Channel Head Inspection Guidance

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Background

- Expand on the NRC presentation and meeting summary from September 2023
- Principal guidance documents are:
  - GALL Report (NUREG-1801, Rev. 2)
  - SRP-LR (NUREG-1800, Rev. 2)
  - LR-ISG-2016-01
  - GALL-SLR (NUREG-2191, Rev. 0)
  - SRP-SLR (NUREG-2192, Rev. 0)

Purpose

Clarify NRC guidance on steam generator primary surface inspections for initial and subsequent license renewal (LR and SLR)

- Divider plate assembly
- Tube-to-tubesheet welds
- Channel head interior surface
- Tubesheet

Terminology

- A “plant-specific aging management program” (AMP) is an AMP that includes additional programs beyond the Water Chemistry and Steam Generators programs (*e.g.*, One-Time Inspection)
  - Defined in SRP-SLR and LR-ISG-2016-01
- “Industry analysis applicable and bounding” refers to EPRI Report 3002002850, “Steam Generator Management Program: Investigation of Crack Initiation and Propagation in the Steam Generator Channel Head Assembly”

General Visual Inspection

- Intended to identify signs of cracking or loss of material (*e.g.*, made visible by rust stains)
- Applies to the following, regardless of material:
  - Divider plate assembly
  - Tube-to-tubesheet welds
  - Channel head interior surface
  - Tubesheet (primary side)
- Materials, alternate repair criteria, and applicability of bounding industry analysis determine the need for a plant-specific AMP

General Visual Inspection

Divider Plate Assembly and Tube-to-Tubesheet Welds

Initial License Renewal	Subsequent License Renewal
❑ Included in NUREG-1801, Rev. 2, AMP XI.M19 (as revised by LR-ISG-2016-01) • Program Description • Scope of Program • Parameters Monitored or Inspected • Detection of Aging Effects • Monitoring and Trending • Acceptance Criteria	❑ Included in NUREG-2191, AMP XI.M19 • Program Description • Scope of Program • Parameters Monitored or Inspected • Detection of Aging Effects • Monitoring and Trending • Acceptance Criteria
❑ Further Evaluation Guidance in NUREG-1800, Rev. 2 (as revised by LR-ISG-2016-01) • Section 3.1.2.2.11.1 for divider plate assembly • Section 3.1.2.2.11.2 for tube-to-tubesheet welds	❑ Further Evaluation Guidance in NUREG-2192 • Section 3.1.2.2.11.1 for divider plate assembly • Section 3.1.2.2.11.2 for tube-to-tubesheet welds

General Visual Inspection

Channel Head Interior Surfaces and Tubesheet

Initial License Renewal	Subsequent License Renewal
❑ Included in NUREG-1801, Rev. 2, AMP XI.M19 (as revised by LR-ISG-2016-01) • Program Description • Scope of Program • Parameters Monitored or Inspected • Detection of Aging Effects • Monitoring and Trending • Acceptance Criteria	❑ Included in NUREG-2191, AMP XI.M19 • Program Description • Scope of Program • Parameters Monitored or Inspected • Detection of Aging Effects • Monitoring and Trending • Acceptance Criteria

Divider Plate Cracking Guidance

Visual representation of Further Evaluation Section 3.1.2.2.11.1

Material	Weld Material	Industry analysis (EPRI 3002002850) applicable and bounding	Plant-specific program required beyond existing programs[1]
690	690	N/A	No
600	600	Yes	No
600	600	No	Yes

[1] If a plant-specific program is not necessary, then aging is managed by the existing Water Chemistry and Steam Generators programs

Tube-to-Tubesheet Weld Cracking Guidance

Visual representation of Further Evaluation Section 3.1.2.2.11.2

Tube Material	Tubesheet Cladding Material	Alternate Repair Criteria (C*, F*, W*, or H*) approved for both hot- and cold-leg side of SG	Industry analysis (EPRI 3002002850) applicable and bounding	Plant-specific program required beyond existing programs[1]
690	690	N/A	N/A	No
690	600	N/A	Yes	No
690	600	N/A	No	Yes
600	N/A	Yes	N/A	No
600	N/A	No	N/A	Yes

[1] If a plant-specific program is not necessary, then aging is managed by the existing Water Chemistry and Steam Generators programs

Summary

- The Steam Generators and Water Chemistry AMPs are used by all plants to manage aging of the primary surfaces
- Visual inspection of primary surfaces is in the current guidance for both initial and subsequent license renewal
  - Steam Generators AMP
  - Further Evaluation Sections 3.1.2.2.11.1 and 3.1.2.2.11.2
- A plant-specific program may be needed to evaluate the effectiveness of the Steam Generators and Water Chemistry programs
- The need for a plant-specific program is evaluated according to:
  - The divider plate assembly, tube, and tubesheet cladding materials
  - Whether or not the steam generator is bounded by the industry analyses
  - Alternate repair criteria affecting the tube-to-tubesheet welds

References

- NUREG-1800, Revision 2, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” dated December 2010 (ML103490036)
- NUREG-1801, Revision 2, “Generic Aging Lessons Learned (GALL) Report,” dated December 2010 (ML103490041)
- LR-ISG-2016-01, “Changes to Aging Management Guidance for Various Steam Generator Components,” dated November 2016 (ML16237A383)
- NUREG-2191, Revision 0, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,” dated July 2017 (ML17187A031 (Volume 1) and ML17187A204 (Volume 2))
- NUREG–2192, Revision 0, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants,” dated July 2017 (ML17188A158)
- EPRI Report 3002002850, “Steam Generator Management Program: Investigation of Crack Initiation and Propagation in the Steam Generator Channel Head Assembly”

References (cont'd)

- NUREG-2191, Revision 1, Draft, published July 2023, (ML23180A182 (Volume 1), ML23180A188 (Volume 2))
- NUREG–2192, Revision 1, Draft, published July 2023 (ML23180A191)
  - Corrected Tables 3.1-1 and 3.2-1, published August 2023 (ML23213A036)
- NUREG–2221, Supplement 1, "Technical Bases for Changes in the Subsequent License Renewal Guidance Documents NUREG–2191 and NUREG–2192", Draft for Comment, published July 2023 (ML23180A208)
- NRC Meeting with the Industry Steam Generator Task Force, September 7, 2023
  - Meeting Summary (ML23268A340)
  - Industry Slides (ML23240A002)
  - NRC Slides (ML23244A175)

Questions