2011). Technical Docs generated:
      - TD 1: Guide for Regulatory Criteria on Ageing Management (AM) and LTO
      - TD 2: Guide for Regulatory Assessment of AM and LTO
      - TD 3: Guide for Regulatory Inspection of AM and LTO
      - TD 4: Guide for AM Issues in the PSR of NPP
  - Radiation protection of workers
  - Radiation protection of patients
  - Emergency preparedness and response
  - Control of radiation sources

Summary

- Stress Tests Overview
- Thematic Areas of Improvements
- Update on Status of Actions and Improvements in Member Countries
- Conclusions

Stress Tests Overview

- The FORO member countries, owners of NPPs, decided to conduct Stress Tests (STs) assessments in response to the Fukushima Daiichi accident
- A first Technical Meeting was held in Madrid, (Spain) in September 2011 to define the methodology to be applied, and scope of the assessments
- The STs scope takes into account the STs implemented in the European NPPs (WENRA / ENSREG)
- Each Regulatory Body (RB) presented a National Report (NR) including the ST's results of **each** NPP and the regulatory position on the implementation of the arisen improvements

Stress Tests Overview (Cont.)

- A Cross-Peer-Review was conducted on the NRs content
- In June 2012 a Final Report was prepared, which included the results of the joint review carried out by all the FORO members
- The STs Final Report was approved by the FORO Plenary and presented at the Second Extraordinary Meeting of the Nuclear Safety Convention dedicated to the lessons learned from Fukushima
- The conclusions, agreements and commitments were recognized in the **Declaration** adopted by the **Heads of States** and **Governments** at the Ibero-American Summit held in Cádiz, Spain in November 2012

Stress Tests Overview (Cont.)

- Each NR includes:
  - Assessments of the plant responses to the occurrence of extreme external events, loss of safety functions and the time available to take the prevention and mitigation measures
  - Improvements and modifications that, as a result of the STs, are scheduled for implementation in each NPP
  - Improvements for BDBAs management
  - Emergency response improvements

Thematic Areas of Improvements

- Improvements related to prevention and mitigation of severe accidents were found to:
  - Core Integrity Protection
  - Severe Accident Prevention / Management
  - Containment Integrity Protection
  - Spent Fuels Storage Protection
  - Protection of the Public
  - Sites re-assessment

- ***Core Integrity Protection:***

Alternative Water Sources:

- To SG's
- To Emergency Core Cooling System
- To Dry Well
- Replenishment of Condenser Hot Well

Alternative Power Sources:

- Mobile Diesel Generators.
- Electrical interconnection to different external lines in multi-unit sites
- Electrical interconnection of Diesel Generators in multi-unit sites

- ***Core Integrity Protection*** *(Cont.):*

Improvements to Safety and Safety Related Systems:

- Improvement of Shut-down Systems trip coverage
- Upgrade of stand-by diesel generators
- Improvement of Emergency Water Supply System
- Improvement of Emergency Core Cooling System Reliability
- Alternative cooling for Emergency Power Supply DGs
- Increase of diesel fuel supply
- Fire protection systems

Procedural improvements:

- Water replenishment of SG's and dousing tank with the Emergency Water Supply System

- ***Severe Accident Prevention / Management:***

Alternative Water Sources:

- Water to Reactor Vessel / Calandria Vault (CANDU)
- Water to Moderator tank / Calandria (CANDU)
- Cooling of Reactor Pressure Vessel from external side

Improvements to Safety and Safety Related Systems:

- Addition / Improvement of Emergency Power Supply System
- Extension of batteries availability / procurement of diesel mobile battery chargers
- Provisions for pressure relief in Calandria Vault (CANDU)

- ***Severe Accident Prevention / Management*** *(Cont.):*

Improvements to Procedures:

- Review and improvement of Accident Management Guidelines
- Implementation of Severe Accident Management Guidelines

Improvements to Instrumentation and Control:

- Reactor core and containment Instrumentation to provide data during Severe Accident Management
- Improvements to measurements of PHTS sub-cooling margin; moderator level and water level in Calandria Vault (CANDU)
- New seismic instrumentation

- ***Severe Accident Prevention / Management*** *(Cont.):*

Improvements in Control Rooms Habitability:

- Main Control Room elements for long time residence
- Secondary Control Room air recirculation and filtering system implementation
- Secondary Control Room water-tight improvements

- ***Containment Integrity Protection:***

Improvements in Instrumentation and Control:

- To provide data during severe accident situations
  - Hydrogen flammability
  - Pressure
  - Radiation level
  - Sump water level

Containment Protection:

- Addition of Autocatalytic Passive Recombiners
- Addition of Filtered Containment Venting System

Procedural Improvements:

- Development of strategies to relieve containment pressure during severe accidents

- ***Spent Fuel Storage Protection:***

Alternative Water Sources:

- External connection and piping to supply make-up water for storage pool replenishment from reservoirs, groundwater, fire trucks, etc.
- Addition of alternative pool-water cooling system

Improvements to Instrumentation and Control:

- Pool water level
- Pool water temperature
- Addition of instrumentation for measurements from the Secondary Control Room

- ***Spent Fuel Storage Protection*** *(Cont.):*

Improvements in Procedures:

- Control of passive components to verify vacuum breakdown / siphon piping associated with spent fuel pool cooling
- Verification and update of spent fuel pools source term

Site-specific Studies:

- Seismic review of Dry Storage Systems

- ***Protection of the Public:***

Improvements in Procedures:

- Review and improvement of emergency procedures
- Review of the Emergency Control Internal Center conformation procedure, for multi-unit sites

Improvements in Infrastructure:

- Unification of emergency control centers fro multi-unit sites
- Addition / Improvement of personnel meeting points infrastructure
- Improvement of communication systems – Satellite phones
- Emergency portable lighting equipment (generators and lights columns).

- ***Protection of the Public*** *(Cont.):*

Radiological Monitoring:

- Radiological and meteorological monitoring networks in the surroundings of nuclear sites

Emergency Drills and Public Preparedness:

- Implementation of extended-time emergency drills with the participation of non-nuclear emergency mitigation organizations
- Conditioning of Emergency Control Centres away from the emergency zone

- ***Site Re-assessment:***

Seismic:

- Seismic re-assessments based on updated seismic hazards
- Re-assessment of consequences of earthquakes on dams that can affect the heat-sink

Hydrological and hydraulic:

- Assessment of consequences of internal flooding
- Assessment of scenarios for flooding or heat-sink low water levels for the worst conditions

Other events:

- Tornadoes
- Extreme winds
- Etc.

Update on Status of Actions and Improvements in member countries

- The improvements and modifications included an Implementation Plan with short, medium and long term actions

- Some of the proposed improvements are already implemented; others are under way and the remaining are foreseen to be implemented by 2016

- The FORO members decided to perform two follow-up technical meetings to verify the implementation of the improvements, in June 2014, and in 2016

Conclusions

- A Cross Peer Review process for reviewing a stress test for NPPs in operation, throughout the FORO framework, was considered an adequate tool
- The process meets the FORO requirements and the IAEA Action Plan recommendations
- The STs demonstrate the existence of suitable margins to fulfil the safety functions in case of the occurrence of the extreme accidental situations proposed
- No relevant weaknesses or cliff-edge situation were identified
- Some improvements are already implemented, others are under way, and the remaining are foreseen to be implemented by 2016

Final remark

The STs Final Report was approved by the FORO Plenary, and the conclusions, agreements and commitments were recognized in the **Declaration** adopted by the **Heads of States** and **Governments** at the Ibero-American Summit held in Cádiz, Spain in November 2012

Conclusions

All the **National Reports** produced by the Regulatory Bodies, as well as the **FORO's STs Final Report** can be found at the FORO's public access web site:

www.foroiberam.org/web/guest/publicaciones/evaluacion

More information

- **www.foroiberam.org**
- **info@foroiberam.org**

Thank you very much.