



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 26, 2023

U.S. Nuclear Regulatory Commission Public Meeting Summary

Title: Meeting with the Industry Steam Generator Task Force

Meeting Identifier: 20230950T

Date of Meeting: September 7, 2023

Location: Webinar

Type of Meeting: Observation Meeting

Purpose of the Meeting: The purpose of this meeting was for the U.S. Nuclear Regulatory Commission (NRC) staff to discuss steam generator (SG) issues with the industry Steam Generator Task Force (SGTF).

General Details: The industry SGTF met with NRC staff on September 7, 2023, by webinar. The purpose of the meeting was to discuss a variety of SG issues. The NRC and industry slides are available in Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML23244A175 and ML23240A002, respectively. This meeting was noticed as a public meeting and the agenda is available under ML23234A013.

LISTING OF ATTENDEES
U.S. NRC MEETING WITH THE INDUSTRY STEAM GENERATOR TASK FORCE

September 7, 2023

Participant	Affiliation	Participant	Affiliation
Isaac Anchondo-Lopez	NRC	Rich Guill	EPRI
John Arhar	PG&E	Andrew Johnson	NRC
Sasan Bakhtiari	ANL	Craig Kelley	Framatome
James Benson	EPRI	Sean Kil	EPRI
Jana Bergman	Curtiss-Wright	Paul Klein	NRC
Ashley Birdett	Luminant - CPNPP	Mike Liu	Intertek
Cotasha Blackburn	Southern Company	Greg Makar	NRC
Steven Bloom	NRC	Dan Mayes	Duke Energy
Michael Bodak	Constellation	Jeremy Mayo	TVA
Jasmyn Bone	Entergy	Josh Morton	Energy Harbor
Brent Capell	EPRI	Patrick Purtscher	NRC
Russ Cipolla	Intertek	Jeff Raschiatore	Westinghouse
James Cirilli	EPRI	Connor Rigsby	TVA
Helen Cothron	EPRI	Jay Smith	Westinghouse
Bill Cullen	EPRI	Mike Stark	Dominion Energy
Timothy Deziel	NextEra Energy	Leslie Terry	NRC
Nick Fabritiis	Constellation	Kester Thompson	FPL
Clifford Fell		Tim Tulien	Duke Energy
Lee Friant	Constellation	Luke Twarek	Energy Harbor
Michael Frotscher	Entergy	Bill Wiltsey	Intertek
Keith Fruzzetti	EPRI	Zefeng Yu	Westinghouse

Summary of Presentations: Industry representatives made presentations on recently published Electric Power Research Institute (EPRI) reports, the status of revisions to industry guidelines, the re-characterization of primary water stress corrosion cracking (PWSCC) eddy current indications to outside diameter stress corrosion cracking (ODSCC) in low-row u-bends, and a status update on the transfer function relating rotating probe eddy current signals to array probe signals.

The NRC staff presented feedback on license renewal guidance for managing aging of SG divider plate assemblies and tube-to-tubesheet welds, and a summary of proposed changes to subsequent license renewal (SLR) guidance documents related to the Aging Management Program (AMP) XI.M19, "Steam Generators."

Additional details of the information exchanged during the meeting is provided below.

- Recently published EPRI reports on the following topics were discussed: general corrosion testing for secondary-side filming product application, effect of secondary-side filming products on general corrosion under simulated secondary-side lay-up conditions, and methodology for evaluating two non-destructive evaluation datasets for data compatibility and exclusion criteria.
- In response to a question from the NRC staff, industry estimated a publication date of mid- or late-2024 for the next revision to the "Steam Generator Management Program: Pressurized Water Reactor Steam Generator Examination Guidelines."

- Industry summarized interim guidance for “Pressurized Water Reactor Secondary Water Chemistry Guidelines – Revision 8.” The change allows plants operating at a reduced hydrazine-to-oxygen ratio at a power above the Mid-Point Value (MPV) to continue operating with the same ratio if they decrease power below the MPV. The ratio could be lower than the Action Level that would normally apply below the MPV, but the change does not allow the reduced hydrazine-to-oxygen ratio during startup because the presence of reducible metal oxides may cause corrosion.
- An industry representative described the re-characterization of eddy current indications in thermally treated Alloy 600 (A600TT) low-radius U-bend tubes that were initially characterized as PWSCC. The NRC agreed with the reclassification from PWSCC to ODSCC for the U-bend indication in the SG Model D5 plant. However, the NRC stated that additional follow-up would be needed concerning the 2009 Row 1 U-bend indication that was initially characterized as PWSCC. Based on the information in the presentation, the NRC had remaining questions about the difference between the 2009 U-bend eddy current signal and the eddy current signals presented in the SGTF presentation slides 15-17.
- An industry representative provided an update on a transfer function, which was described as a linear regression of array probe signal amplitude on +Point™ rotating probe signal amplitude. Industry is developing the transfer function because the use of array probes for inspecting A600TT tubing is increasing, but compared to +Point™, less crack data was available during development of corresponding Examination Technique Specification Sheets (ETSSs) for detecting stress corrosion cracking (SCC) with array probes. The transfer function was developed to strengthen probability of detection (POD) for SCC by estimating array probe amplitude from prior +Point™ signals that have been destructively examined and including these signals in the A-hat function (flaw voltage vs. flaw depth). The presentation compared the transfer function for ODSCC, which was determined using electrical discharge machining notches, to plant inspection data, pulled tube data, and laboratory-produced flaws. Based on the benchmarking results, industry intends to use the transfer function to develop POD curves for ODSCC until ETSSs are available (estimated 2025). Industry also intends to develop transfer functions for PWSCC in 2024. The NRC asked the industry if they intend to develop a peer reviewed process with guidance for tube integrity engineers using the transfer function. The staff also noted a parallel with the use of Model Assisted Probability of Detection (MAPOD) in developing site-specific POD curves and had previously asked about guidance/peer review in cases where the MAPOD results seem too optimistic relative to historically proven probe performance.
- The NRC staff provided feedback on initial license renewal (LR) SLR guidance for managing aging of SG divider plate assemblies and tube-to-tubesheet welds, and a summary of proposed changes to SLR guidance documents related to AMP XI.M19. Regarding aging management for the divider plate assemblies and tube-to-tubesheet welds, the NRC staff summarized the current NRC guidance for LR and SLR and the conditions under which a plant-specific program is required. The plant-specific program is aging management activity in addition to control of the reactor water chemistry by the “Water Chemistry” program and general visual inspections of the channel head interior surfaces by the “Steam Generators” program. Regarding the proposed changes to AMP XI.M19, the NRC staff described the revisions and how to access them and submit public comments (<https://www.regulations.gov>, Docket ID NRC-2023-0096). The public comment period was extended to October 11, 2023 (88 FR 61628; September 7, 2023).

The NRC provided the following in response to questions:

- According to the latest interim staff guidance (ISG) for LR and the current guidance and proposed changes for SLR, a visual inspection of the divider plate assemblies and tube-to-tubesheet welds is part of AMP XI.M19 for all SGs, regardless of material. Differences in materials and SG design are considered in Further Evaluation Section 3.1.2.2.11 in the License Renewal Interim Staff Guidance LR-ISG-2016-01, "Changes to Aging Management Guidance for Various Steam Generator Components" (ML16237A383), and NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (ML17188A158) to determine if a plant-specific program is also required.
- A general visual inspection is acceptable, including those currently being performed to satisfy or supplement the SG vendor recommendations for primary-side inspection in the SG channel head. The LR and SLR guidance states that these inspections are intended to identify signs that cracking or loss of material may be occurring (e.g., through identification of rust stains).
- The guidance for LR is not being updated to reflect the increase in maximum inspection intervals from 72 to 96 effective full power months (EFPY). Applicants for LR that have adopted Technical Specifications Task Force Traveler 577 (TSTF-577), "TSTF Response to NRC Questions on TSTF-577, Revision 0, 'Revised Frequencies for Steam Generator Tube Inspections,' and Submittal of Revision 1" (ML21060B434) or converted to Revision 5 of the Standard Technical Specifications (STS) may take an exception to the conflicting guidance in LR-ISG-2016-01. For SLR, the change from 72 to 96 EFPY is included in the proposed guidance updates. Until the final guidance documents are issued, SLR applicants that have adopted TSTF-577 or converted to Revision 5 of the STSs may take an exception to the conflicting guidance in NUREG-2191.

To supplement the meeting discussion, portions of the NRC guidance documents addressing the channel head visual inspections are included in the enclosure.

If you have any questions regarding this meeting summary, please feel free to contact Greg Makar by phone at 301-415-4034, or by email at Gregory.Makar@nrc.gov.

Enclosure:

Guidance on Channel Head Visual Inspection for Initial and Subsequent License Renewal

Attachments:

- | | |
|---------------------|-------------|
| 1. Meeting Notice: | ML23234A013 |
| 2. NRC Slides: | ML23244A175 |
| 3. Industry Slides: | ML23240A002 |
| 4. Package: | ML23268A338 |

SUBJECT: SUMMARY OF THE SEPTEMBER 7, 2023, MEETING WITH THE INDUSTRY
STEAM GENERATOR TASK FORCE TO DISCUSS STEAM GENERATOR
ISSUES
DATED SEPTEMBER 26, 2023.

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ADAMS Accession Nos.:

Package: ML23268A338

Meeting Summary: ML23268A340

Meeting Notice: ML23234A013

NRC Slides: ML23244A175

Industry Slides: ML23240A002

OFFICE	NRR/DNRL/NCSG	NRR/DNRL/NLIB/LA	NRR/DNRL/NCSG/BC
NAME	GMakar	SGreen	SBloom
DATE	09/26/2023	09/25/2023	9/26/23

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GUIDANCE ON CHANNEL HEAD VISUAL INSPECTION FOR INITIAL AND SUBSEQUENT LICENSE RENEWAL

I. INITIAL LICENSE RENEWAL

License Renewal Interim Staff Guidance LR-ISG-2016-01, “Changes to Aging Management Guidance for Various Steam Generator Components,” ML16237A383

DISCUSSION

Evaluation of PWSCC in Divider Plate Assemblies

Page 4 of 62

In addition, utilities in the U.S. perform various visual inspections of the channel head internal area when the steam generators are accessed for steam generator tube inspections. These visual inspections provide an opportunity to identify cracking if it were to grow into the pressure boundary components through identification of rust stains and gross cracking or distortion of the divider plate assembly. GALL Report, Revision 2, AMP XI.M19 does not currently include these inspections in the program scope. This LR-ISG revises AMP XI.M19 to include such visual inspections to manage cracking due to PWSCC of divider plate assemblies. As a result, this LR-ISG identifies the primary water chemistry program and steam generator program as existing AMPs that manage the aging of divider plate assemblies.

Evaluation of PWSCC in Tube-to-Tubesheet Welds

Page 8 of 62

As previously discussed, utilities in the U.S. perform various visual inspections of the channel head internal area when the steam generators are accessed for steam generator tube inspections. These visual inspections provide an opportunity to identify cracking if it were to grow into the pressure boundary components through identification of rust stains or other abnormal observations. GALL Report, Revision 2, AMP XI.M19 does not currently include these inspections in the program scope. This LR-ISG revises GALL Report AMP XI.M19 to include such visual inspections to manage cracking due to PWSCC of tube-to-tubesheet welds [emphasis added]. Therefore, this LR-ISG identifies the primary water chemistry program and steam generator program as existing AMPs that manage cracking due to PWSCC for the tube-to-tubesheet welds.

AGING MANAGEMENT PROGRAM XI.M19, “STEAM GENERATORS”

Program Description

Page 49 of 62

Degradation of divider plate assemblies, tube-to-tubesheet welds, heads (internal surfaces), or tubesheets (primary side) may have safety implications. Therefore, all of these components and the steam generator tubes, plugs, sleeves and secondary side components are addressed by this aging management program (AMP).

Evaluation and Technical Basis

3. Parameters Monitored/Inspected

Page 51 of 62

In summary, the NEI 97-06 program provides guidance on parameters to be monitored or inspected except for steam generator divider plate assemblies, tube-to-tubesheet welds, heads (channel or lower/upper heads), and tubesheets. For these latter components, visual inspections are performed at least every 72 effective full power months or every third refueling outage, whichever results in more frequent inspections. These inspections of the steam generator head interior surfaces including the divider plate are intended to identify signs that cracking or loss of material may be occurring (e.g., through identification of rust stains).

II. SUBSEQUENT LICENSE RENEWAL

A. NUREG-2191, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,” Volume 2, ML17187A204

Aging Management Program XI.M19, “Steam Generators”

Evaluation and Technical Basis

3. Parameters Monitored/Inspected

Page XI.M19-3

In summary, the NEI 97-06 program provides guidance on parameters to be monitored or inspected except for steam generator divider plate assemblies, tube-to-tubesheet welds, heads (channel or lower/upper heads), and tubesheets. For these latter components, visual inspections are performed at least every 72 effective full power months or every third refueling outage, whichever results in more frequent inspections. These inspections of the steam generator head interior surfaces including the divider plate are intended to identify signs that cracking or loss of material may be occurring (e.g., through identification of rust stains).

B. Draft NUREG-2191, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR), Draft Report for Comment,” Revision 1, Volume 2, ML23180A188

<https://www.regulations.gov>, Docket ID NRC-2023-0096, public comment period extended to October 11, 2023 (88 FR 61628; September 7, 2023).

Aging Management Program XI.M19, “Steam Generators”

Evaluation and Technical Basis

3. Parameters Monitored/Inspected

Page XI-137

In summary, the NEI 97-06 program provides guidance on parameters to be monitored or inspected except for steam generator divider plate assemblies, tube-to-tubesheet welds, heads (channel or lower/upper heads), and tubesheets. For these latter components, visual inspections are performed at least every 72 effective full power months. These inspections may be performed every 96 effective full power months for units for which the technical specifications allow for extended steam generator inspection intervals. These inspections of the steam

generator head interior surfaces including the divider plate are intended to identify signs that cracking or loss of material may be occurring (e.g., through identification of rust stains).

C. NUREG-2192, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants,” ML17188A158

Section 3.1.2.2.11.1

Page 3.1-9

The existing programs rely on control of reactor water chemistry to mitigate cracking due to PWSCC and general visual inspections of the channel head interior surfaces (included as part of the steam generator program).

Section 3.1.2.2.11.2

Page 3.1-9

The existing programs rely on control of reactor water chemistry to mitigate cracking due to PWSCC and visual inspections of the steam generator head interior surfaces.

D. Draft NUREG-2192, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants, Draft Report for Comment,” Revision 1, ML23180A191

<https://www.regulations.gov>, Docket ID NRC-2023-0096, public comment period extended to October 11, 2023 (88 FR 61628; September 7, 2023).

Section 3.1.2.2.11.1

The existing programs rely on control of reactor water chemistry to mitigate cracking due to PWSCC and general visual inspections of the channel head interior surfaces (included as part of the steam generator program).

(No change proposed)

Section 3.1.2.2.11.2

The existing programs rely on control of reactor water chemistry to mitigate cracking due to PWSCC and visual inspections of the steam generator head interior surfaces.

(No change proposed)