
TSTF-577
NRC Review Status
1-7-2021

NRR/DNRL/NCSG

Outline

- Objective
- Background/TSTF-577 History
- Audit - Alloy 600TT SG Tubing
- Key Issues
- Staff Position
- Next Steps

Objective

- Communicate NRC TSTF-577 Review Status and NRC Staff Position
- Discuss Next Steps

Steam Generators Safety Significance

- SG tubes form the majority of RCS boundary, relied on to maintain primary system pressure/inventory
- Unique role – remove heat from the primary system
- SGTR DBA – rupture of a single tube
- For every other DBA, SG tube integrity is assumed
- SG tube failures can result in containment bypass

- SG tube integrity is necessary to ensure the tubes are capable of performing their intended safety functions

Background

- TSTF-577, “Revised Frequencies for Steam Generator Tube Inspections,” Rev. 0, June 2020 (ML20160A359)
- Public Meeting Dates – February 13, June 27, November 12, and November 14, 2019; and January 22, February 24, May 4, and October 28, 2020
- Previous SG regulatory changes in 2005 (TSTF-449) and 2011 (TSTF-510)
- NRC staff interacting in parallel with TSTF and Steam Generator Task Force/EPRI

TSTF-577 Proposed Changes Compared to Existing TS

Item	A600 MA	A600TT	A690
Inspect Not To Exceed	24 EFPM No change	TSTF-510 (48 EFPM) TSTF-577 (72 EFPM, 4 cycles)	TSTF-510 (72 EFPM) TSTF-577 (96 EFPM, 4 or 5 cycles)
Inspect 100% tubes within (Inspection period)	60 EFPM to 24 EFPM	120, 96, 72 EFPM to 72 EFPM	144, 120, 96, 72 EFPM to 96 EFPM
Mid-point inspect requirement	Previously eliminated	Previously eliminated	Previously eliminated
Cracking	If crack indications are found, then the next inspection for each potentially affected SG shall not exceed 24 EFPM or one RFO, whichever results in more inspections		

highlight = proposed TSTF-577 changes

Alloy 600TT Audit Background

- EPRI Audit - August 17 to September 24, 2020
 - Audit Plan and Summary (ML20216A673)
- Audit purpose:
 - Gain a better understanding of information supporting the proposed inspection interval for Alloy 600TT SG tubing in TSTF-577
 - Identify information that will require docketing to support the basis for a regulatory decision

A600TT Audit Key Staff Takeaways

- Substantial industry work supporting Alloy 600TT generic operational assessments (OA)
- Excluding tube end cracking (H* ARC), 205 cracks in fleet, substantial number present in data look back
- Intertek OA – model development continued over the course of audit, final results support 72 EFPM
- Westinghouse OA (axial PWSCC, Circ. ODSCC)
 - Base case (crack growth rates estimated by 600TT fleet eddy current data) and sensitivity study case (EPRI typical default crack growth rates) support different time intervals

A600TT Audit Key Takeaways (2)

- Fully probabilistic OAs required to obtain 72 EFPM
- OA process is complex and requires highly experienced tube integrity engineers. OA models contain many available refinements
- Crack growths estimated from eddy current sizing contain large uncertainties
- Staff questions:
 - How does the plant SG inspection POD compare to the eddy current technique POD?
 - Margin to accommodate future degradation surprises

TSTF-577 Draft RAI Responses Feedback

- RAIs (ML20308A656)
- RAI #1: 100% inspection “past or future” (Alloy 600TT)
- RAI #3: AP1000 operating experience reference removed
- RAI #4: inspection with enhanced probes
- RAI #6: EPRI Guidelines revisions
- No staff comments on the other draft RAI responses

Loose Parts Management

- Issue - longer primary inspection intervals may increase tubing susceptibility to loose part damage
- Plant operating experience with loose parts varies
 - Design, loose part strainers
 - Primary inspection strategy and technique POD
 - Secondary inspections (FOSAR) frequency
 - Foreign material exclusion program effectiveness
- Basis for inspection approach differences not always clear to NRC staff
- Development of a comprehensive industry strategy based on experience, analysis, and with minimum requirements, seems prudent to NRC staff

Staff Alloy 600TT Deliberation Inputs

- Alloy 600TT Audit Materials
- NCSG SG team internal debate
- NRC contractor – former NRC employee SG branch
- PRA Branch – initiating frequency sensitivity consultation
- RES/ANL support – eddy current expertise for data review
- Regional Inspectors feedback
- Public stakeholder

NRC Staff Position

- Alloy 600MA/690TT intervals are acceptable
 - Additional interaction needed on loose parts, EPRI Guideline changes, reporting template
- Alloy 600TT:
 - 54 EFPM (adds one cycle) for all plants
 - Conditional 72 EFPM (adds two cycles) if:
 - (1) plants have no cracking history (excludes H* ARC) and
 - (2) 100% enhanced probe inspections are performed
 - If cracks detected, inspect next outage.
 - Conditional relaxation to inspect at 2nd RFO if:
 - (1) 100% enhanced probe inspections are performed

Enhanced Inspections

- 100% Definition
 - Tube end to tube end (except below H* distance) with probes equivalent to or better than array probe technology
 - For regions where array probe technology is not possible, tube inspection techniques applied shall be capable of detecting all forms of existing and potential degradation in that region

Next Steps

- NRC staff requesting additional near term meeting to discuss SGTIR reporting template, loose parts strategy, and EPRI Guidelines revision
- A TSTF-577 revision will be needed to align with NRC staff position
- Staff will be drafting safety evaluation in parallel