



IAEA

60 Years

Atoms for Peace and Development

Challenges and Needs for Long Term Operation of Nuclear Power Plants

**Workshop on the Application of Espoo Convention
to the Life Extension of Nuclear Power Plants**

28-30 May 2018, Geneva, Switzerland

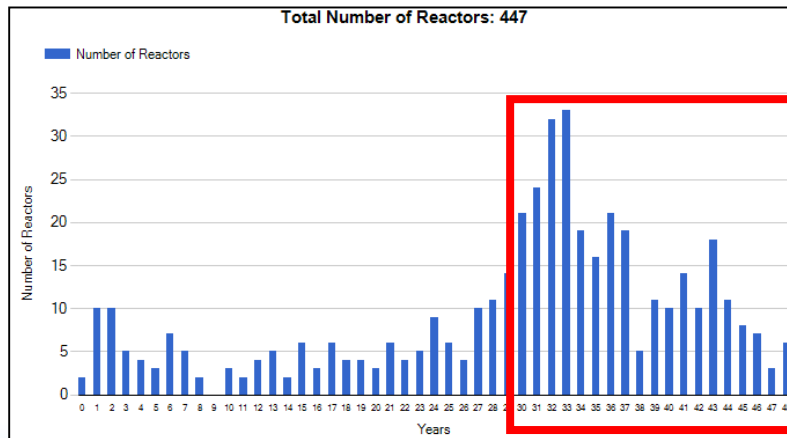
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Department of Nuclear Safety and Security**

Long Term Operation of Nuclear Power Plants

Nuclear Power Plants

- 288 in operation for more than 30 years
- 87 in operation for more than 40 years
- 57 under construction



Source: <http://www.iaea.org/pris>

Long Term Operation

- Operation beyond an established time frame defined by the licence term, the original plant design, relevant standards, or national regulations

Programme

- Cumulative effects and implications of ageing (ageing mechanisms and ageing management programmes)
- Safety modifications (repairs, replacements and upgrades)
- Technical developments
- Operating experience
- Site characteristics

Licensing documentation

- Valid through the entire period

Safety Challenges for Long Term Operation

National energy strategies and policies

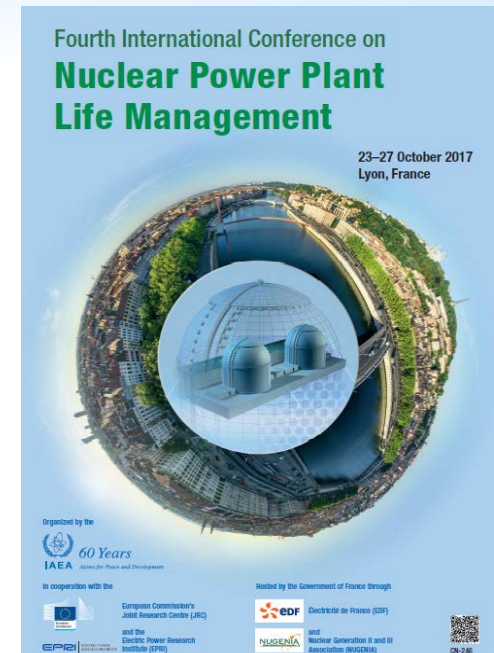
- Direction on the future of nuclear energy
- Nuclear energy as viable option

National regulatory frameworks

- Fitness for service of Structures, Systems and Components
- Safe operation for extended period of operation
- Effectiveness of safety functions
- Consideration of safety improvements

Safety of operation

- Understanding of the plant condition
 - ✓ Physical aging of Systems, Structures and Components
- Technological and conceptual obsolescence
 - ✓ Operating experience and new standards
 - ✓ Implementation of safety upgrades
 - ✓ Quality of equipment, suppliers and contractors
- Qualified workforce



IAEA Activities Supporting Long Term Operation

Development of IAEA Safety Standards

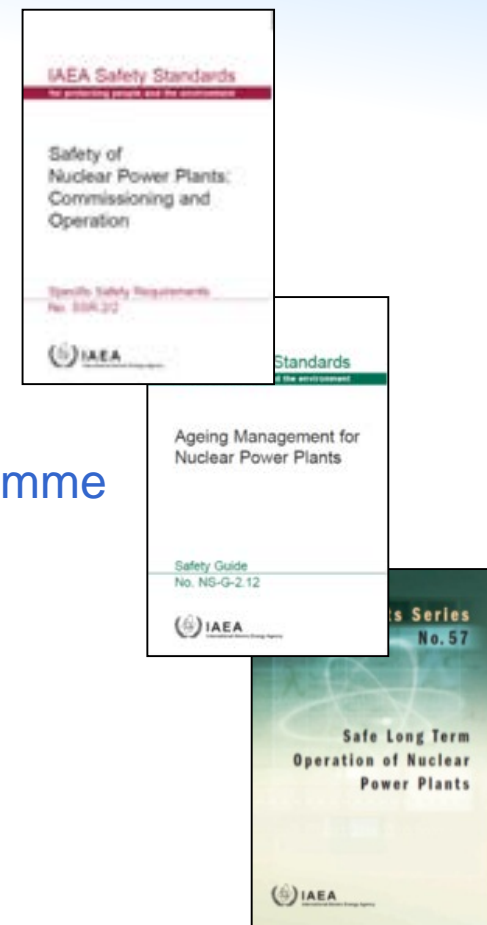
- Requirements for commissioning and operation
 - Requirement 12: Periodic Safety Review (PSR)
 - Requirement 14: Ageing Management (AM)
 - Requirement 16: Programme for Long Term Operation (LTO)
- Guidance on PSR, Ageing Management and LTO

Capacity building

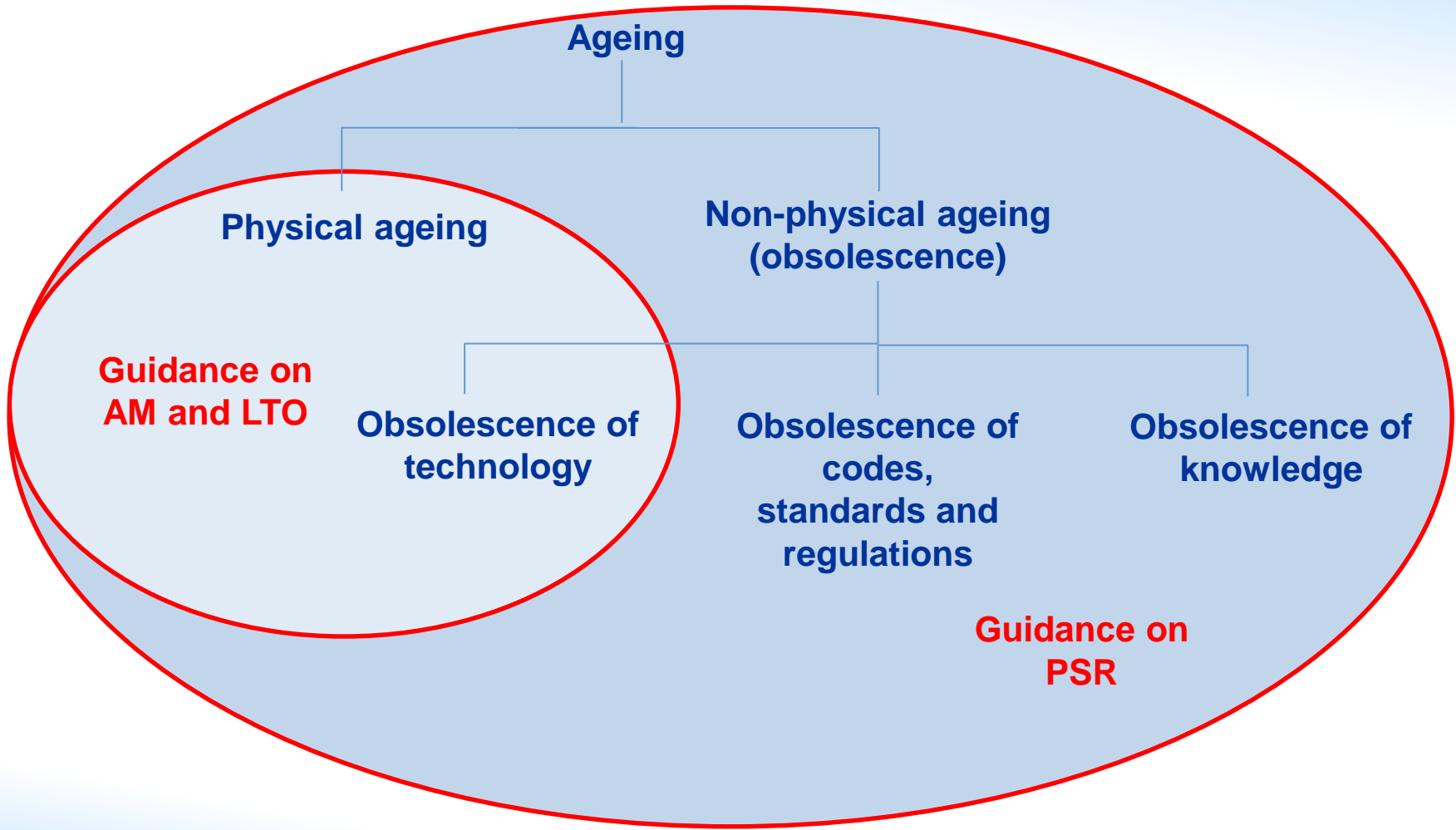
- International Generic Ageing Lessons Learned Programme
- Ageing management and LTO workshops
- Coordinated research projects

Review services

- Operational Safety Review (OSART) – LTO module
- Safety Aspect of Long Term Operation (SALTO)
- Site and External Events Design Review (SEED)
- Technical Review Services (design assessment)



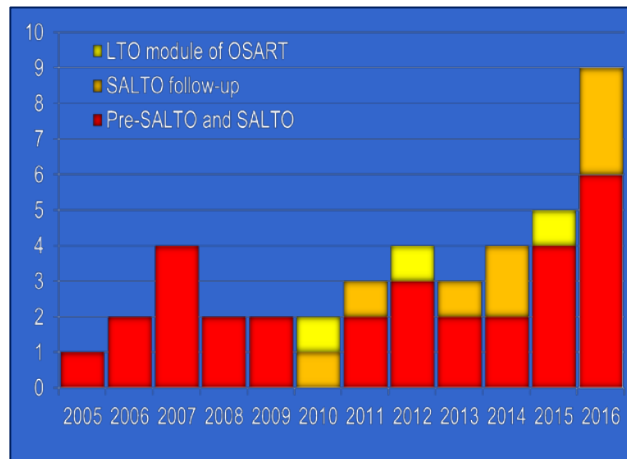
IAEA Safety Standards for Long Term Operation





SALTO Peer Review: Objective

Focus on physical ageing and technological obsolescence



31 SALTO missions in 18 NPPs

Objective assessment of the status of preparation for LTO

- Review of alignment with IAEA Standards
- Recommendations and suggestions for **full implementation of IAEA Standards**
- Opportunity to share experience and practices with international experts
- Advice on licensing processes and procedures
- Openness and transparency
 - Public awareness and acceptance

SALTO Peer Review: Observations

Programmes for Long Term Operation are generally based on Periodic Safety Reviews

- Safety assessment with due consideration of ageing
- Demonstration of validity of (updated) licensing basis
- Review of adequacy of the arrangements to maintain plant safety
- Implementation of improvements to resolve the safety issues identified

Opportunities for further improvements

- Clarity of national regulations for LTO
- Policies and organizational arrangements for LTO
- Completeness of ageing management review
- Timely implementation of LTO programmes
- **Consideration of reasonably practicable safety improvements**

Reasonably Practicable Safety Improvements

Vienna Declaration on Nuclear Safety

Objective

Prevent accidents with radiological consequences and, should an accident occur, mitigate possible releases of radionuclides

Review Process

- Comprehensive and systematic safety **assessments are to be carried out periodically** and regularly for existing installations throughout their lifetime in order to identify safety improvements that are oriented to meet the above objective. **Reasonably practicable or achievable safety improvements are to be implemented in a timely manner**
- National requirements and regulations for addressing this objective throughout the lifetime of nuclear power plants are to take into account the relevant **IAEA Safety Standards**

Periodic Safety Review

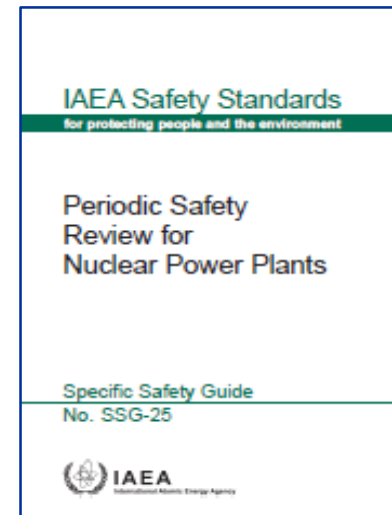
Objective

Systematic and comprehensive safety assessments of the plant performed by the operating organization throughout the plant's operating lifetime with due account taken of operating experience and **significant new safety related information** from all relevant sources.

Scope

Consequences of the cumulative effects

- **plant ageing and plant modifications**
- equipment requalification
- operating experience
- **current standards and technical developments**
- organizational and management issues
- siting aspects



Main Benefits

Determination of **reasonable and practical modifications** that should be made to enhance the safety of the plant to a level approaching that of modern plants, and to allow for long term operation



Summary

Considerations for safe Long Term Operation

- Extent to which the plant conforms to modern standards and practices
- Extent to which the (updated) licensing basis will remain valid
- Adequacy of arrangements to maintain plant safety
- Improvements to be implemented to resolve safety issues, including reasonably practicable modifications

Programmes for Long Term Operation

- Demonstrate adequate arrangements to maintain plant safety for extended period of operation are being implemented
- Opportunity for determination of **reasonable and practical modifications**
 - ✓ Enhance the safety of the plant to a level approaching that of modern plants
 - ✓ Prevent accidents with radiological consequences and, should an accident occur, mitigate possible releases of radionuclides
- Reasonably practicable safety improvements are to be assessed and implemented in a timely manner