SGTF, TSTF, NRC Meeting

June 27, 2019

Agenda

- Objective of the Meeting
- Background
- Industry Proposed Technical Specification Change
- Operational Assessment Methodology
- Next Steps
- Discussion

Objective of the Meeting
Steve Brown, Entergy

Objective of the Meeting

- The industry is proposing replacement of the fixed periods for performing steam generator tube inspections with licensee-controlled, performance-based frequencies.
- This change is consistent with other NRC-approved Technical Specifications and NRC policy direction.
- The industry would like to obtain the staff's feedback on the concept.

Background
Brian Mann, Technical Specifications Task Force

Background

- The TSTF worked with EPRI in the past to develop two travelers on steam generator tube inspections:
  - TSTF-449-A, Rev. 4, Steam Generator Tube Integrity (approved May 2005).
  - TSTF-510-A, Rev. 2, Revision to Steam Generator Program Inspection Frequencies and Tube Sample Selection (approved October 2011).

Background

- TSTF-510 provided fixed operating periods between inspections for all tube materials:
  - Alloy 690TT plants are allowed to operate three cycles between inspections.
  - Alloy 600TT plants are allowed to operate two cycles between inspections.
  - Alloy 600MA plants must inspect each outage.
  - The Technical Specifications also specified fixed periods for inspecting 100% of the tubes.
- Both TSTF-449 and TSTF-510 included prescriptive frequencies for performing SG tube inspection.
- As we discussed in February, OE justifies longer inspection frequencies for many licensees.
  - In lieu of individual submittals, a TSTF traveler for generic review is more efficient.

Licensee-Controlled Test Frequencies

- In July 2009, the NRC approved TSTF-425, Revision 3, "Relocate Surveillance Frequencies to Licensee Control."
  - TSTF-425 relocates all periodic frequencies from the Technical Specifications to licensee control, except those specified in programs, such as the Steam Generator Testing Program and the Containment Leakage Rate Testing Program.
    - Changes to frequencies are evaluated in accordance with the NRC-approved NEI 04-10-A, "Risk-Informed Method for Control of Surveillance Frequencies," which is referenced in the Technical Specification Surveillance Frequency Control Program.

SR 3.4.14.2	----------NOTE---------- Not required to be performed until 12 hours after establishment of steady state operation. ---------- Verify primary to secondary LEAKAGE is ≤ 150 gallons per day through any one SG.	In accordance with the Surveillance Frequency Control Program

5.5.18 Surveillance Frequency Control Program

This program provides controls for Surveillance Frequencies. The program shall ensure that Surveillance Requirements specified in the Technical Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met.

a. The Surveillance Frequency Control Program shall contain a list of Frequencies of those Surveillance Requirements for which the Frequency is controlled by the program.

b. Changes of the Frequencies listed in the Surveillance Frequency Control Program shall be made in accordance with NEI 04-10, "Risk-Informed Method for Control of Surveillance Frequencies," Revision 1.

c. The provisions of Surveillance Requirements 3.0.2 and 3.0.3 are applicable to the Frequencies established in the Surveillance Frequency Control Program.

Licensee-Controlled Test Frequencies

- TSTF-425-A has been adopted by > 93% of plants not scheduled for permanent shutdown.
- The key aspects of the Surveillance Frequency Control Program are:
  - Specifying a methodology for evaluating frequency changes, and
  - A feedback mechanism to evaluate and, if needed, revise frequencies.

Performance-Based Requirements

- The Commission has encouraged the staff to pursue performance-based requirements when appropriate.
- In Staff Requirements Memoranda 98-144, the Commission provided direction on the use of performance-based regulation.
- The SRM noted that a performance-based approach can be implemented without the use of risk insights. Such an approach would require that objective performance criteria be based on deterministic safety analysis and performance history. This approach would still provide flexibility to the licensee in determining how to meet the performance criteria.

Performance-Based Requirements

- The SRM stated that a performance-based requirement approach should have four attributes:
  1. measurable (or calculable) parameters (i.e., direct measurement of the physical parameter of interest or of related parameters that can be used to calculate the parameter of interest) exist to monitor system, including facility and licensee , performance,
  2. objective criteria to assess performance are established based on risk insights, deterministic analyses and/or performance history,
  3. licensees have flexibility to determine how to meet the established performance criteria in ways that will encourage and reward improved outcomes; and
  4. a framework exists in which the failure to meet a performance criterion, while undesirable, will not in and of itself constitute or result in an immediate safety concern.

Industry Proposal

- As discussed at the February 13, 2019 NRC / industry meeting, current SG tube inspection frequencies are set by the Operational Assessment (OA), unless the TS frequencies are more restrictive.
- The industry is proposing a revised TS SG Program to replace prescriptive inspection frequencies and periods with performance-based inspection frequencies based on the OA.

Scope

- The proposed change does not alter:
  - condition monitoring assessments (paragraph a),
  - performance criteria for SG integrity (paragraph b),
  - SG tube repair criteria (paragraph c),
  - General provisions for SG tube inspections, inspections during the first refueling outage following SG replacement (paragraphs d and d.1)
  - Monitoring of operational primary-to-secondary leakage, or (paragraph e),
  - SG tube repair methods (paragraph f).

Add Operational Assessment Requirement to TS

- Add a new paragraph after paragraph c describing the Operational Assessment:
  - Provisions for operational assessments. An operational assessment is an evaluation that projects the condition of the SG tubes in order to establish the inspection frequency, and confirms that the SG tubes will satisfy the performance criteria for structural integrity and accident induced leakage until the next inspection. Operational assessments shall be performed during each outage in which which SG tubes are inspected, plugged, [or repaired].

Revise Inspection Frequency to be Based on the Operational Assessment

Revise paragraph d as shown:

~~----------REVIEWER'S NOTE----------~~

~~Plants are to include the appropriate Frequency (e.g., select the appropriate Item 2.) for their SG design. The first Item 2 is applicable to SGs with Alloy 600 mill annealed tubing. The second Item 2 is applicable to SGs with Alloy 600 thermally treated tubing *and* . The third Item 2 is applicable to SGs with Alloy 690 thermally treated tubing.~~

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1. Inspect 100% of the tubes in each SG during the first refueling outage following SG replacement.

2. *After the first refueling outage following SG installation, inspect each SG within the timeframe defined in the operational assessment.*

~~[2. Inspect 100% of the tubes at sequential periods of 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the SGs. No SG shall operate for more than 24 effective full power months or one refueling outage (whichever is less) without being inspected.]~~

~~[2. Inspect 100% of the tubes at sequential periods of 120, 90, and, thereafter, 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the SGs. In addition, inspect 50% of the tubes by the refueling outage nearest the midpoint of the period and the remaining 50% by the refueling outage nearest the end of the period. No SG shall operate for more than 48 effective full power months or two refueling outages (whichever is less) without being inspected.]~~

~~[2. Inspect 100% of the tubes at sequential periods of 144, 108, 72, and, thereafter, 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the SGs. In addition, inspect 50% of the tubes by the refueling outage nearest the midpoint of the period and the remaining 50% by the refueling outage nearest the end of the period. No SG shall operate for more than 72 effective full power months or three refueling outages (whichever is less) without being inspected.]~~

Revise the SG Tube Inspection Report to Include the Inspection Frequency

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:

(existing a-g) ...

h. The maximum operating interval until the next inspection established by the operational assessment,

(existing h and i renumbered)

The Proposed Change is Consistent with NRC Guidance on Performance-Based Regulation

- It is based on measurable (or calculable) parameters, such as tube inspection results and operational leakage,
- There are objective criteria to assess performance; the structural integrity performance criteria, accident induced leakage performance criteria, and operational leakage criteria,
- Licensees will have flexibility to determine how to meet the established performance criteria (structural integrity, accident induced leakage) in ways that will encourage and reward improved outcomes; and
- The TS requirements on operational leakage ensure the failure to meet a performance criterion, while undesirable, will not in and of itself constitute or result in an immediate safety concern.

Summary

- The vast majority of Technical Specification surveillance frequencies are licensee-controlled and performance-based.
- The proposed change to SG inspection frequency is consistent with NRC policy on performance-based regulation.
- The industry has conservative guidelines to maintain safe SG operation.
- The SG Program specifies the performance criteria to be met when establishing the inspection frequency.
- Operating experience demonstrates that the operational assessments ensure safe inspection frequencies.

OA Methodology Overview
Helen Cothron/Steve Brown

OA Methodology Overview

- The EPRI SGMP Integrity Assessment Guidelines describe acceptable OA methods that predict SG condition at the next inspection relative to the integrity performance criteria.
- The OA methods have been successfully used for 20 years.
- In general, the methods begin simplistic and increase in complexity based on plant specific conditions.

OA Methodology Overview

- Single flaw degraded tube analyses model the worst flaw.
  - Arithmetic
  - Simplified Statistical
  - Mixed Arithmetic/Simplified Statistical
  - Monte Carlo
- Fully probabilistic analyses model the entire tube bundle.
  - Fully probabilistic means that uncertainties, flaw character distributions, growth distributions, probabilities of detection and other inputs are randomly sampled for each simulation and each simulation is repeated many times over.
- All OA methods are conservative,
- Fully probabilistic analyses are the most accurate and realistic projection of the SG condition.

Current Inspection Intervals

- A recent survey indicates the majority of units (approximately 2/3) are able to use the simplistic methods to meet the current prescriptive inspection intervals.
- Current Technical Specifications and Operational Assessments allow a population of tubes to operate greater than three cycles between inspections.
  - Bobbin inspections with 50% sampling every third outage, tubes are inspected on a rotating 6 cycle period.
- The industry operating experience demonstrates performance criteria are met with longer inspection intervals.

Foreign Objects

- Operating experience has shown the risk of leakage events from foreign object wear is not dependent on inspection frequencies.
- Nuclear plants have robust programs and procedures to minimize the potential for foreign objects.
- Typical foreign objects do not pose a threat of tube burst.
- The Integrity Assessment Guidelines require secondary side conditions be considered and a review of the OA for each outage where inspections are not performed.
- SGMP Primary-to-Secondary Leakage Guidelines require plants to monitor for leakage.
  - The industry has been successful with identifying very small levels of primary-to-secondary leakage.
  - The industry has a long history of being able to shut down the plants upon detecting leakage that could lead to tube burst.

Impact of Performance-Based Inspection Intervals

- The operational assessment would dictate the number cycles between inspections.
  - The majority of the Alloy 690TT plants would be able to safely increase their inspection interval by at least one cycle.
  - A600TT plants with no SCC history would likely be able to safely increase their inspection interval by at least one additional cycle.
  - A600TT plants with SCC reported at the most recent outage may be able to operate for up to two cycles, subject to plant specific conditions.
  - A600MA plants would have no change in inspection intervals.

Next Steps
Brian Mann, TSTF

Next Steps

- The TSTF, working with EPRI, will develop a TSTF traveler with appropriate justification.
- Following industry review, a draft will be provided to the NRC.
- Hold a pre-submittal meeting.
- Following resolution of any NRC comments, the traveler will be submitted for NRC review.

Discussion

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