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Aging Management and License Renewal in the United States

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US Practices Compared to EU Topical Peer Review

- The USNRC assessment found that the US is generally well-aligned with the results of the TPR
- US has a strong regulatory basis to continue with its practices and determined no change in regulatory practices are necessary.
- The USNRC found a gap or area not addressed by the TPR.
  - The TPR did not address time-limited aging analyses, which are considered of safety importance in the US.

What is Aging Management?

- Design, fabrication, construction, installation, testing and operation steps to:
  - Inhibit or preclude aging degradation (e.g., material selection and environmental control)
  - Identify degradation conditions in SSCs prior to a loss of intended function
  - Ensure effective corrective actions

License Renewal Status in USA

98 operating reactors

- **65 PWRs**
- **33 BWRs**

90 units with renewed licenses

49 units in the period of extended operation

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License Renewal Rule 10 CFR Part 54

- Atomic Energy Act of 1954, as amended
  - Plants initially licensed to operate for 40 years
  - Allows for license renewal for up to 20 more years
  - A renewed license may be subsequently renewed (10 CFR 54.31(d)) with no restrictions on number of subsequent renewals
- A limited scope review focused on demonstrating adequate management of the effects of aging for long-lived, passive structures and components important to plant safety

License Renewal Guidance Documents

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NUREG-1800, Rev. 2

Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants

Final Report

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NUREG-1801, Rev. 2

Generic Aging Lessons Learned (GALL) Report

Final Report

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REGULATORY GUIDE

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STANDARD FORMAT AND CONTENT
FOR APPLICATIONS TO RENEW
NUCLEAR POWER PLANT OPERATING LICENSES

NEI 95-10
Revision 6

Industry Guideline For Implementing The Requirements of 10 CFR Part 54 – The License Renewal Rule

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NRC Safety Review

- Review adequacy of scoping and screening
- Assess adequacy of aging management review – have all relevant aging effects been identified and will they be effectively managed (using aging management programs)
- Adequacy of evaluation of time-limited aging analyses (TLAAs)
- Inspections on licensee implementation of the license renewal aging management programs

Inspections

- IP 71002 – License Renewal Inspection
  - Implemented as a part of the review of the license renewal application
- IP 71003 – Post-Approval Site Inspection
  - 4 phases implemented after license has been renewed
- Continue regular maintenance and other specialized activities (e.g., in-service inspection, fire protection)

Subsequent License Renewal (SLR)

- Operation from 60 to 80 years
- Regulatory framework and approval process is the same as license renewal
- Specific regulatory documents have been issued – GALL-SLR and SRP-SLR
- Optimization of the review process
  - 18 month review (reduced from 22 months)
  - Increased use of in-office audits and web portals

Technical Issues for SLR

- Reactor pressure vessel neutron embrittlement at high fluence
- Irradiation-assisted stress corrosion cracking (IASCC) of reactor internals
- Concrete and containment degradation
- Electrical cable qualification, condition monitoring and assessment

Status of SLR

- Three SLR applications submitted for review
  - Turkey Point, Units 3 and 4 (PWR): SER with Open Items issued May 2019
    - ACRS Subcommittee Meeting Scheduled June 2019
  - Peach Bottom, Units 2 and 3 (BWR): Safety and Environmental Reviews Ongoing
  - Surry, Units 1 and 2 (PWR): Safety and Environmental Reviews Ongoing
- North Anna, Units 1 and 2 (PWR) SLRA expected late calendar year 2020.

Summary

- Licensees are responsible for demonstrating that aging is adequately managed for licensed operating period
- NRC ensures that plants will be operated with reasonable assurance of adequate protection of the public health and safety
- Licenses have been renewed for ~90% of US plants and reviews of remaining plants are ongoing or planned
- NRC is currently reviewing applications for plant operation up to 80 years
- Certain technical issues require plant-specific resolution for subsequent license renewal
- For more information, license renewal website: https://www.nrc.gov/reactors/operating/licensing/renewal.html.