Draft NRC Response
Clarification of Inspection Requirements in Technical Specifications Task Force 577 (TSTF-577)

NRC Meeting with

Industry Steam Generator Task Force (SGTF)

March 3, 2022

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Outline

- Background
  - TSTF-577 - Revised Frequencies for Steam Generator (SG) Tube Inspections
- SGTF Request for Clarification on TSTF-577 Inspection Requirements
- Draft NRC Response to SGTF Clarification Request
- Standardizing Titles of SG Tube Inspection Reports

Background

- TSTF-577, which made changes to the Standard Technical Specifications (STS) for pressurized-water reactors, was issued on April 14, 2021
  - Longer inspection intervals for thermally-treated Alloy 600 (48 Effective Full Power Months (EFPM) to 54 EFPM) and thermally-treated Alloy 690 (72 EFPM to 96 EFPM) tubing
  - For thermally-treated Alloy 600 only:
    - Conditional 72 EFPM for plants that have no cracking history and that perform a 100 percent enhanced probe inspection
    - Conditional relaxation to inspect at the second refueling outage after crack indications are detected if 100 percent enhanced probe inspections are performed

Background Cont'd

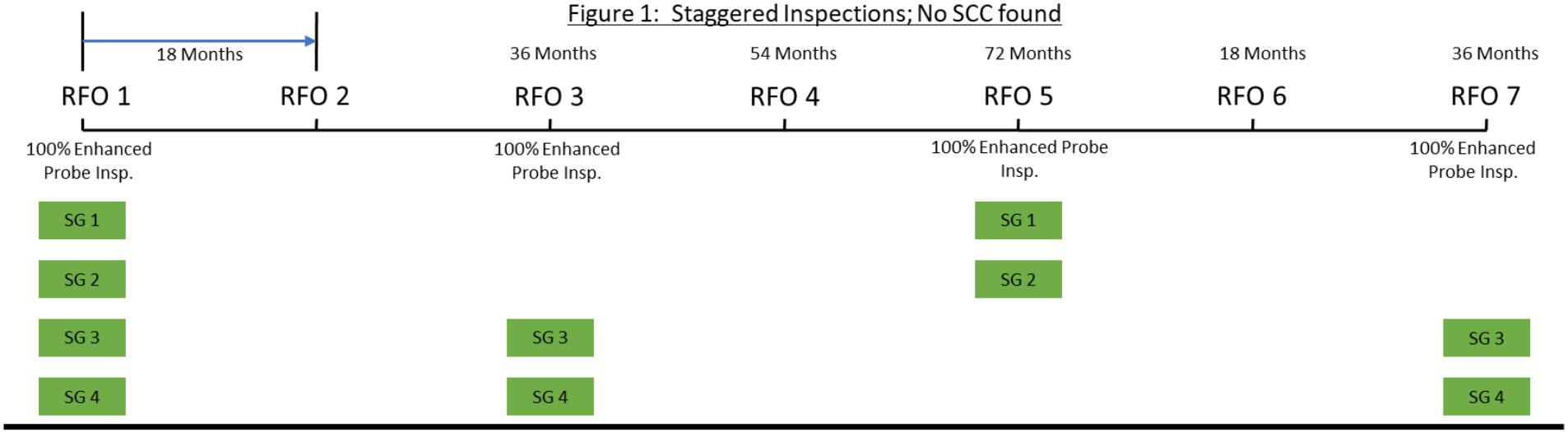
  - Added definition of 100 percent enhanced probe inspection
  - Updated requirements for SG tube inspection reports
  - Editorial changes
  - Incorporation of changes in NRC-approved TSTF-510, Revision 2
- TSTF-577 changes have been incorporated into Revision 5 of the STS:
  - NUREG-1430 (Babcock and Wilcox)
  - NUREG-1431 (Westinghouse)
  - NUREG-1432 (Combustion Engineering)

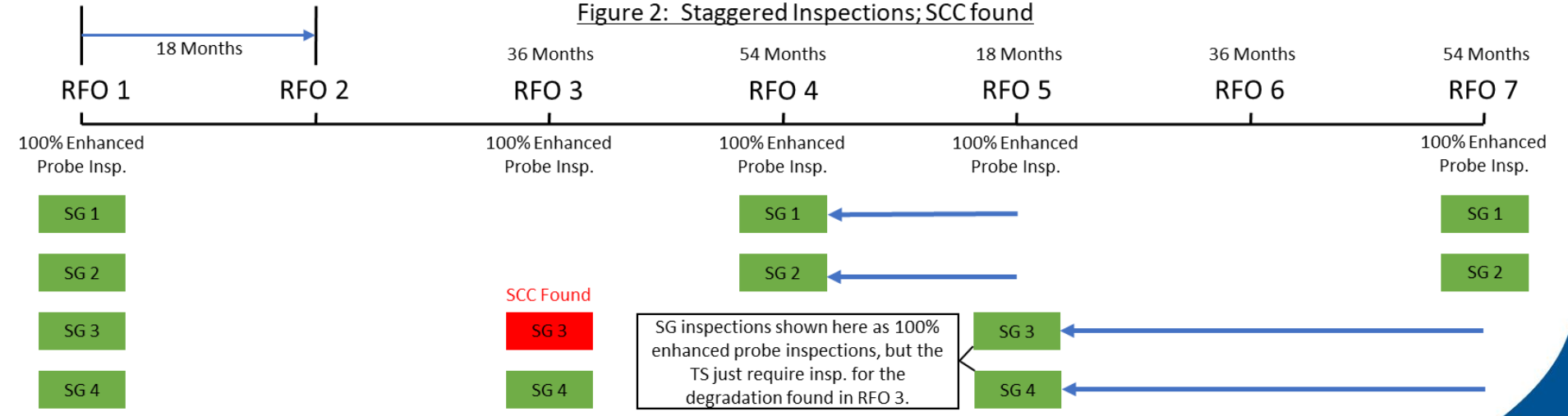
SGTF Request for Clarification

- December 9, 2021 - SGTF submitted a letter requesting clarification on TSTF-577 inspection requirements
  - STS Section 5.5.9.3 - Clarify the scope of the next inspection after crack indications are found
  - STS Section 5.5.9.2 – For thermally-treated Alloy 600 units with 72 EFPM intervals, can inspections be staggered once the initial 100% inspection is performed

Draft NRC Response to SGTF Clarification Request

- STS 5.5.9.3 - Minimum inspection requirements for the next refueling outage is for the degradation mechanism that caused the crack indication, in the affected and potentially affected SGs, based on the degradation assessment
- STS Section 5.5.9.2 - No prohibitions against allowing SG tube inspections to be switched to a staggered inspection approach after the initial 100 percent enhanced probe method inspection scope is completed
  - Staggered inspection approach may involve:
    - 100 percent inspection of alternating SGs (e.g., SGs 1 and 3 in one outage, followed by SGs 2 and 4 in a subsequent outage)
    - Partial inspection of all SGs (e.g., 50 percent of SGs A, B, and C in one outage, followed by the remaining 50 percent of SGs A, B, and C in a subsequent outage)
  - Developed inspection scenarios of how a plant operating within a 72 EFPM inspection interval would be affected by the detection of cracking for the first time during a staggered inspection





Staggered Inspections (18-month)

Inspection Scenario 1	Initial Crack Detection	Next Inspection and Beyond
Initial 100% enhanced probe inspection was performed on all four SGs and no cracking is detected. The SGs enter a 72 EFPM inspection period. Thereafter, staggered inspections by SG (e.g., SGs 1/3 and SGs 2/4 are offset by two refueling outages (RFOs) on an 18-month fuel cycle).	After two cycles, a 100% enhanced probe inspection is performed in SGs 1/3. Cracking detected in SG 1. SG 3 had no cracking detected but is potentially affected by the degradation mechanism. SGs 2/4 may or may not have received a partial inspection from initial scope expansion but are potentially affected by the degradation mechanism. All SGs are now limited to a 54 EFPM maximum inspection period.	All SGs are now limited to a 54 EFPM maximum inspection period [basis: TS 5.5.9.d.2]. SGs 1/3 – since a 100% enhanced probe inspection was performed and cracking was detected, inspection for the degradation mechanism is required at the second subsequent RFO [basis: TS 5.5.9.d.3]. SGs 2/4 – inspection is required at the next RFO to meet (i) the 54 EFPM maximum inspection period [basis: TS 5.5.9.d.2], and (ii) since the SGs did not receive a 100% enhanced probe inspection after cracking was detected in SG 1 [basis: TS 5.5.9.d.3].

Inspection Scenario 1a	Initial Crack Detection	Next Inspection and Beyond
Initial 100% enhanced probe inspection to enter 72 EFPM. Thereafter, staggered inspections by SG sub-population (e.g., 50% of each SG per outage offset by two RFOs on an 18-month fuel cycle).	After two cycles, enhanced probe inspection is performed on all tubes within the subpopulation in all SGs (e.g., 50% of each SG per inspection). Cracking detected in one SG. All SGs are now limited to a 54 EFPM maximum inspection period.	All SGs are now limited to a 54 EFPM maximum inspection period [basis: TS 5.5.9.d.2]. If less than 100% of tubes were inspected with the enhanced probe in all affected and potentially affected SGs, then inspection for the degradation mechanism is required at the next refueling outage [basis: TS 5.5.9.d.3]. In addition, any sub-population of tubes not inspected by an enhanced probe during the RFO when cracking was detected would need to be inspected at the next RFO to satisfy the 54 EFPM inspection period [basis: TS 5.5.9.d.2]. If 100% of all tubes (scope expansion) in all SGs were inspected with the enhanced probe, inspection for the degradation mechanism for affected and potentially affected SGs is required at the second subsequent refueling outage [basis: TS 5.5.9.d.3]. Those tubes not inspected at the second subsequent refueling outage would be inspected at the third subsequent refueling outage to satisfy the 54 EFPM inspection period [basis: TS 5.5.9.d.2].

Figure 3: Staggered Inspections; No SCC found

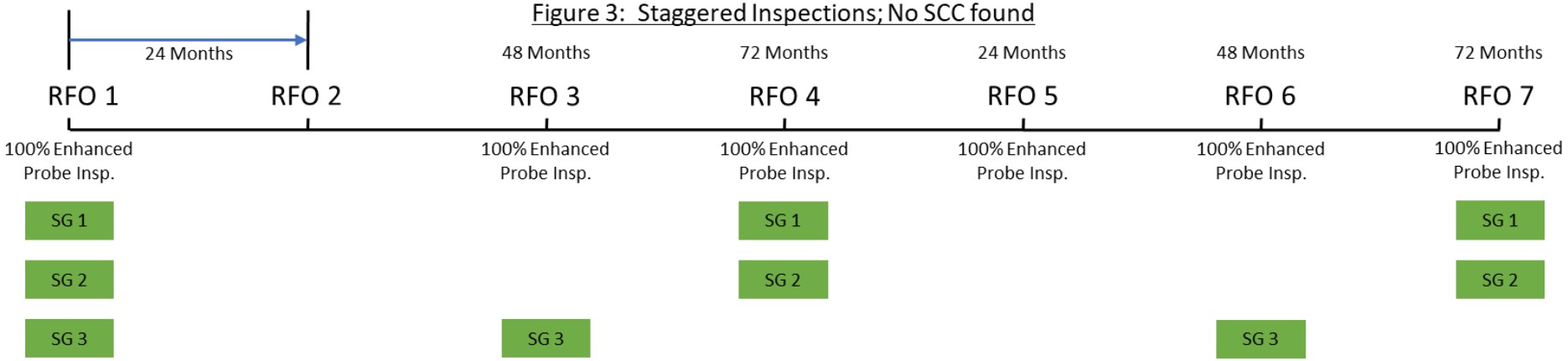
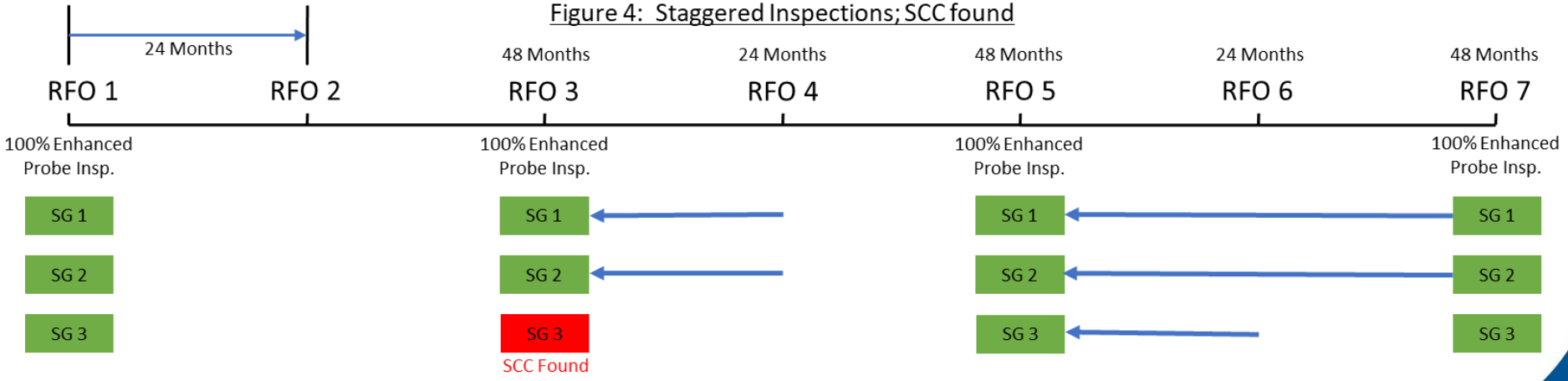


Figure 4: Staggered Inspections; SCC found



Staggered Inspections (24-month)

Inspection Scenario 2	Initial Crack Detection	Next Inspection and Beyond
Initial 100% enhanced probe inspection to enter 72 EFPM. Subsequent 100% enhanced probe inspections every 3rd RFO (24-month fuel cycle).	A 100% enhanced probe inspection performed in SGs A, B, and C after 72 EFPM. Cracking detected in SG A. SGs B and C had no cracking detected. All SGs are now limited to a 54 EFPM maximum inspection period.	All SGs are now limited to a 54 EFPM maximum inspection period [basis: TS 5.5.9.d.2]. SGs A, B, and C – since a 100% enhanced probe inspection was performed, inspection for the degradation mechanism is required at the second subsequent RFO (after 48 EFPM) [basis: TS 5.5.9.d.3]. In addition, the second subsequent RFO will likely be used to meet the 54 EFPM maximum inspection period requirement [basis: TS 5.5.9.d.2].

Inspection Scenario 2a	Initial Crack Detection	Next Inspection and Beyond
Initial 100% enhanced probe inspection to enter 72 EFPM inspection period. Staggered inspections by SG (e.g., SGs A/B and SG C are offset starting two refueling outages (RFOs) on a 24-month fuel cycle).	A 100% enhanced probe inspection performed in SGs A and B after 48 EFPM. Cracking detected in SG A. SG B had no cracking detected. All SGs are now limited to a 54 EFPM maximum inspection period.	All SGs are now limited to a 54 EFPM maximum inspection period [basis: TS 5.5.9.d.2]. Therefore, SG C will likely be inspected at the time cracking was detected in SG A to meet the 54 EFPM maximum inspection period requirement [basis: TS 5.5.9.d.2]. Assuming 100% of all tubes in all SGs receive an enhanced probe inspection, inspection for the degradation mechanism is required at the second subsequent RFO [basis: TS 5.5.9.d.3]. Assuming less than 100% of all tubes in all SGs receive an enhanced probe inspection, inspection for the degradation mechanism is required at the next subsequent RFO [basis: TS 5.5.9.d.3]. In addition, the second subsequent RFO will likely be used to meet the 54 EFPM maximum inspection period requirement [basis: TS 5.5.9.d.2].

Standardizing Titles of SG Tube Inspection Reports

- Standardized titles improve:
  - Distribution to appropriate NRC staff
  - ADAMS search
- NRC requests industry use title in STS – "Steam Generator Tube Inspection Report"

5.6.7	Steam Generator Tube Inspection Report A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with the Specification 5.5.9, "Steam Generator (SG) Program." The report shall include:

*STS – Westinghouse Plants: Specifications (NUREG-1431, Revision 5, Volume 1)

References

- TSTF Response to NRC Questions on TSTF-577, Revision 0, "Revised Frequencies for Steam Generator Tube Inspections," and Submittal of Revision 1, dated March 1, 2021 (ML21060B434)
- TSTF-577, Revision 1, Final Safety Evaluation Package (ML21099A086)
- SGTF Letter, "Clarification of Inspection Requirements in Technical Specifications Task Force (TSTF) 577," dated December 9, 2021 (ML22006A030)
- NUREG-1430, Revision 5, "Standard Technical Specifications – Babcock and Wilcox Plants," dated September 2021 (ML21272A363 (Volume 1) and ML21272A370 (Volume 2))
- NUREG-1431, Revision 5, "Standard Technical Specifications – Westinghouse Plants," dated September 2021 (ML21259A155 (Volume 1) and ML21259A159 (Volume 2))
- NUREG-1432, Revision 5, "Standard Technical Specifications – Combustion Engineering Plants," dated September 2021 (ML21258A421 (Volume 1) and ML21258A424 (Volume 2))

Questions