

# International Approach to Long Term Operation

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# OUTLINE

- IAEA Approach to LTO
  - Safety Reviews
  - Aging Management
  - Long Term Operation
- IAEA On-Going Activities
- U.S. support of IAEA activities on LTO

# Long Term Operation

- IAEA characterizes Long Term Operation (LTO) as “operation beyond an established time frame set forth by, . . ., licence term, design, standards, licence and/or regulations”



# IAEA Approach



- Safety Review
  - Periodic Safety Review for Nuclear Power Plants (Safety Guide)
  - Guidelines for IAEA Operational Safety Review Teams (OSART)
- Aging Management
  - Ageing Management for Nuclear Power Plants (Safety Standard)
  - International Generic Ageing Lessons Learned (IGALL) (Safety Report)
  - Approaches to Ageing Management in Member States (TECDOC)
- Long Term Operation
  - Safe Long Term Operation of Nuclear Power Plants (Safety Report)
  - Guidelines for Peer Review of Safety Aspects of Long Term Operation of Nuclear Power Plants (SALTO)



# Comparison of PSR and License Renewal



## Periodic Safety Review

- “an overall view of actual plant safety . . . and to determine reasonable and practical modifications to ensure or improve safety”
- “. . . to ensure that a high level of safety is maintained during continued operation”

## License Renewal

- The ongoing regulatory process is adequate to ensure the safety of currently operating plants
- The same plant operating rules apply during the renewal term (plant CLB to be maintained)
  - Requires additional actions for aging management of passive, long-lived plant structures and components for license renewal

# PSR Safety Factors



- Plant design
- Actual condition of SSCs important to safety
- Equipment qualification
- Ageing
- Deterministic safety analysis
- Probabilistic safety assessment
- Hazard analysis
- Safety performance
- Use of experience from other plants and research findings
- Organization, the management system and safety culture
- Procedures
- Human factors
- Emergency planning
- Radiological impact on the environment



# Purpose of Integrated Regulatory Review Service Mission to US NRC

- to conduct a review of the . . . nuclear regulatory framework and regulatory activities as applied to operation of nuclear power plants to **review its regulatory effectiveness** and to exchange information and experience in the areas covered by IRRS. The review was carried out by **comparison against IAEA safety standards as the international benchmark for safety.**

# REGULATORY PROCESS ESSENTIAL ELEMENTS



- Effective compliance with regulations
- On-site resident inspectors and specialized inspections
- Performance assessments of inspection findings
- Operating experience analysis and utilization
- Safety issue resolutions (generic and plant specific)
- Materials aging & degradation issues important to safety addressed by
  - Rule changes, generic communications, orders, voluntary actions

# FINDINGS BY IRRS MISSION



## IRRS Report 2010

NRC has in place separate programmes for periodically assessing the state of safety relevant items and provisions for industry self-assessments. However, **there is no requirement on the licensee to conduct with regular intervals its own comprehensive review of whether adequate safety margins have been maintained, whether the safety margins have been verified with best available methods, and whether the management processes with relevance for safety have been kept current.** Such Periodic Safety Reviews are generally carried out in other countries and have been found useful, both for maintaining and enhancing safety and for training younger generations to understand and take into account the relevant safety issues. Although the NRC utilizes an alternate approach to meet the PSR safety factors, NRC should incorporate lessons learned from Periodic Safety Reviews performed in other countries as an input to the NRC's assessment processes.



# Relevant Conclusions from IRRS Mission



## Good Practices

- GP5: Licensing process is very transparent
- GP11: A robust operational experience feedback programme
- GP12: Collects and documents aging management lessons learned and shares with international nuclear community

## Suggestion

- S9: Confirmed NRC proposal to incorporate lessons learned from PSRs in other countries



# International Generic Ageing Lessons Learned (IGALL) Program



- Guidance on recommendable or “proven” ageing management programmes.
- For nuclear power plants with diverse water reactor technologies
- **Additional in-scope components, including active (no screening)**
- Update IGALL Report periodically (at least each 5 years)
- Fundamental document to support ageing management Safety Guide

Web - <http://gnssn.iaea.org/NSNI/PoS/IGALL/SitePages/Home.aspx>



# IGALL Status



- **Phase 1** (2010-13) developed initial report, including AMRs, AMPs, TLAAs based on US NRC GALL report
- **Phase 2** (2014-15) expanded for CANDU and WWER, technological obsolescence, and active components
- **Phase 3** (2016-17) objectives
  - Prepare IGALL Safety Report, version 2018
  - Update IGALL database and enhance its completeness
  - Support Member States in use of IGALL



# Objectives of SALTO Peer Review

- An objective assessment of preparedness for LTO compared to international nuclear safety standards;
- Recommendations and suggestions for areas of improvement
- Discussions of key plant staff and external experts
- Identify good practices for Member States



# SALTO Review Areas



- A: Organization and functions, CLB, configuration/modification management
- B: Scoping and screening and plant programmes relevant to LTO
- C: AMR, AMPs, and TLAAs for mechanical components
- D: AMR, AMPs, and TLAAs for electrical and I&C components
- E: AMR, AMPs, and TLAAs for TLAAs for civil structures
- F: Human resources, competence and knowledge management for LTO (optional area)



# NRC Support to IAEA Activities



- NRC has been and will continue to be active participants in the IGALL Program
  - Steering Committee
  - Working Groups
- NRC will continue to support SALTO missions and related workshops
- Important for knowledge sharing of U.S. experience and counterparts experiences



# Summary



- Use of license renewal approach necessitates implementation of other essential elements of the United States regulatory process
- Scope of IGALL program exceeds that of license renewal
- International sharing of operational findings is an important part of maintaining informed aging management world wide
- Support to international programs (IGALL and SALTO) is an essential part of knowledge sharing and dissemination of best practices



# Related IAEA Documents

- “Periodic Safety Review for Nuclear Power Plants,” Specific Safety Guide No. SSG-25 (2013)
- “OSART guidelines, 2005 Edition, Reference report for IAEA Operational Safety Review Teams (OSARTs),” Services Series No. 12, SVS-12 (2005)
- “Ageing Management for Nuclear Power Plants, IAEA Safety Standards,” Safety Guide No. NSG2.12 (2009) [Under revision to address LTO considerations, see IAEA DS-485]
- “Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL),” Safety Reports Series No. 82, SRS-82 (2015)
- “Approaches to Ageing Management in Member States: International Generic Ageing Lessons Learned (IGALL) Final Report,” IAEA-TECDOC-1736 (2014)
- “Safe Long Term Operation of Nuclear Power Plants,” Safety Reports Series No. 57, SRS-57 (2008)
- “SALTO Peer Review Guidelines, Guidelines for Peer Review of Safety Aspects of Long Term Operation of Nuclear Power Plants,” Services Series No. 26, SVS-26 (2014)
- “Integrated Regulatory Review Service (IRRS) Guidelines for the Preparation and Conduct of IRRS Missions,” Services Series No. 23 (2013)

