March 1, 2021

TSTF-20-07
PROJ0753

Attn: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: TSTF Response to NRC Questions on TSTF-577, Revision 0, "Revised Frequencies for Steam Generator Tube Inspections," and Submittal of Revision 1

On November 6, 2020, the NRC provided a Request for Additional Information (RAI) regarding TSTF-577, Revision 0, "Revised Frequencies for Steam Generator Tube Inspections" (ADAMS Accession Number ML20308A656).

The TSTF's response to the NRC RAI is attached.

The RAI responses resulted in changes to TSTF-577. In addition, the TSTF-577 changes to the completed but not yet published Revision 5 of the Standard Technical Specifications (NUREG-1430, NUREG-1431, and NUREG-1432) have been incorporated into the traveler. TSTF-577, Revision 1, is enclosed.

Should you have any questions, please do not hesitate to contact us.

James P. Miksa (PWROG/CE)

Ryan M. Joyce (BWROG)

Dwi Murray (PWROG/W)

Jordan L. Vaughan (PWROG/B&W)

Wesley Sparkman (PWROG/AP1000)

Attachment
Enclosure

11921 Rockville Pike, Suite 100, Rockville, MD 20852
Phone: 301-984-4400, Fax: 301-984-7600
Administration by EXCEL Services Corporation

cc: Michelle Honcharik, Technical Specifications Branch
Victor Cusumano, Technical Specifications Branch
Helen Cothron, EPRI

TSTF Response to NRC Questions on TSTF-577, Revision 0,
"Revised Frequencies for Steam Generator Tube Inspections"

The NRC questions are repeated below in italics, followed by the TSTF response.

INTRODUCTION

By letter dated June 8, 2020 (Agencywide Documents Access and Management System Accession No. ML20160A359), the Technical Specification Task Force (TSTF) submitted TSTF 577, Revision 0, "Revised Frequencies for Steam Generator Tube Inspections," to the U.S. Nuclear Regulatory Commission (NRC) for review. TSTF 577 would revise the technical specifications (TS) related to steam generator (SG) tube inspections to extend the inspection interval for thermally treated Alloy 600 (Alloy 600TT) and thermally treated Alloy 690 (Alloy 690TT) SG tubing.

To complete its review of TSTF-577, the NRC staff has determined that additional information is needed. The regulatory basis and the requested additional information are as follows.

REGULATORY BASIS FOR REQUEST

The general design criteria (GDC) in Appendix A to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR) provide regulatory requirements that state the reactor coolant pressure boundary (RCPB) shall have "an extremely low probability of abnormal leakage and of gross rupture" (GDC 14), "shall be designed with sufficient margin" (GDCs 15 and 31), shall be of "the highest quality standards practical" (GDC 30), and shall be designed to permit "periodic inspection and testing…to assess …structural and leak tight integrity" (GDC 32).

Section 182(a) of the Atomic Energy Act requires nuclear power plant operating licenses to include TS. In 10 CFR 50.36, "Technical specifications," NRC regulatory requirements related to the content of the TS are established. The TS for all current primary water reactor (PWR) licenses require that an SG Program be established and implemented to ensure that SG tube integrity is maintained. Programs established by the licensee, including the SG Program, are listed in the administrative controls section of the TS to operate the facility in a safe manner.

SG tube integrity is maintained by meeting the performance criteria specified in the TS for structural and leakage integrity, consistent with the plant design and licensing basis. The TS require that a condition monitoring assessment be performed during each outage in which the SG tubes are inspected, to confirm that the performance criteria are being met. The TS include provisions regarding the scope, frequency, and methods of SG tube inspections. These provisions require that the inspections be performed with the objective of detecting flaws of any type that may be present along the length of a tube and that may satisfy the applicable tube plugging criteria. The applicable tube plugging criteria, specified in the TS, are that tubes found during in service inspection to contain flaws with a depth equal to or exceeding 40 percent of the nominal wall thickness shall be plugged, unless the tubes are permitted to remain in service through application of alternate repair criteria provided in the TS. The TS include a limit on operational primary-to-secondary leakage, beyond which the plant must be promptly shut down. Should an existing flaw that exceeds the tube integrity repair limit not be detected during the periodic tube surveillance required by the plant TS, the operational leakage limit provides added assurance of timely plant shutdown before tube structural and leakage integrity are impaired, consistent with the design and licensing bases.

As part of the plant's licensing basis, applicants for PWR licenses are required to analyze the consequences of postulated design-basis accidents (DBAs), such as a SG tube rupture and a steam line break. These analyses consider primary-to-secondary leakage that may occur during these events and must show that the offsite radiological consequences do not exceed the applicable limits of 10 CFR 50.67 or 10 CFR 100.11 for offsite doses; GDC 19 of 10 CFR Part 50, Appendix A, for control room operator doses (or some fraction thereof as appropriate to the accident); or the NRC-approved licensing basis (e.g., a small fraction of these limits).

REQUESTED ADDITIONAL INFORMATION

While the following questions are based on the NRC staff's review of TSTF-577, the staff notes there is a parallel effort in reviewing the technical basis for the proposed Alloy 600TT SG tubing inspection interval. The staff recently completed an audit of the feasibility studies that support the proposed changes for Alloy 600TT tubing material. The "Audit Plan for the Regulatory Audit of Electric Power Research Institute [EPRI] for Steam Generator Task Force Information Related to Technical Specification Task Force-577, 'Revised Frequencies for Steam Generator Tube Inspections,'" is available in ADAMS under Accession No. ML20216A676. These preliminary feasibility studies are expected to be finalized and submitted in 2020. The staff expects additional technical discussions with industry on topics of importance to TSTF-577, such as how the probability of crack detection from the Alloy 600TT fleet compare to the values determined from eddy current technique development, how sizing errors could influence the crack growth rates determined from plant eddy current data, and on a template for the TSTF-577 TS reporting requirements. It is possible, but not certain, that additional questions could arise from these activities.

1) *In Section 2.4.4., "Editorial Improvements," it is stated that, "The model application states that on implementation of the license amendment request the current inspection period will begin at the last 100 percent inspection of each SG." During the recent NRC staff audit, an industry slide discussing lessons learned to be applied in future SG inspections stated that a 100 percent inspection of the region of interest would be performed at the beginning of TSTF-577 implementation.*

    a) *Please clarify if the implementation of TSTF-577 would be considered at the next 100 percent inspection of all SG tubes in a unit.*

Response to RAI 1.a

The new inspection period would start after a 100% inspection of all SG tubes performed during a single outage (past or future) with the objective of detecting flaws of any type that may satisfy the applicable tube plugging or repair criteria.

For example, if a 690TT unit performed a 100% inspection in the Spring of 2019 and TSTF-577 was approved for that unit in 2021, the period would begin in the Spring of 2019 and the unit would be able to operate 96 EFPM from that outage if the operational assessment justifies this interval. The ability to start the period with a past inspection requires that the licensee confirms the prior scope fully satisfied the revised TS requirements, including recent operational

experience. SGMP guidelines require a review of the Degradation Assessment and Operational Assessment prior to every outage in which SG inspections are not to be performed.

Plants that implement an amendment based on TSTF-577 and credit a prior 100% inspection of SG tubes will submit a revised Steam Generator Tube Inspection Report that satisfies the revised TS reporting requirements.

The justification for TSTF-577 has been revised to clarify this issue.

b) Upon implementation of TSTF-577, how is the starting point of the "new" current inspection period determined if units performed SG inspections on only a portion of the SGs in alternating refueling outages (e.g., SGs A and C in one outage and then SGs B and D in the next outage)?

Response to RAI 1.b

The new inspection period would start after a 100% inspection of all tubes in all SGs performed during a single outage (past or future). For example, a unit with 690TT tubes must perform a 100% inspection of all steam generator tubes in a single outage prior to being able to operate 96 EFPM, and then only if the operational assessment justifies this interval.

c) Upon implementation of TSTF-577, how is the starting point of the "new" current inspection period determined if units performed partial SG inspections of all SGs in alternating refueling outages (e.g., 50 percent inspections of SGs A, B, C, and D in two outages)?

Response to RAI 1.c

See the response to RAI 1.b.

2) *Section 3.1.3., "Technical Evaluation of Alloy 600TT Tubing Material Inspection Frequency," states,*

> *Operating experience for nearly forty years has shown no propensity for rapidly increasing crack initiation rates in Alloy 600TT SG tubes, as was observed for Alloy 600MA [mil annealed Alloy 600] SG tubes. The proposed change of inspection frequency from 48 EFPM [effective full power months] to 72 EFPM has been demonstrated to meet the structural integrity and accident induced leakage performance criteria even for SGs that have experienced cracking. However, the proposed change maintains the existing requirement to inspect each affected and potentially affected SG at the next refueling outage after identifying a definitive crack indication. Based on this operating experience, the proposed TS change to require inspection of the tubing at least every 72 EFPM is acceptable.*

The NRC staff agrees that the operational experience of SGs with Alloy 600TT tubing is significantly improved over that demonstrated by SGs with Alloy 600MA tubing. The staff notes, however, the proposed change to increase inspection intervals of Alloy 600TT tubing is supported by industry modeling performed using the Operational Assessment (OA) methodology contained in the EPRI "Steam Generator Management Program: Steam Generator Integrity Assessment Guidelines," not actual operating experience since the current TS do not permit the longer intervals. The staff also notes that the technical bases documents reviewed by the staff in the audit performed in September 2020 were preliminary and that changes were expected to be made in the final documents. Please submit the final feasibility study documents, as discussed in the audit exit meeting on September 24, 2020, since the staff may rely on portions of this material during the regulatory evaluation process.

Response to RAI 2

The Alloy 600TT Feasibility Studies were published as a single EPRI report, "Steam Generator Management Program: Feasibility Study for Multi-Cycle 600TT Operational Assessments, 3002018258," dated November 2020 (ADAMS Accession No. ML20335A173). An additional operational assessment addressing potentially high residual stress tubes was published as EPRI report, "Extended Inspection Interval Analyses of Axial ODSCC at Tube Support Plate Intersections on High Residual Stress Tubes for Steam Generators with Alloy 600TT Tubing, 3002019984," dated November 2020. Both reports have been submitted by EPRI to the NRC and have been withheld from public disclosure.

3) *Section 3.1.4., "Technical Evaluation of Alloy 690TT Tubing Material Inspection Frequency," states that the Advanced Passive 1000 (AP1000) SGs are fundamentally the same as other Westinghouse SG designs utilizing Alloy 690TT tubing. The TSTF goes on to state that, "recent international operating experience indicates the only damage mechanism is wear, which is consistent with other SGs with Alloy 690TT tubing." Please confirm that this statement is specific to international operating experience for AP1000 SGs and provide the international operating experience. In addition, the NRC staff requests that Section 3.1.4. be revised to clearly describe how the AP1000 SG design, operating conditions, and international experience is bounded by the U.S. Alloy 690TT SG tubing operating experience.*

Response to RAI 3

The AP1000 SG is a vertical shell and U-tube evaporator with integral moisture separating equipment. The AP1000 SGs are designed in accordance with the recommendations of Generic Letter 85-02, "Staff Recommended Actions Stemming from NRC Integrated Program for the Resolution of Unresolved Safety Issues Regarding Steam Generator Tube Integrity," and NUREG-0844, "NRC Integrated Program for the Resolution of Unresolved Safety Issues A-3, A-4, and A-5 Regarding Steam Generator Tube Integrity." The basic design and features have been proven in tests and in previous SGs, including replacement SG designs.

The AP1000 Model Delta-125 SG is similar to an upgraded Model Delta-75 SG that has been used in operation as a replacement SG. Design enhancements based on proven technology include nickel-chromium-iron Alloy 690 thermally treated tubes on a triangular pitch, improved antivibration bars, single-tier separators, enhanced maintenance features, and a primary-side channel head design that allows for easy access and maintenance by robotic tooling. The AP1000 SGs employ tube supports utilizing a broached hole support plate design. Anti-vibration bars installed in the U-bend portion of the tube bundle minimize the potential for excessive vibration.

The specifications of the AP1000 SGs are:

Steam Generator Design Pressure, reactor coolant side – 2500 psia
Steam Generator Design Pressure, steam side – 1200 psia
Steam Generator Design Temperature, reactor coolant side – 650°F
Steam Generator Design Temperature, steam side – 600°F
Number of Steam Generators per unit – 2
Steam Generator Heat Transfer Area/SG – 123,538 $feet^2$
Steam Generator Number of tubes/SG – 10,025
Steam Generator Tube Material – I 690 TT
Steam Generator Zero load temperature – 557°F
Steam Generator Feedwater temperature– 440°F
Steam Generator Exit Steam Pressure– 836 psia
Steam Generator Steam Flow per steam generator – 7.5 x 10^6 lb/hr
Steam Generator Total Steam Flow – 14.99 x 10^6 lb/hr
Steam Generator Tube outer diameter – 0.688 inch
Steam Generator Tube wall thickness – 0.040 inch
Steam Generator Tube pitch – 0.980 inch (triangular)

The plant is designed for rated performance with up to 10 percent of the steam generator tubes plugged and with a maximum hot leg temperature of 610°F.

The international experience of the AP1000 steam generators is bounded by the degradation identified in operating steam generators in the US. The international AP1000 plants experienced minor wear at tube support plate intersections and anti-vibration bar intersections. All of the wear indications were below 40% through-wall. Therefore, the inspection and reporting criteria for Alloy 690TT tubing is equally applicable to the AP1000 SGs.

4) *Section 3.1.5., "Consideration of Inspection Techniques," states that, "…the TS will continue to require robust inspections to support the proposed inspection intervals." In general, licensees have demonstrated the ability to detect stress corrosion cracking (SCC) before tube integrity is challenged, demonstrated the ability to conservatively manage loose parts once they are detected, and have managed tube wear while maintaining tube integrity. This good operational experience, however, was developed within the inspection frequency of the existing TS.*

   The proposed SG tube inspection frequencies will increase the amount of time that SCC can initiate and grow and will increase the amount of time that wear can occur from loose parts and at support structures between inspections. The NRC staff notes that some assumptions made in the OA modeling, such as consistent secondary side conditions, have greater uncertainty with increasing time between inspections. In addition, detection of early stages of SCC can be challenging, particularly in the presence of masking signals caused by local tube changes, for example at dents/dings, manufacturing marks, and under deposits. The staff notes that the enhanced detection achieved by inspection with advanced probes could be expected to provide one mitigating factor to increased operational time between inspections, by providing a more accurate assessment of the current tube condition.

   The NRC staff believes that such inspections are an important element of an inspection program supporting an increased interval between inspections. Regardless of the specific tubing alloy in a SG, detection of existing loose parts is enhanced by using advanced probes, such as the combination bobbin and array coil probe or other equivalent (or better) probes. Use of enhanced probes would also provide earlier detection of corrosion, should it occur during future operation. Therefore, the staff supports the widespread use of advanced probes in future inspections.

   In light of the preceding discussion, discuss how strategies for greater use of advanced probes will support longer inspection intervals on a tube material basis or provide justification for not incorporating enhanced inspections equivalent to or better than array probe technology into the SG TS (e.g., in Section 5.5.9.d.2). Alternatively, revise the SG TS to incorporate enhanced inspections equivalent to or better than array probe technology or provide revisions that will ensure enhanced inspections equivalent to or better than array probe technology will be performed during the SG inspections.

Response to RAI 4

The TS proposed in TSTF-577 require that the number and portions of the tubes inspected, and methods of inspection, be performed with the objective of detecting flaws of any type that may be present along the length of the tube. The operational assessment considers the probability of detection of the techniques used. Better probability of detection supports longer inspection intervals. Dents/dings, high stressed tubes, tubesheet, and low row U-bends are examples of areas that are inspected with advanced probe technology that support longer inspection intervals. Bobbin examinations provide an acceptable probability of detection for most degradation mechanisms and locations. In the proposed Steam Generator Tube Inspection Report that will be required by all licensees that adopt TSTF-577, the NRC will be provided information on the probe technology used for all inspections.

TSTF-577, Revision 1, changed the Alloy 600 thermally treated inspection interval. The inspection period is 54 effective full power months unless none of the SG tubes have ever experienced cracking in any prior inspection and a 100% SG inspection along the full length of the tubing is performed using enhanced probes that provide improved detection of cracking equivalent to or better than array probe technology (with the exceptions provided in paragraph d.2 of the program). In that case, a 72 effective full power month inspection period is permitted.

5) *The model application states that "the TS Bases are not affected by the proposed changes." TSTF-577 proposes to incorporate TSTF-510, which affected the TSTF-449 TS Bases. Therefore, this statement will be incorrect for units currently using TSTF-449 and proposing to incorporate TSTF-577. Please revise the sentence to be applicable to units using either TSTF-449 or TSTF-510.*

Response to RAI 5

The TSTF-577 model application is revised to add statements regarding the TS Bases in brackets, indicating that the information is plant-specific. Licensees adopting TSTF-577 that revise the Bases will include the statements.

6) *Please provide details for any changes that are planned to the EPRI SG Guidelines in support of longer inspection intervals.*

Response to RAI 6

The industry met with the NRC staff on October 28, 2020, and one of the discussion topics was the scope of the revisions to the EPRI Integrity Assessment Guidelines. Work has begun and the industry will communicate with the NRC as progress is made.

Enclosure

TSTF-577, Revision 1

Technical Specifications Task Force
Improved Standard Technical Specifications Change Traveler

Revised Frequencies for Steam Generator Tube Inspections

NUREGs Affected: ☑ 1430 ☑ 1431 ☑ 1432 ☐ 1433 ☐ 1434 ☑ 2194

Classification: 1) Technical Change | Recommended for CLIIP?: Yes

Correction or Improvement: Improvement | NRC Fee Status: Not Exempt

Benefit: Reduces Testing | Changes Marked on ISTS Rev 5.0

PWROG RISD & PA (if applicable): RS-2018-023,PA-LSC-1649

See attached.

Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: EPRI

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 13-Mar-20

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 27-Mar-20

TSTF Review Information

TSTF Received Date: 13-Mar-20 Date Distributed for Review 13-Mar-20

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 08-Jun-20

NRC Review Information

NRC Received Date: 08-Jun-20

NRC Comments:

The original TSTF-577 draft was titled, "Performance Based Frequencies for Steam Generator Tube Inspections." The TS related to steam generator (SG) tube inspection were revised to permit the licensee to determine the SG tube inspection frequency using an operational assessment instead of fixed frequencies specified in the TS. A draft was provided to the NRC on September 10, 2019 and a presubmittal meeting was held on October 16, 2019. The NRC did not support the industry's proposal to remove all Steam Generator tube inspection interval limits from the Technical Specifications. The NRC believed that there is significant uncertainty in determining the existing condition of the SG tubes and the anticipated flaw growth rates, and did not have confidence that the Operational Assessment (OA) process is adequate to ensure the

OG Revision 0 Revision Status: Closed

performance requirements will be met. The NRC staff was open to discussing changes to some existing SG tube inspection frequencies provided there was sufficient technical justification.

Based on this feedback, TSTF-577 was revised. The revised traveler extended and simplified the SG inspection intervals and it provided to the NRC on March 30. A presubmittal teleconference was held on May 4 and the NRC provided written comments on May 18.

The significant changes to the March 30 draft TS are:
* The 3 Effective Full Power Month (EFPM) allowance to extend the inspection period to the next refueling outage was removed based an NRC question and an SGMP evaluation that it is no longer needed.
* The Alloy 600TT and 690TT inspection interval discussion related to prorating tube inspections was eliminated as the TS no longer requires more than one inspection during the inspection period.
* The TS markups based on TSTF-449 and NUREG-2194 were expanded to include the TS 3.4.XX, "Steam Generator (SG) Tube Integrity," and Bases changes in made in TSTF-510 (changed "repair" to "plugging [or repair]") so that the adopted TS will be the same for all plants.
* The AP1000 TS are included in the traveler.

Significant changes to the justification and model application are:
* Added a discussion of foreign objects.
* Added a discussion of inspection techniques.
* Added a discussion of recent OE on 600TT tubes.
* Revised the model application and variation section to discuss when the inspection period begins after adoption of the traveler.

The NRC provided a Request for Additional Information on November 6, 2020, which resulted in changes to the traveler.

Final Resolution: Superceded by Revision

TSTF Revision 1 Revision Status: Active

Revision Proposed by: PWROG

Revision Description:
Revised to reflect the response to the November 6, 2020 NRC Request for Additional Information.

Significant changes are:
Added TS markup based on completed but not published STS Revision 5.
Revised the Alloy 600TT inspection period to 54 EFPM unless inspection performed with enhanced probes, then a 72 EFPM inspection period is allowed if there has been no cracking.
Revised the Alloy 600TT cracking inspection requirement to extend by one refueling outage if inspections performed with enhanced probes.
Revised the model application to provide options for submittals that revise Bases.
Revised the Regulatory Evaluation section of the justification to address the 5 questions on Bases.
Revised the justification and model application to accommodate licensees crediting SG inspections performed prior to implementation of the traveler.

TSTF Revision 1 **Revision Status: Active**

Owners Group Review Information

Date Originated by OG: 02-Dec-20

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 18-Dec-20

TSTF Review Information

TSTF Received Date: 02-Dec-20 Date Distributed for Review 02-Dec-20

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 18-Dec-20

NRC Review Information

NRC Received Date: 01-Mar-21

NRC Comments:
On November 6, 2020, the NRC provided a Request for Additional Information (RAI) on TSTF-577, Rev. 0.

On December 23, 2020, the TSTF provided a draft response to the RAI which included a draft revision to TSTF-577.

On January 7, 2021, the TSTF and NRC held a teleconference to discuss the draft documents and the NRC provided comments.

On January 26, 2021, the NRC and EPRI held a teleconference and the NRC's comments on TSTF-577 were discussed.

On Feburary 15, 2021, the TSTF provided a revised draft TSTF-577 and draft RAI response.

On Feburary 18, 2021, the NRC provided comments on the drafts.

On Feburary 23, 2021, the TSTF provided a draft response to the NRC's comments.

On Feburary 23, 2021, the NRC provided two additional questions.

On February 26, 2021, the TSTF responded. One response resulted in a minor wording change to paragraph d.2 of the SG program.

On March 1, 2021, the NRC responded that the TSTF responses answered their questions and the TSTF should formally submit Revision 1.

Affected Technical Specifications

5.5.9	Steam Generator Program	NUREG(s)- 1430 1431 1432 Only

5.6.7	Steam Generator Tube Inspection Report	NUREG(s)- 1430 1431 1432 Only
LCO 3.4.17	Steam Generator Tube Integrity	NUREG(s)- 1430 2194 Only
LCO 3.4.17 Bases	Steam Generator Tube Integrity	NUREG(s)- 1430 2194 Only
Action 3.4.17.A	Steam Generator Tube Integrity	NUREG(s)- 1430 2194 Only
Action 3.4.17.A Bases	Steam Generator Tube Integrity	NUREG(s)- 1430 2194 Only
SR 3.4.17.1 Bases	Steam Generator Tube Integrity	NUREG(s)- 1430 2194 Only
SR 3.4.17.2	Steam Generator Tube Integrity	NUREG(s)- 1430 2194 Only
SR 3.4.17.2 Bases	Steam Generator Tube Integrity	NUREG(s)- 1430 2194 Only
LCO 3.4.20	Steam Generator Tube Integrity	NUREG(s)- 1431 Only
LCO 3.4.20 Bases	Steam Generator Tube Integrity	NUREG(s)- 1431 Only
Action 3.4.20.A	Steam Generator Tube Integrity	NUREG(s)- 1431 Only
Action 3.4.20.A Bases	Steam Generator Tube Integrity	NUREG(s)- 1431 Only
SR 3.4.20.1 Bases	Steam Generator Tube Integrity	NUREG(s)- 1431 Only
SR 3.4.20.2	Steam Generator Tube Integrity	NUREG(s)- 1431 Only
SR 3.4.20.2 Bases	Steam Generator Tube Integrity	NUREG(s)- 1431 Only
LCO 3.4.18	Steam Generator Tube Integrity	NUREG(s)- 1432 Only
LCO 3.4.18 Bases	Steam Generator Tube Integrity	NUREG(s)- 1432 Only
Action 3.4.18.A	Steam Generator Tube Integrity	NUREG(s)- 1432 Only
Action 3.4.18.A Bases	Steam Generator Tube Integrity	NUREG(s)- 1432 Only
SR 3.4.18.1 Bases	Steam Generator Tube Integrity	NUREG(s)- 1432 Only
SR 3.4.18.2	Steam Generator Tube Integrity	NUREG(s)- 1432 Only
SR 3.4.18.2 Bases	Steam Generator Tube Integrity	NUREG(s)- 1432 Only
5.5.4	Steam Generator Program	NUREG(s)- 2194 Only
5.6.6	Steam Generator Tube Inspection Report	NUREG(s)- 2194 Only

Table of Contents

ENCLOSURES:

- Changes to the Technical Specifications Based on TSTF-449
- Changes to the Technical Specifications Based on TSTF-510
- Changes to Revision 5 of the Standard Technical Specifications
- Changes to NUREG-2194
- Example Clean-Typed Affected Pages of NUREG-1431 Incorporating the Proposed Changes

1. SUMMARY DESCRIPTION

The Technical Specifications (TS) related to steam generator (SG) tube inspections are revised to extend the surveillance interval for some SG tube types by up to 24 effective full power months (EFPM) and to revise the post-inspection reporting requirements. The proposed change modifies NUREG-1430, "Standard Technical Specifications - Babcock & Wilcox Plants," NUREG-1431, "Standard Technical Specifications - Westinghouse Plants," NUREG-1432, "Standard Technical Specifications - Combustion Engineering Plants," and NUREG-2194, "Standard Technical Specifications - Westinghouse Advanced Passive 1000 (AP1000) Plants."

2. DETAILED DESCRIPTION

2.1. System Design and Operation

The SG tubes in pressurized water reactors (PWRs) have a number of important safety functions. SG tubes are an integral part of the reactor coolant pressure boundary (RCPB) and, as such, are relied on to maintain the primary system's pressure and inventory. As part of the RCPB, the SG tubes are unique in that they act as a heat transfer surface between the primary and secondary systems to remove heat from the primary system. In addition, the SG tubes isolate the radioactive fission products in the primary coolant from the secondary system.

The steam generator tube rupture (SGTR) accident is the limiting design basis event for an SG. The analysis of an SGTR event assumes a bounding primary to secondary leakage rate equal to the operational leakage rate TS limit, plus the leakage rate from a double-ended rupture of a single tube. The analysis for design basis accidents and transients other than an SGTR assume the SG tubes retain their structural integrity (i.e., they are assumed not to rupture). In these analyses, the steam discharge to the atmosphere is based on the total primary to secondary leakage from all SGs or is assumed to increase to the limit as a result of accident induced conditions. For accidents that do not involve fuel damage, the primary coolant activity level is assumed to be equal to the TS limits. For accidents that assume fuel damage, the primary coolant activity is a function of the amount of activity released from the damaged fuel.

SG tube integrity is necessary to ensure the tubes are capable of performing their intended safety functions. Concerns relating to the integrity of the tubing stem from the fact that the SG tubing can be subject to a variety of degradation mechanisms. SG tubes have experienced tube degradation related to corrosion phenomena, such as wastage, pitting, intergranular attack, and stress corrosion cracking, along with other mechanically induced phenomena such as wear. These degradation mechanisms can impair tube integrity if they are not managed effectively. When the degradation of the tube wall reaches a prescribed criterion for action, the tube is considered defective and corrective action is taken, such as plugging or repair. Note that not all plants have approved repair techniques. Therefore, references to "repair" are bracketed (i.e., are optional) in the Standard Technical Specifications (STS).

The industry, working through the Electric Power Research Institute (EPRI) Steam Generator Management Program (SGMP), has implemented a generic approach to managing SG performance referred to as "Steam Generator Degradation Specific Management" (SGDSM).

The overall program is described in NEI 97-06, "Steam Generator Program Guidelines," which is supported by a number of EPRI guidelines, such as:

- PWR Steam Generator Examination Guidelines
- Steam Generator Integrity Assessment Guidelines
- Steam Generator In-Situ Pressure Test Guidelines
- PWR Primary-to-Secondary Leak Guidelines
- PWR Primary Water Chemistry Guidelines
- PWR Secondary Water Chemistry Guidelines

NEI 97-06 and the EPRI Guidelines define a comprehensive, performance based approach to managing SG performance.

2.2. Current Technical Specifications Requirements

There are four Standard Technical Specifications requirements related to SG tube inspections.

- STS 3.4.13, "RCS [Reactor Coolant System] Operational LEAKAGE," (STS 3.4.7 in NUREG-2194) describes the SG operational leakage limit of 150 gallons per day primary to secondary leakage through any one SG.

- NUREG-1430 and NUREG-2194 STS 3.4.17, NUREG-1431 STS 3.4.20, and NUREG-1432 STS 3.4.18, "Steam Generator (SG) Tube Integrity," require inspection per the Steam Generator Program and provide actions when the SG tube integrity is not maintained.

- STS 5.5.9, "Steam Generator (SG) Program," (STS 5.5.4 in NUREG-2194) describes a program that ensures that SG tube integrity is maintained by meeting the three SG performance criteria: structural integrity, accident induced leakage, and operational leakage. The program defines the performance criteria, requires condition monitoring assessments, defines SG tube plugging or repair criteria, and requires SG inspections.

  The SG Program provides the inspection scope and frequency based on the SG tube material type: Thermally Treated Alloy 690 (i.e., 690TT), Thermally Treated Alloy 600 (i.e. 600TT), or Mill Annealed Alloy 600 (i.e., 600MA).

- STS 5.6.7, "Steam Generator Tube Inspection Report," (STS 5.6.6 in NUREG-2194) describes a report that is submitted to the NRC within 180 days after entry into Mode 4 following completion of an SG inspection performed per the SG Program and describes the results of the inspection.

The plant-specific Technical Specifications requirements may vary from the STS.

2.3. Reason for the Proposed Change

Operating experience supports a longer inspection period for plants with Alloy 600TT and Alloy 690TT tubes. In addition, the current inspection practices permit a simplified inspection routine with fixed periods for 100% inspection of the SG tubes.

2.4. Description of the Proposed Change

2.4.1. Proposed Changes to TS Based on TSTF-449

The current STS requirements were established by TSTF-449, "Steam Generator Tube Integrity," approved on May 6, 2005, that:

- Established a limit on allowable primary-to-secondary leakage from any one SG,
- Revised the SG Program to describe SG condition monitoring, performance criteria, repair methods, repair criteria, and inspection frequency,
- Revised the requirements for the SG Tube Inspection Report, and
- Added a SG Tube Integrity Specification.

All operating PWRs adopted TSTF-449. TSTF-449 was incorporated into Revision 3.1 and Revision 4 of the STS.

In 2009, the TSTF, supported by EPRI, submitted TSTF-510, "Revision to Steam Generator Program Inspection Frequencies and Tube Sample Selection." The differences between TSTF-449 and TSTF-510 that are relevant to the proposed change are:

- TSTF-510 changed the phrase "tube repair" to "tube plugging [or repair]" to be consistent with the treatment of plant-specific repair methods in the SG Tube Integrity TS and the associated Bases, and the SG Program.
- TSTF-510 added the option to extend each inspection period up to 3 EFPM to include a SG inspection outage in an inspection period.
- TSTF-510 added guidance on prorating SG tube inspection samples.
- TSTF-510 made wording changes and minor reporting changes to the Steam Generator Tube Inspection Report.
- TSTF-510 included minor wording changes, such as stating, "A degradation assessment" instead of "An assessment of degradation."

TSTF-510 was approved by the NRC on October 27, 2011 and has been adopted by greater than 82% of the applicable plants. TSTF-510 was approved after publication of Revision 4 of the STS.

TSTF-449 and TSTF-510 are incorporated into Revision 5 of the STS.

On March 28, 2012, the TSTF wrote to the NRC that an administrative error had been found in TSTF-510, Revision 2 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML 12088A082). One of the editorial improvements in TSTF-510-A revised references to "tube repair criteria" to "tube plugging [or repair] criteria." Not all plants have

approved tube repair criteria, so references to tube repair are bracketed to indicate they are plant-specific. In paragraph d.2 (all versions), the TSTF determined one instance of "tube repair criteria" was inadvertently not changed to "tube plugging [or repair] criteria." In a letter dated June 17, 2013 (ADAMS Accession No. ML13120A541), the NRC agreed that it was an administrative error and that the correction should be included in license amendment requests to adopt TSTF-510. This correction is included in the proposed changes.

The requirements in NUREG-2194 are similar to those approved in TSTF-510, but the optional (i.e., bracketed) references to tube repair techniques are omitted and only paragraph d.2 for SG tubes made of Alloy 690TT is included, since all current AP1000 plants have Alloy 690TT tubes. The optional references to tube repair techniques are added in the proposed changes.

In order to maximize the consistency of the proposed TS across the operating fleet, the TSTF-510 changes to the TS Section 3.4, "Steam Generator (SG) Tube Integrity" specification, the associated TS Bases, the SG Program, and the Steam Generator Tube Inspection Report are incorporated into the TSTF-449 based markups and the NUREG-2194 markups, such that the proposed TS are the same regardless of the current TS.

Four sets of STS markups are provided. One set is based on TSTF-449 for NUREG-1430, NUREG-1431, and NUREG-1432. The second set is based on TSTF-510 for NUREG-1430, NUREG-1431, and NUREG-1432. This is applicable to the majority of licensees. The third set shows the changes to the completed, but not yet published, Revision 5 of the STS for NUREG-1430, NUREG-1431, and NUREG-1432. The fourth set shows the changes to NUREG-2194, which is similar to TS based on TSTF-510.

Also attached is an example set of clean-typed NUREG-1431 pages incorporating the proposed changes to assist the NRC staff in their review.

In the model application, the licensee will identify whether the current plant TS are based on TSTF-449, TSTF-510, or NUREG-2194.

2.4.2. Proposed Changes to the SG Tube Inspection Requirements

In NUREG-1430, NUREG-1431, and NUREG-1432, TS Section 5.5.9, paragraph "d" is revised as shown below:

> ----------REVIEWER'S NOTE----------
> The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.
> ----------

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet [except for any portions of the tube that are exempt from inspection by alternate repair criteria], and that may satisfy

the applicable tube plugging [or repair] criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A degradation assessment shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

----------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. The third Item 2 is applicable to SGs with Alloy 690 thermally treated tubing.
---

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

[2. After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 24 effective full power months, which defines the inspection period.]

[2. After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection period may be extended to 72 effective full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region.]

[2. After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 96 effective full power months, which defines the inspection period.]

----------REVIEWER'S NOTE----------
The bracketed phrases in Paragraph 3 are only applicable to SGs with Alloy 600 thermally treated tubing.
---

3. If crack indications are found in any SG tube, [excluding any region that is exempt from inspection by alternate repair criteria], then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall be at the next refueling outage [, but may be deferred to the following refueling outage if the 100% inspection of all SGs was performed with enhanced probes as described in paragraph d.2]. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

In NUREG-2194, the changes are the same except that the Reviewer's Notes are not included, only the last paragraph d.2 (applicable to SG tubes made of Alloy 690TT) is included, and the bracketed phrase in paragraph d.3 (only applicable to SGs with Alloy 600TT tubes) is not included.

2.4.2.1. Proposed Changes for Alloy 600MA Tubing Material

The Paragraph "d.2" for Alloy 600MA tubing material is revised.

- For TS based on TSTF-449 and TSTF-510, the requirement to inspect 100% of the tubes every 60 EFPM is replaced with a requirement to inspect 100% of the tubes every 24 EFPM, which is the new inspection period. References to refueling outages are removed.
- For TS based on TSTF-510, the allowance to extend the inspection period by 3 months and the discussion of prorating inspections is deleted.

The proposed changes are shown below for TS based on TSTF-449 (insertions are in italics; deletions are struck through).

After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 24 effective full power months, which defines the inspection period. ~~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.~~

The proposed changes are shown below for TS based on TSTF-510.

After the first refueling outage following SG installation, inspect *100% of the tubes in* each ~~steam generator~~ *SG* at least every 24 effective full power months*, which defines the inspection period.* ~~or at least every refueling outage (whichever results in more frequent inspections). In addition, inspect 100% of the tubes at sequential periods of 60 effective~~

~~full power months beginning after the first refueling outage inspection following SG installation. Each 60 effective full power month inspection period may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period.~~

2.4.2.2. Proposed Changes for Alloy 600TT Tubing Material

Paragraph "d" for Alloy 600TT tubing material is revised.

- For TS based on TSTF-449 and TSTF-510, the requirement to inspect from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet is clarified to acknowledge that portions of the tube may be exempt from inspection by alternate repair criteria.

The proposed changes are shown below for TS based on TSTF-449.

---*REVIEWER'S NOTE*---
The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.

Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet *[except for any portions of the tube that are exempt from inspection by alternate repair criteria]*, and that may satisfy the applicable tube *plugging [or* repair*]* criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. ~~An assessment of~~ *A* degradation *assessment* shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

The proposed changes are shown below for TS based on TSTF-510.

> *----------REVIEWER'S NOTE----------*
> *The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.*
> ---

> Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet *[except for any portions of the tube that are exempt from inspection by alternate repair criteria]*, and that may satisfy the applicable tube plugging [or repair] criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A degradation assessment shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

Paragraph "d.2" for Alloy 600TT tubing material is revised.

- For TS based on TSTF-449, the requirement to inspect 100% of the tubes at periods of 120, 90, and 60 EFPM is replaced with a requirement to inspect 100% of the tubes every 54 EFPM, which is the new, fixed inspection period. The 48 EFPM limit between inspections is replaced with the 54 EFPM inspection period.
- For TS based on TSTF-449, the requirement to inspect 50% of the tubes at the inspection nearest the midpoint of the inspection period is eliminated.
- For TS based on TSTF-510, the requirement to inspect 100% of the tubes during each period in paragraphs d.2.a (120 EFPM), d.2.b (96 EFPM), and d.2.c (72 EFPM) is replaced with a requirement to inspect 100% of the tubes every 54 EFPM, which is the new, fixed inspection period. References to refueling outages are removed.
- For TS based on TSTF-510, the allowance to extend the inspection period by 3 months and the discussion of prorating inspections is deleted.
- For TS based on TSTF-449 and TSTF-510, if a plant's SG tubes have never experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and 100% of the SG tubes are inspected with enhanced probes, the inspection period may be extended to 72 EFPM.

The proposed changes are shown below for TS based on TSTF-449.

> *After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection period may be extended to 72 effective*

full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region. ~~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.~~

The proposed changes are shown below for TS based on TSTF-510.

After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection period may be extended to 72 effective full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region. ~~After the first refueling outage following SG installation, inspect each SG at least every 48 effective full power months. or at least every other refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, and c below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube *plugging [or* repair*]* criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~
~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~
~~---~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 120 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period; and~~

~~c) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the third and subsequent inspection periods.~~

2.4.2.3. Proposed Changes for Alloy 690TT Tubing Material

Paragraph "d.2" for Alloy 690TT tubing material is revised.

- For TS based on TSTF-449, the requirement to inspect 100% of the tubes at periods of 144, 108, 72, and 60 EFPM is replaced with a requirement to inspect 100% of the tubes every 96 EFPM, which is the new, fixed inspection period. The 72 EFPM limit between inspections is replaced with the 96 EFPM inspection period.
- For TS based on TSTF-449, the requirement to inspect 50% of the tubes at the inspection nearest the midpoint of the inspection period is eliminated.
- For TS based on TSTF-510, the requirement to inspect 100% of the tubes during each period in paragraphs d.2.a (144 EFPM), d.2.b (120 EFPM), d.2.c (96 EFPM), and d.2.d (72 EFPM) is replaced with a requirement to inspect 100% of the tubes every 96 EFPM, which is the new, fixed inspection period. References to refueling outages are removed.
- For TS based on TSTF-510, the allowance to extend the inspection period by 3 months and the discussion of prorating inspections is deleted.

The proposed changes are shown below for TS based on TSTF-449.

After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 96 effective full power months, which defines the inspection period. ~~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.~~

The proposed changes are shown below for TS based on TSTF-510 and on NUREG-2194.

After the first refueling outage following SG installation, inspect *100% of the tubes in* each SG at least every *96*~~72~~ effective full power months*, which defines the inspection*

period. ~~or at least every third refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, c and d below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube *plugging [or* repair*]* criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~
~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~
~~----------~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 144 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 120 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period;~~

~~c) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the third inspection period; and~~

~~d) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the fourth and subsequent inspection periods.~~

2.4.2.4. Proposed Changes to Inspections After Crack Indications are Found

Paragraph d.3 regarding crack indications is revised.

- For TS based on TSTF-449, TSTF-510, or NUREG-2194, the requirement to inspect within 24 EFPM or one refueling outage after a crack indication is found, whichever is less, is simplified to a requirement to inspect at the next refueling outage.
- For TS based on TSTF-449, paragraph d.3 is revised to require inspection of each "affected and potentially affected" SG for the degradation mechanism that caused the crack.

- For plants based on TSTF-449 and TSTF-510 with Alloy 600TT tubing material, a clarification is added to acknowledge that some areas are exempt from inspection for cracking under alternate repair criteria. Also, an option is provided to defer the inspection for an additional refueling outage if the 100% inspection of all SGs was performed with enhanced probes.

The proposed changes are shown below for TS based on TSTF-449.

> *----------REVIEWER'S NOTE----------*
> *The bracketed phrases in Paragraph 3 are only applicable to SGs with Alloy 600 thermally treated tubing.*
> *----------*
>
> If crack indications are found in any SG tube*[excluding any region that is exempt from inspection by alternate repair criteria]*, then the next inspection for each *affected and potentially affected* SG for the degradation mechanism that caused the crack indication shall *be at the next* ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever is less)~~ *[, but may be deferred to the following refueling outage if the 100% inspection of all SGs was performed with enhanced probes as described in paragraph d.2]*. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

The proposed changes are shown below for TS based on TSTF-510.

> *----------REVIEWER'S NOTE----------*
> *The bracketed phrase in Paragraph 3 is only applicable to SGs with Alloy 600 thermally treated tubing.*
> *----------*
>
> If crack indications are found in any SG tube *[excluding any region that is exempt from inspection by alternate repair criteria]*, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall *be at the next* ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever is less)~~ *[, but may be deferred to the following refueling outage if the 100% inspection of all SGs was performed with enhanced probes as described in paragraph d.2]*. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

The proposed changes are shown below for TS based on NUREG-2194.

> If crack indications are found in any SG tube, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall *be at the next* ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever is less)~~. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a

crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

2.4.3. Proposed Changes to the SG Tube Inspection Report Contents

The Steam Generator Tube Inspection Report for TS based on TSTF-510, TSTF-449, and NUREG-2194 is revised to include different reporting requirements. The report is TS 5.6.7 for NUREG-1430, NUREG-1431, and NUREG-1432, and TS 5.6.6 for NUREG-2194. The revised TS requirements state:

5.6.[X] 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.[X], "Steam Generator (SG) Program." The report shall include:

a. The scope of inspections performed on each SG;

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;

c. For each degradation mechanism found:

1. The nondestructive examination techniques utilized;

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported;

3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;

4. The number of tubes plugged [or repaired] during the inspection outage; and

[5. The repair methods utilized and the number of tubes repaired by each repair method.]

d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;

e. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each SG;

f. The results of any SG secondary side inspections; and

[g. Insert any plant-specific reporting requirements, if applicable.]

For TS based on TSTF-449, TSTF-510, and NUREG-2194, the reporting requirements are rearranged. The new reporting requirements are:

- An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results (Item d).
- The results of any SG secondary side inspections (Item f).

For all TS, the revised reporting requirements are:

- For tube wear at support structures that is less than 20 percent through-wall, only the total number of indications needs to be reported, and the location, orientation (if linear), measured size (if available), and voltage response is not required to be reported for each such indication (Item c.2).
- In addition to a description of the condition monitoring assessment, the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment are required to be reported (Item c.3).
- When reporting the results of condition monitoring, the results of tube pulls and in-situ testing is not explicitly required to be reported (Item c.3).
- Any existing plant-specific reporting requirements are added as Item g.

A template is being developed for industry use that provides guidance on complying with the revised reporting requirements. The template will be included in a revision of the EPRI Integrity Assessment Guidelines.

2.4.4. Editorial Improvements

Editorial improvements to the current TS are included. The acronym "SG" is defined in the Steam Generator Program title but is used inconsistently within the program. This is corrected.

A model application is attached. The model may be used by licensees desiring to adopt the traveler following NRC approval. The model application states that on implementation of the license amendment request the current inspection period will begin at the last 100% inspection of each SG. Inspections performed since the last 100% inspection of each SG are included in the current inspection period, such that all SG tubes in each SG will be inspected within the current inspection period. Should a licensee desire to modify the beginning of the inspection period, the model application contains an optional variation that may be used to describe and justify the alternative.

3. TECHNICAL EVALUATION

3.1. Revision to the SG Tube Inspection Requirements

The existing SG Program contains prescriptive frequencies for inspection of SGs with tubes made of Alloy 600MA, Alloy 600TT, and Alloy 690TT.

3.1.1. Technical Evaluation of Changes to TS Based on TSTF-449

The following changes are made to TS based on TSTF-449 to adopt features of TSTF-510.

- References to "tube repair criteria" are changed to references to "tube plugging [or repair] criteria," in the SG Tube Integrity TS and the associated Bases, the SG Program, and the SG Tube Inspection Report, as not all plants have approved repair criteria.

- The proposed change eliminates the requirement to inspect 50% of the tubes at the inspection nearest the midpoint of the inspection period and adds a discussion of prorating inspections. The NRC's model SE for TSTF-510 noted that if there are not an equal number of inspections in the first half and second half of the inspection period, the average minimum sampling requirement may be markedly different for inspections in the first half of the inspection period compared to those in the second half, even when there are uniform intervals between each inspection. The NRC staff found that there was no basis to require the minimum initial sample size to vary so much from inspection to inspection. TSTF-510 revised the requirement such that the minimum sample size for a given inspection in a given inspection period is 100 percent divided by the number of scheduled inspections during that inspection period. The NRC staff concluded that the change was an improvement over the existing requirement since it provides a more consistent minimum initial sampling requirement.

- In TSTF-510, paragraph d.3 was revised to require inspection of each "affected and potentially affected" SG for the degradation mechanism that caused the crack. The NRC's model SE for TSTF-510 determined that the change was an acceptable clarification of the requirement. The NRC staff stated that the intent of the requirement is that it applies to the affected SG and to any other SG which may be potentially affected by the degradation mechanism that caused the known crack(s). If it can be established that the extent of condition of any manufacturing anomaly applies only to one SG and not the others, then the NRC staff agreed that only the affected SG needs to be inspected.

3.1.2. Technical Evaluation of Alloy 600MA Tubing Material Inspection Frequency

The TS based on TSTF-449 and TSTF-510 require 100% of the tubes in SGs using Alloy 600MA to be inspected within 60 EFPM and each SG to be inspected at least every 24 EFPM or at least every refueling outage (whichever results in more frequent inspections).

The proposed change requires 100% inspection within 24 EFPM. The change to the inspection frequency is conservative. The prescriptive inspection frequency has not changed, but the requirement to perform 100% inspection is decreased from 60 EFPM to 24 EFPM. This is consistent with current operating practices. As the proposed change results in more frequent

100% inspection (every 24 EFPM instead of every 60 EFPM), the proposed change is acceptable. The inspection period starts after a 100% inspection of all SG tubes performed during a single outage (past or future).

For TS based on TSTF-510, the proposed change eliminates the discussion of prorating SG tube inspections. Because the proposed change requires 100% of the tubes to be inspected every 24 EFPM (i.e., every refueling outage), the elimination of the discussion has no effect and is acceptable.

3.1.3. Technical Evaluation of Alloy 600TT Tubing Material Inspection Frequency

For TS based on TSTF-510, the current requirement is to inspect 100% of the tubes during each sequential period of 120 EFPM, 96 EFPM, and 72 EFPM, and for TS based on TSTF-449, the current requirement is to inspect 100% of the tubes during each sequential period of 120 EFPM, 90 EFPM, and 60 EFPM. In both cases, each SG must be inspected at least every 48 EFPM or at least every other refueling outage (whichever results in more frequent inspections). The proposed change requires inspecting 100% of the tubes every 54 EFPM regardless of the age of the SGs. The new inspection period starts after a 100% inspection of all SG tubes performed during a single outage (past or future).

Significant operating experience has been gained over the course of 15 years since the current TS inspection frequencies were determined and provides justification for extending these frequencies.

For the Alloy 600TT fleet, stress corrosion cracking (SCC) is the primary concern. Nine of the seventeen plants with SGs with Alloy 600TT tubing have experienced sporadic cracking. The majority of the cracking has been identified in subpopulations of tubes with anomalous conditions that have been identified and are inspected, as needed, to maintain margin to the performance criteria. Operating experience for nearly forty years has shown no propensity for rapidly increasing crack initiation rates in Alloy 600TT SG tubes, as was observed for Alloy 600MA SG tubes. The proposed change of inspection frequency from 48 EFPM to 54 EFPM has been demonstrated to meet the structural integrity and accident induced leakage performance criteria even for SG tubes that have experienced cracking. However, the proposed change maintains the existing requirement to inspect each affected and potentially affected SG at the next refueling outage after identifying a definitive crack indication unless the inspection was performed using enhanced probes. In that case, the inspection may be deferred until the following refueling outage. Based on this operating experience, the proposed TS change to require inspection of the tubing at least every 54 EFPM is acceptable.

There has been some recent industry experience with unexpected Alloy 600TT SG tube cracking. The industry has reviewed the size of the crack indications and has begun reviewing the current and past eddy current data. There is evidence in the past data that the indications did not grow to detection levels in only one cycle. The crack indications are short (the largest is less than 0.25” long). The size of these indications is bounded by the mechanisms assessed in the studies performed to support the proposed changes. This recent operating experience does not affect the conclusion that plants with Alloy 600TT SGs tubes can safely operate for up to 54 EFPM between inspections. However, as with the current inspection intervals, some plants with Alloy

600TT SG tubes may need to perform inspections more frequently due to limits imposed by their forward looking assessments.

Plants with Alloy 600TT tube material that have not experienced cracking (other than in regions that are exempt from inspection by alternate repair criteria) and that inspected 100% of the SG tubes using enhanced probes may extend the inspection period from 54 to 72 EFPM. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology and are used from tube-end to tube-end (excluding regions that are exempt from inspection by alternate repair criteria). If the enhanced probe cannot be used in a region, the tube regions must be inspected by probes that can detect all forms of existing and potential degradation in that region. It is acceptable to extend the inspection period from 54 EPFM to 72 EFPM if enhanced probes are used in all accessible regions because enhanced probes provide improved detection of cracking, such that a longer period between inspections is warranted.

Along with the prescribed inspection frequencies in the proposed change, the SG Program requires assessments ensure safe SG inspection intervals that are based on measurable parameters that monitor SG performance, such as results of SG tube inspections and operational leakage. Objective criteria to assess performance are established based on risk insights, deterministic analyses, and performance history. In addition, the TS requirements on operational leakage require a plant shutdown if the limits are exceeded. This ensures that the failure to meet a performance criterion, while undesirable, will not result in an immediate safety concern. Therefore, the proposed extension of the existing SG inspection frequencies is acceptable.

3.1.4. Technical Evaluation of Alloy 690TT Tubing Material Inspection Frequency

For TS based on TSTF-510, the current requirement is to inspect 100% of the tubes during each sequential period of 144 EFPM, 120 EFPM, 96 EFPM, and 72 EFPM , and for TS based on TSTF-449, the current requirement is to inspect 100% of the tubes during each sequential period of 144 EFPM, 108 EFPM, 72 EFPM, and 60 EFPM. In both cases, each SG must be inspected at least every 72 EFPM or at least every third refueling outage (whichever results in more frequent inspections). The proposed change requires inspecting 100% of the tubes every 96 EFPM regardless of the age of the SGs. The new inspection period starts after a 100% inspection of all SG tubes performed during a single outage (past or future).

Significant operating experience has been gained over the course of 15 years since the current TS inspection frequencies were determined and provides justification for extending these frequencies.

For the Alloy 690TT SGs, wear at support structures is the primary concern. Twenty-one of the forty-four units with Alloy 690TT tubing in the US have few or no structure wear indications. Fifteen of these have never been required to plug a tube for structure wear. Among these are units that have been in service since the 1990's. The other six units have been required to plug less than 10 tubes for structure wear. Twelve of the units with Alloy 690TT tubing have moderate numbers of wear indications with low growth rates that tend to attenuate over time. Conservative new initiation and growth rate projections out to 96 EFPM of operating time between inspections for these units has been easily justified, i.e., the structural integrity and accident induced leakage performance criteria are met with margin. The eleven units with Alloy

690TT tubing in the US with higher numbers of wear indications or higher growth rates are limited to inspection frequencies dictated by the assessments required by the SG Program, as is the case with the current inspection frequencies. Based on this operating experience, the TS change to require inspection of the SG tubes at periods not to exceed 96 EFPM is acceptable.

The AP1000 SGs are fundamentally the same as other Westinghouse SG designs utilizing Alloy 690TT tubing. The AP1000 Model Delta-125 SG is similar to an upgraded Model Delta-75 SG that has been used in operation as a replacement SG. Design enhancements based on proven technology include nickel-chromium-iron Alloy 690 thermally treated tubes on a triangular pitch, improved antivibration bars, single-tier separators, enhanced maintenance features, and a primary-side channel head design that allows for easy access and maintenance by robotic tooling. The AP1000 SGs employ tube supports utilizing a broached hole support plate design. Anti-vibration bars installed in the U-bend portion of the tube bundle minimize the potential for excessive vibration. The international experience of the AP1000 steam generators is bounded by the degradation identified in operating steam generators in the US. The international AP1000 plants experienced minor wear at tube support plate intersections and anti-vibration bar intersections. All of the wear indications were below 40% through-wall. Therefore, the inspection and reporting criteria for Alloy 690TT tubing is equally applicable to the AP1000 SGs.

Along with the prescribed inspection frequencies in the proposed change, the SG Program requires assessments ensure safe SG inspection intervals that are based on measurable parameters that monitor SG performance, such as results of SG tube inspections and operational leakage. Objective criteria to assess performance are established based on risk insights, deterministic analyses, and performance history. In addition, the TS requirements on operational leakage require a plant shutdown if the limits are exceeded. This ensures that the failure to meet a performance criterion, while undesirable, will not result in an immediate safety concern. Therefore, the proposed extension of the existing SG inspection frequencies is acceptable.

3.1.5. Consideration of Inspection Techniques

Existing paragraph d of the SG Program requires using the appropriate inspection techniques to detect flaws of any type (e.g., volumetric flaws, axial and circumferential cracks). In addition to the required inspections at the specified intervals, Paragraph d requires that the inspection scope, the inspection methods, and the inspection intervals ensure that SG tube integrity is maintained until the next SG inspection. Further, the degradation assessment is used to determine the type and location of flaws to which the tubes may be susceptible and to determine which inspection methods need to be employed at what locations to detect any such flaws. Therefore, the TS will continue to require robust inspections to support the proposed inspection intervals.

Plants with Alloy 600TT tubes may choose to use enhanced probes which provide improved detection of cracking. In that case, if the plant has not experienced SG tube cracking, a longer inspection period is justified when using the enhanced probes.

3.1.6. Consideration of Foreign Objects

Foreign objects may enter the SG tube bundle at any time during an operating cycle and cause wear on the tubes. Licensees perform eddy current and visual inspections to identify objects and retrieve them; however, this cannot preclude foreign object events. Operating experience proves that wear from foreign objects begins with low level leakage. Licensees have primary to secondary leak monitoring programs that are capable of identifying leakage at very low levels and plant procedures require a shutdown of the unit when necessary to avoid the potential of tube rupture.

The EPRI guidance on forward looking assessments states that utilities should consider secondary side conditions that could affect SG tube integrity, such as foreign material in the SGs, material degradation that could generate foreign objects during operation, and degradation of support structures. The forward looking assessment to establish the acceptable inspection interval should ensure that degraded secondary side components do not affect tube integrity during future operation. Additional guidance concerning a loose parts management strategy will be included in a revision to the EPRI Integrity Assessment Guidelines (IAG).

3.1.7. Technical Evaluation of Elimination of 3 Month Extension Allowance and Prorating Discussion

For TS based on TSTF-510 and NUREG-2194, the current requirements permit extension of the inspection period by up to 3 EFPM. The proposed inspection periods do not require this extension to align with refueling outages and the allowance is deleted.

For TS based on TSTF-510 and NUREG-2194, multiple SG inspections are required in each inspection period and the TS requires prorating SG tube sample sizes to inspect for new degradation mechanisms. Under the proposed change, only one inspection is required per inspection period and the prorating requirements are no longer needed. The discussion of prorating is deleted.

3.1.8. Technical Evaluation of Inspection After Cracking Indications

The current paragraph d.3 requires inspection within 24 EFPM or one refueling outage after a crack indication is found, whichever is less. References to refueling outages is proposed to be removed from the rest of paragraph d and the current presentation is unnecessarily complex. All PWRs have cycle lengths of 24 months or less and that is not expected to change in the foreseeable future. Therefore, it is acceptable to simplify the requirement to require inspection at the next refueling outage after a crack is found.

Plants with Alloy 600TT tube material that inspected 100% of the SG tubes using enhanced probes (as described in paragraph d.2) may defer the inspection for an additional refueling outage. Enhanced probes provide improved detection of cracking, such that a longer period until the inspection is warranted.

3.1.9. Technical Evaluation of Additional Changes to NUREG-2194

The TS in NUREG-2194 are revised to change references to "tube repair criteria" to references to "tube plugging [or repair] criteria," and other optional changes related to repair criteria are added to support future plant operation.

3.2. Technical Evaluation of the TS SG Tube Inspection Report Requirements

The TS have included a requirement to report the results of SG tube inspections since at least the mid-1970's. The content of those reports has evolved with the understanding of the underlying mechanisms related to SG tube degradation.

The proposed change rearranges the existing reporting requirements for clarity. These changes are administrative.

Using industry guidelines, all licensees perform a forward-looking projection of SG tube performance until the next inspection. These assessments have proven successful in predicting SG tube performance for more than 20 years. Licensees perform more frequent inspections should the forward-looking evaluation determine that a SG inspection is needed prior to the TS mandated interval. The proposed change requires licensees to provide a summary of the predicted conditions at the next inspection relative to the SG performance criteria as determined by the forward-looking assessment, including the analysis methodology, inputs, and results. This information will assist the NRC in reviewing the plant's planned SG inspection program.

Paragraph "a" of the SG program requires the performance of condition monitoring assessments. Condition monitoring assessments evaluate the "as found" condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The TS requires a condition monitoring assessment to be conducted whenever the SG tubes are inspected to confirm that the performance criteria are being met. The proposed change expands the current reporting requirement of the results of the conditioning monitoring assessment to include the margin to the tube integrity performance criteria and comparisons to the predicted margin. The proposed change also removes the explicit requirement to report the results of any tube pulls or in-situ testing. This type of testing is rarely performed, but if it should be performed it would be reported as part of the condition monitoring assessment summary. The additional information will assist the NRC in reviewing the licensee's condition monitoring program.

The proposed change provides an exception to reporting tube wear indications (location, orientation (if linear), measured size (if available), and voltage response) at support structures that are less than 20 percent through-wall. However, the total number of such indications is required to be reported. This reduces the amount of data to be reported while not having a significant effect on the ability of the NRC to review the inspection results.

The proposed change requires reporting the results of any secondary side inspections. The TS do not require SG secondary side inspections. However, licensees often perform such inspections and have been informally reporting the results to the NRC. The proposed change formalizes this reporting, but the use of the term "any" clarifies that the report is not imposing new inspection requirements.

The proposed change requires new or different information to be included in the SG Tube Inspection Report. Should a licensee desire to start the new inspection period based on a previously performed inspection of 100% of the SG tubes, the model application states that licensees crediting a previously performed 100% SG tube inspection as the beginning of the inspection period will submit a SG Tube Inspection Report meeting the revised TS 5.6.[7] requirements.

3.3. Technical Evaluation of Editorial Improvements

Various editorial improvements are made for consistency within the proposed requirements and with the STS, such as consistent use of acronyms. These improvements have no effect on the application of the requirements and are, therefore, acceptable.

4. REGULATORY EVALUATION

Section IV, "The Commission Policy," of the "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors" (58 Federal Register 39132), dated July 22, 1993, states in part:

> The purpose of Technical Specifications is to impose those conditions or limitations upon reactor operation necessary to obviate the possibility of an abnormal situation or event giving rise to an immediate threat to the public health and safety by identifying those features that are of controlling importance to safety and establishing on them certain conditions of operation which cannot be changed without prior Commission approval.
>
> …[T]he Commission will also entertain requests to adopt portions of the improved STS, even if the licensee does not adopt all STS improvements.
>
> …The Commission encourages all licensees who submit Technical Specification related submittals based on this Policy Statement to emphasize human factors principles.
>
> …In accordance with this Policy Statement, improved STS have been developed and will be maintained for [PWR designs]. The Commission encourages licensees to use the improved STS as the basis for plant-specific Technical Specifications.
>
> …[I]t is the Commission intent that the wording and Bases of the improved STS be used … to the extent practicable.

As described in the Commission's "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors," recommendations were made by NRC and industry task groups for new STS that include greater emphasis on human factors principles in order to add clarity and understanding to the text of the STS, and provide improvements to the Bases of STS, which provides the purpose for each requirement in the specification. Improved vendor-specific STS were developed and issued by the NRC in September 1992.

The regulation at Title 10 of the Code of Federal Regulations (10 CFR) Section 50.36(a)(1) requires an applicant for an operating license to include in the application proposed TS in accordance with the requirements of 10 CFR 50.36. The applicant must include in the

application a "summary statement of the bases or reasons for such specifications, other than those covering administrative controls…." However, per 10 CFR 50.36(a)(1), these technical specification bases "shall not become part of the technical specifications."

Plants with current TS based on TSTF-449 or on NUREG-2194 may also incorporate changes to the TS Bases as part of the adoption of this traveler. The Final Policy Statement provides the following description of the scope and the purpose of the Technical Specification Bases:

> Appropriate Surveillance Requirements and Actions should be retained for each LCO [limiting condition for operation] which remains or is included in the Technical Specifications. Each LCO, Action, and Surveillance Requirement should have supporting Bases. The Bases should at a minimum address the following questions and cite references to appropriate licensing documentation (e.g., FSAR, Topical Report) to support the Bases.
>
> 1. What is the justification for the Technical Specification, i.e., which Policy Statement criterion requires it to be in the Technical Specifications?
>
>   The proposed change does not alter the justification for the Technical Specification or the applicable 10 CFR 50.36(c)(2)(ii) criteria.
>
> 2. What are the Bases for each LCO, i.e., why was it determined to be the lowest functional capability or performance level for the system or component in question necessary for safe operation of the facility and, what are the reasons for the Applicability of the LCO?
>
>   The proposed change alters the LCO Bases to reference any plant-specific, previously NRC-approved option for tube repair criteria in lieu of tube plugging. This change does not alter the reasons why the LCO is the lowest functional capability or performance level for the system. The proposed change does not alter the Applicability of the LCO.
>
> 3. What are the Bases for each Action, i.e., why should this remedial action be taken if the associated LCO cannot be met; how does this Action relate to other Actions associated with the LCO; and what justifies continued operation of the system or component at the reduced state from the state specified in the LCO for the allowed time period?
>
>   The proposed change alters the Action Bases to reference any plant-specific, previously NRC-approved option for tube repair criteria in lieu of tube plugging. This change does not alter the remedial actions to be taken if the LCO is not met and continues to justify continued operation for the allowed time period.
>
> 4. What are the Bases for each Safety Limit?
>
>   The proposed change does not alter any Safety Limits or Bases discussion of Safety Limits.

5. What are the Bases for each Surveillance Requirement and Surveillance Frequency; i.e., what specific functional requirement is the surveillance designed to verify? Why is this surveillance necessary at the specified frequency to assure that the system or component function is maintained, that facility operation will be within the Safety Limits, and that the LCO will be met?

   The proposed change alters the Surveillance Requirement Bases to reference any plant-specific, previously NRC-approved option for tube repair criteria in lieu of tube plugging. The SR Bases are also revised to discuss the TS inspection requirement if crack indications are found. The proposed change does not alter Bases discussion of the functional requirements or specified frequencies for the Surveillance Requirements.

   Note: In answering these questions the Bases for each number (e.g., Allowable Value, Response Time, Completion Time, Surveillance Frequency), state, condition, and definition (e.g., operability) should be clearly specified. As an example, a number might be based on engineering judgment, past experience, or PSA [probabilistic safety assessment] insights; but this should be clearly stated.

   The proposed change does not alter any numbers (e.g., Allowable Value, Response Time, Completion Time, Surveillance Frequency) in the Technical Specifications.

Additionally, 10 CFR 50.36(b) requires:

> Each license authorizing operation of a … utilization facility … will include technical specifications. The technical specifications will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to [10 CFR] 50.34 ["Contents of applications; technical information"]. The Commission may include such additional technical specifications as the Commission finds appropriate.

The categories of items required to be in the TS are provided in 10 CFR 50.36(c). As required by 10 CFR 50.36(c)(2)(i), the TS will include LCOs, which are the lowest functional capability or performance levels of equipment required for safe operation of the facility. Per 10 CFR 50.36(c)(2)(i), when an LCO of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TS until the condition can be met.

The regulation at 10 CFR 50.36(c)(3) requires TS to include items in the category of SRs, which are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the LCOs will be met.

Per 10 CFR 50.90, whenever a holder of a license desires to amend the license, application for an amendment must be filed with the Commission, fully describing the changes desired, and following as far as applicable, the form prescribed for original applications.

Per 10 CFR 50.92(a), in determining whether an amendment to a license will be issued to the applicant, the Commission will be guided by the considerations which govern the issuance of initial licenses to the extent applicable and appropriate.

The NRC staff's guidance for the review of TS is in Chapter 16, "Technical Specifications," of NUREG-0800, Revision 3, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (SRP), dated March 2010 (ADAMS Accession No. ML100351425). As described therein, as part of the regulatory standardization effort, the NRC staff has prepared STS for each of the light-water reactor nuclear designs.

In conclusion, based on the considerations discussed above, the proposed revision does not alter the current manner of operation and (1) there is reasonable assurance that the health and safety of the public will not be endangered by continued operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the approval of the proposed change will not be inimical to the common defense and security or to the health and safety of the public.

5. REFERENCES

1. TSTF-449, Revision 4, "Steam Generator Tube Integrity," April 14, 2005. ADAMS Accession No. ML051090200.

2. "Notice of Availability of Model Application Concerning Technical Specification; Improvement to Modify Requirements Regarding Steam Generator Tube Integrity; Using the Consolidated Line Item Improvement Process," Federal Register Vol. 70, No. 87, Pg. 24126.

3. TSTF-510, Revision 2, "Revision to Steam Generator Program Inspection Frequencies and Tube Sample Selection," March 1, 2011, ADAMS Accession No. ML110610350.

4. "Models for Plant-Specific Adoption of Technical Specifications Task Force Traveler TSTF-510, Revision 2, "Revision to Steam Generator Program Inspection Frequencies and Tube Sample Selection'," Federal Register Vol. 76, No. 288, Pg. 66763.

Model Application

[DATE] 10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

DOCKET NO. [50][52]-[xxx]
PLANT NAME
SUBJECT: Application to Revise Technical Specifications to Adopt TSTF-577, "Revised Frequencies for Steam Generator Tube Inspections"

Pursuant to 10 CFR 50.90, [LICENSEE] is submitting a request for an amendment to the Technical Specifications (TS) for [PLANT NAME, UNIT NOS.].

[LICENSEE] requests adoption of TSTF 577, "Revised Frequencies for Steam Generator Tube Inspections," which is an approved change to the Standard Technical Specifications (STS), into the [PLANT NAME, UNIT NOS] TS. The TS related to steam generator (SG) tube inspections and reporting are revised based on operating history.

The enclosure provides a description and assessment of the proposed changes. Attachment 1 provides the existing TS pages marked to show the proposed changes. Attachment 2 provides revised (clean) TS pages. [Attachment 3 provides the existing TS Bases pages marked to show revised text associated with the proposed TS changes and is provided for information only.][The TS Bases are not affected by the proposed changes.]

[LICENSEE] requests that the amendment be reviewed under the Consolidated Line Item Improvement Process (CLIIP). [The amendment is requested to be approved by [date] to support the [Spring 2022] refueling outage. *(or)* Approval of the proposed amendment is requested within 6 months of completion of the NRC's acceptance review.] Once approved, the amendment shall be implemented within [30] days.

There are no regulatory commitments made in this submittal.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated [STATE] Official.

[In accordance with 10 CFR 50.30(b), a license amendment request must be executed in a signed original under oath or affirmation. This can be accomplished by attaching a notarized affidavit confirming the signature authority of the signatory, or by including the following statement in the cover letter: "I declare under penalty of perjury that the foregoing is true and correct. Executed on (date)." The alternative statement is pursuant to 28 USC 1746. It does not require notarization.]

If you should have any questions regarding this submittal, please contact [NAME, TELEPHONE NUMBER].

Sincerely,

[Name, Title]

Enclosure: Description and Assessment

Attachments:
1. Proposed Technical Specification Changes (Mark-Up)
2. Revised Technical Specification Pages
[3. Proposed Technical Specification Bases Changes (Mark-Up) – For Information Only]

[The attachments are to be provided by the licensee and are not included in the model application.]

cc: NRC Project Manager
NRC Regional Office
NRC Resident Inspector
State Contact

ENCLOSURE

DESCRIPTION AND ASSESSMENT

1.0 DESCRIPTION

[LICENSEE] requests adoption of TSTF-577, "Revised Frequencies for Steam Generator Tube Inspections," which is an approved change to the Standard Technical Specifications (STS), into the [PLANT NAME, UNIT NOS] Technical Specifications (TS). The TS related to steam generator (SG) tube inspections and reporting are revised based on operating history.

2.0 ASSESSMENT

2.1 Applicability of Safety Evaluation

[LICENSEE] has reviewed the safety evaluation for TSTF-577 provided to the Technical Specifications Task Force in a letter dated [DATE]. This review included a review of the NRC staff's evaluation, as well as the information provided in TSTF-577. [As described herein,] [LICENSEE] has concluded that the justifications presented in TSTF-577 and the safety evaluation prepared by the NRC staff are applicable to [PLANT, UNIT NOS.] and justify this amendment for the incorporation of the changes to the [PLANT] TS.

The current SG TS requirements are based on [TSTF-449, "Steam Generator Tube Integrity."][TSTF-510, "Revision to Steam Generator Program Inspection Frequencies and Tube Sample Selection."][NUREG-2194, "Standard Technical Specifications, Westinghouse Advanced Passive 1000 (AP1000) Plants."]

---------- PREPARER'S NOTE ----------
The following paragraph is only applicable to licensees crediting an inspection performed before approval of the amendment as the initial inspection in the first inspection period.

[The initial inspection period described in the SG Program, paragraph d.2, began [provide date of a 100% SG tube inspection performed during a single refueling outage prior to approval of the amendment]. [LICENSEE] will submit a SG Tube Inspection Report meeting the revised TS 5.6.[7] requirements within 30 days after implementation of the license amendment.]

2.2 Variations

[LICENSEE is not proposing any variations from the TS changes described in TSTF-577 or the applicable parts of the NRC staff's safety evaluation dated [DATE].] [LICENSEE is proposing the following variations from the TS changes described in TSTF-577 or the applicable parts of the NRC staff's safety evaluation: describe the variations]

[The [PLANT] TS utilize different [numbering][and][titles] than the Standard Technical Specifications on which TSTF-577 was based. Specifically, [describe differences between the plant-specific TS numbering and/or titles and the TSTF-577 numbering and titles.] These

differences are administrative and do not affect the applicability of TSTF-577 to the [PLANT] TS.]

[The [PLANT] TS contain requirements that differ from the Standard Technical Specifications on which TSTF-577 was based but are encompassed in the TSTF-577 justification. [Describe differences and why TSTF-577 is still applicable.]]

[The [PLANT] SG Program TS currently contains a provision for an alternate tube plugging or repair criteria. The description of the alternate tube plugging or repair criteria in the proposed change are equivalent to the descriptions in the current TS [and include an allowed accident induced leakage rate for specific types of degradation at specific locations associated with the tube plugging or repair criteria.]]

3.0 REGULATORY ANALYSIS

3.1 No Significant Hazards Consideration Analysis

[LICENSEE] requests adoption of TSTF-577, "Revised Frequencies for Steam Generator Tube Inspections," which is an approved change to the Standard Technical Specifications (STS), into the [PLANT NAME, UNIT NOS] Technical Specifications (TS). The TS related to steam generator (SG) tube inspections and reporting are revised based on operating history.

[LICENSEE] has evaluated if a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   The proposed change revises the inspection frequencies for SG tube inspections and associated reporting requirements. The SG inspections are conducted as part of the SG Program to ensure and demonstrate that performance criteria for tube structural integrity and accident leakage integrity are met. These performance criteria are consistent with the plant design and licensing basis. With the proposed changes to the inspection frequencies, the SG Program must still demonstrate that the performance criteria are met. As a result, the probability of any accident previously evaluated is not significantly increased and the consequences of any accident previously evaluated are not significantly increased.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No

The proposed change revises the inspection frequencies for SG tube inspections and associated reporting requirements. The proposed change does not alter the design function or operation of the SGs or the ability of an SG to perform the design function. The SG tubes continue to be required to meet the SG Program performance criteria. The proposed change does not create the possibility of a new or different kind of accident due to credible new failure mechanisms, malfunctions, or accident initiators that are not considered in the design and licensing bases.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No

The proposed change revises the inspection frequencies for SG tube inspections and associated reporting requirements. The proposed change does not change any of the controlling values of parameters used to avoid exceeding regulatory or licensing limits. The proposed change does not affect a design basis or safety limit, or any controlling value for a parameter established in the UFSAR or the license.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, [LICENSEE] concludes that the proposed change presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

3.2 Conclusion

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

4.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

Changes to the Technical Specifications Based on TSTF-449

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.17 Steam Generator (SG) Tube Integrity

LCO 3.4.17 SG tube integrity shall be maintained.

AND

All SG tubes satisfying the tube plugging [or repair] criteria shall be plugged [or repaired] in accordance with the Steam Generator Program.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each SG tube.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more SG tubes satisfying the tube plugging [or repair] criteria and not plugged [or repaired] in accordance with the Steam Generator Program.	A.1 Verify tube integrity of the affected tube(s) is maintained until the next refueling outage or SG tube inspection. AND A.2 Plug [or repair] the affected tube(s) in accordance with the Steam Generator Program.	7 days Prior to entering MODE 4 following the next refueling outage or SG tube inspection
B. Required Action and associated Completion Time of Condition A not met. OR SG tube integrity not maintained.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.17.1	Verify SG tube integrity in accordance with the Steam Generator Program.	In accordance with the Steam Generator Program
SR 3.4.17.2	Verify that each inspected SG tube that satisfies the tube plugging [or repair] criteria is plugged [or repaired] in accordance with the Steam Generator Program.	Prior to entering MODE 4 following a SG tube inspection

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program

A**n** ~~Steam Generator~~ **SG** Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the **SG** ~~Steam Generator~~ Program shall include the following ~~provisions~~:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the "as found" condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging [or repair] of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected, plugged, [or repaired] to confirm that the performance criteria are being met.

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

1. Structural integrity performance criterion: All in-service **SG**~~steam generator~~ tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down**),** ~~and~~ all anticipated transients included in the design specification~~,~~) and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to exceed [1 gpm] per SG [, except for specific types of degradation at specific locations as described in paragraph c of the **SG** ~~Steam Generator~~ Program].

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.13, "RCS Operational LEAKAGE."

c. Provisions for SG tube **plugging [or** repair**]** criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding [40%] of the nominal tube wall thickness shall be plugged [or repaired].

----------REVIEWER'S NOTE----------
Alternate tube **plugging [or** repair**]** criteria currently permitted by plant technical specifications are listed here. The description of these alternate tube **plugging [or** repair**]** criteria should be equivalent to the descriptions in current technical specifications and should also include any allowed accident induced leakage rates for specific types of degradation at specific locations associated with tube **plugging [or** repair**]** criteria.

[The following alternate tube **plugging [or** repair**]** criteria may be applied as an alternative to the 40% depth based criteria:

1. . . .]

----------REVIEWER'S NOTE----------
The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.
---

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet **[except for any portions of the tube that are exempt from inspection by alternate repair criteria]**, and that may satisfy the applicable tube **plugging [or** repair**]** criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A~~n assessment of~~ degradation **assessment** shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

----------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. The third Item 2 is applicable to SGs with Alloy 690 thermally treated tubing.

---

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

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 24 effective full power months, which defines the inspection period.]**~~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. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection period may be extended to 72 effective full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region.]** ~~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. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 96 effective full power months, which defines the inspection period.]**~~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.]~~

----------REVIEWER'S NOTE----------
The bracketed phrases in Paragraph 3 are only applicable to SGs with Alloy 600 thermally treated tubing.
----

3. If crack indications are found in any SG tube **[excluding any region that is exempt from inspection by alternate repair criteria]**, then the next inspection for each **affected and potentially affected** SG for the degradation mechanism that caused the crack indication shall **be at the next** ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever is less)~~ **[, but may be deferred to the following refueling outage if the 100% inspection of all SGs was performed with enhanced probes as described in paragraph d.2]**. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary to secondary LEAKAGE.

[f. Provisions for SG tube repair methods. ~~Steam generator~~**SG** tube repair methods shall provide the means to reestablish the RCS pressure boundary integrity of SG tubes without removing the tube from service. For the purposes of these Specifications, tube plugging is not a repair. All acceptable tube repair methods are listed below.

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

----------REVIEWER'S NOTE----------
Tube repair methods currently permitted by plant technical specifications are to be listed here. The description of these tube repair methods should be equivalent to the descriptions in current technical specifications. If there are no approved tube repair methods, this section should not be used.
----

1. . . .]

5.5.10 Secondary Water Chemistry Program

5.6 Reporting Requirements

5.6.4 RCS PRESSURE AND TEMPERATURE LIMITS REPORT (continued)

7. Licensees who have removed two or more capsules should compare for each surveillance material the measured increase in reference temperature (RT_{NDT}) to the predicted increase in RT_{NDT}; where the predicted increase in RT_{NDT} is based on the mean shift in RT_{NDT} plus the two standard deviation value ($2\sigma_{\Delta}$) specified in Regulatory Guide 1.99, Revision 2. If the measured value exceeds the predicted value (increase in RT_{NDT} + $2\sigma_{\Delta}$), the licensee should provide a supplement to the PTLR to demonstrate how the results affect the approved methodology.

5.6.5 Post Accident Monitoring Report

When a report is required by Condition B or F of LCO 3.3.[17], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.6 [Tendon Surveillance Report

Any abnormal degradation of the containment structure detected during the tests required by the Pre-stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.]

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:

a. The scope of inspections performed on each SG;~~,~~

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;

c. For each degradation mechanism found:

1. The nondestructive examination techniques utilized;

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support

structures less than 20 percent through-wall, only the total number of indications needs to be reported;

3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;

4. The number of tubes plugged [or repaired] during the inspection outage; and

[5. The repair methods utilized and the number of tubes repaired by each repair method.]

d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;

~~b. Active degradation mechanisms found,~~

~~c. Nondestructive examination techniques utilized for each degradation mechanism,~~

~~d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,~~

5.6 Reporting Requirements

5.6.7 Steam Generator Tube Inspection Report (continued)

~~e. Number of tubes plugged [or repaired] during the inspection outage for each active degradation mechanism,~~

e~~f~~. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each SG;~~Total number and percentage of tubes plugged [or repaired] to date,~~

f. The results of any SG secondary side inspections; and

[g. Insert any plant-specific reporting requirements, if applicable.]

~~g. The results of condition monitoring, including the results of tube pulls and in-situ testing,~~

~~[h. The effective plugging percentage for all plugging [and tube repairs] in each SG, and]~~

~~[i. Repair method utilized and the number of tubes repaired by each repair method.]~~

BASES

APPLICABLE SAFETY ANALYSES

The steam generator tube rupture (SGTR) accident is the limiting design basis event for SG tubes and avoiding an SGTR is the basis for this Specification. The analysis of a SGTR event assumes a bounding primary to secondary LEAKAGE rate equal to the operational LEAKAGE rate limits in LCO 3.4.13, "RCS Operational LEAKAGE," plus the leakage rate associated with a double-ended rupture of a single tube. The accident analysis for a SGTR assumes the contaminated secondary fluid is only briefly released to the atmosphere via safety valves and the majority is discharged to the main condenser.

The analysis for design basis accidents and transients other than a SGTR assume the SG tubes retain their structural integrity (i.e., they are assumed not to rupture.) In these analyses, the steam discharge to the atmosphere is based on the total primary to secondary LEAKAGE from all SGs of [1 gallon per minute] or is assumed to increase to [1 gallon per minute] as a result of accident induced conditions. For accidents that do not involve fuel damage, the primary coolant activity level of DOSE EQUIVALENT I-131 is assumed to be equal to the LCO 3.4.16, "RCS Specific Activity," limits. For accidents that assume fuel damage, the primary coolant activity is a function of the amount of activity released from the damaged fuel. The dose consequences of these events are within the limits of GDC 19 (Ref. 2), 10 CFR 100 (Ref. 3) or the NRC approved licensing basis (e.g., a small fraction of these limits).

Steam generator tube integrity satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO requires that SG tube integrity be maintained. The LCO also requires that all SG tubes that satisfy the plugging [or repair] criteria be plugged [or repaired] in accordance with the Steam Generator Program.

During an SG inspection, any inspected tube that satisfies the Steam Generator Program plugging [or repair] criteria is [repaired or] removed from service by plugging. If a tube was determined to satisfy the plugging [or repair] criteria but was not plugged [or repaired], the tube may still have tube integrity.

In the context of this Specification, a SG tube is defined as the entire length of the tube, including the tube wall [and any repairs made to it], between the tube-to-tubesheet weld at the tube inlet and the tube-to-tubesheet weld at the tube outlet. The tube-to-tubesheet weld is not considered part of the tube.

A SG tube has tube integrity when it satisfies the SG performance criteria. The SG performance criteria are defined in Specification 5.5.9, "Steam Generator Program," and describe acceptable SG tube performance. The Steam Generator Program also provides the evaluation process for determining conformance with the SG performance criteria.

BASES

LCO (continued)

The operational LEAKAGE performance criterion provides an observable indication of SG tube conditions during plant operation. The limit on operational LEAKAGE is contained in LCO 3.4.13, "RCS Operational LEAKAGE," and limits primary to secondary LEAKAGE through any one SG to 150 gallons per day. This limit is based on the assumption that a single crack leaking this amount would not propagate to a SGTR under the stress conditions of a LOCA or a main steam line break. If this amount of LEAKAGE is due to more than one crack, the cracks are very small, and the above assumption is conservative.

APPLICABILITY

Steam generator tube integrity is challenged when the pressure differential across the tubes is large. Large differential pressures across SG tubes can only be experienced in MODE 1, 2, 3, or 4.

RCS conditions are far less challenging in MODES 5 and 6 than during MODES 1, 2, 3, and 4. In MODES 5 and 6, primary to secondary differential pressure is low, resulting in lower stresses and reduced potential for LEAKAGE.

ACTIONS

The ACTIONS are modified by a Note clarifying that the Conditions may be entered independently for each SG tube. This is acceptable because the Required Actions provide appropriate compensatory actions for each affected SG tube. Complying with the Required Actions may allow for continued operation, and subsequent affected SG tubes are governed by subsequent Condition entry and application of associated Required Actions.

A.1 and A.2

Condition A applies if it is discovered that one or more SG tubes examined in an inservice inspection satisfy the tube plugging [or repair] criteria but were not plugged [or repaired] in accordance with the Steam Generator Program as required by SR 3.4.17.2. An evaluation of SG tube integrity of the affected tube(s) must be made. Steam generator tube integrity is based on meeting the SG performance criteria described in the Steam Generator Program. The SG plugging [or repair] criteria define limits on SG tube degradation that allow for flaw growth between inspections while still providing assurance that the SG performance criteria will continue to be met. In order to determine if a SG tube that should have been plugged [or repaired] has tube integrity, an evaluation must be completed that demonstrates that the SG performance criteria will continue to be met until the next refueling outage or SG tube inspection. The tube integrity

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Steam Generator Program determines the scope of the inspection and the methods used to determine whether the tubes contain flaws satisfying the tube plugging [or repair] criteria. Inspection scope (i.e., which tubes or areas of tubing within the SG are to be inspected) is a function of existing and potential degradation locations. The Steam Generator Program also specifies the inspection methods to be used to find potential degradation. Inspection methods are a function of degradation morphology, non-destructive examination (NDE) technique capabilities, and inspection locations.

The Steam Generator Program defines the Frequency of SR 3.4.17.1. The Frequency is determined by the operational assessment and other limits in the SG examination guidelines (Ref. 6). The Steam Generator Program uses information on existing degradations and growth rates to determine an inspection Frequency that provides reasonable assurance that the tubing will meet the SG performance criteria at the next scheduled inspection. In addition, Specification 5.5.9 contains prescriptive requirements concerning inspection intervals to provide added assurance that the SG performance criteria will be met between scheduled inspections. If crack indications are found in any SG tube, the maximum inspection interval for all affected and potentially affected SGs is restricted by Specification 5.5.9 until subsequent inspections support extending the inspection interval.

SR 3.4.17.2

During an SG inspection, any inspected tube that satisfies the Steam Generator Program plugging [or repair] criteria is [repaired or] removed from service by plugging. The tube plugging [or repair] criteria delineated in Specification 5.5.9 are intended to ensure that tubes accepted for continued service satisfy the SG performance criteria with allowance for error in the flaw size measurement and for future flaw growth. In addition, the tube plugging [or repair] criteria, in conjunction with other elements of the Steam Generator Program, ensure that the SG performance criteria will continue to be met until the next inspection of the subject tube(s). Reference 1 provides guidance for performing operational assessments to verify that the tubes remaining in service will continue to meet the SG performance criteria.

[Steam generator tube repairs are only performed using approved repair methods as described in the Steam Generator Program.]

The Frequency of prior to entering MODE 4 following a SG inspection ensures that the Surveillance has been completed and all tubes meeting

the plugging [or repair] criteria are plugged [or repaired] prior to subjecting the SG tubes to significant primary to secondary pressure differential.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.20 Steam Generator (SG) Tube Integrity

LCO 3.4.20 SG tube integrity shall be maintained.

AND

All SG tubes satisfying the tube plugging [or repair] criteria shall be plugged [or repaired] in accordance with the Steam Generator Program.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each SG tube.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more SG tubes satisfying the tube plugging [or repair] criteria and not plugged [or repaired] in accordance with the Steam Generator Program.	A.1 Verify tube integrity of the affected tube(s) is maintained until the next refueling outage or SG tube inspection. AND A.2 Plug [or repair] the affected tube(s) in accordance with the Steam Generator Program.	7 days Prior to entering MODE 4 following the next refueling outage or SG tube inspection
B. Required Action and associated Completion Time of Condition A not met. OR SG tube integrity not maintained.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.20.1	Verify SG tube integrity in accordance with the Steam Generator Program.	In accordance with the Steam Generator Program
SR 3.4.20.2	Verify that each inspected SG tube that satisfies the tube plugging [or repair] criteria is plugged [or repaired] in accordance with the Steam Generator Program.	Prior to entering MODE 4 following a SG tube inspection

5.5 Programs and Manuals

5.5.8 Inservice Testing Program (continued)

d. Nothing in the ASME OM Code shall be construed to supersede the requirements of any TS.

5.5.9 Steam Generator (SG) Program

A**n SG** ~~Steam Generator~~ Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the **SG** ~~Steam Generator~~ Program shall include the following ~~provisions~~:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the “as found” condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging [or repair] of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected, plugged, [or repaired] to confirm that the performance criteria are being met.

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

1. Structural integrity performance criterion: All in-service **SG** ~~steam generator~~ tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down**),** ~~and~~ all anticipated transients included in the design specification~~),~~ and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

exceed [1 gpm] per SG [, except for specific types of degradation at specific locations as described in paragraph c of the ~~Steam Generator~~**SG** Program.**]**

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.13, "RCS Operational LEAKAGE."

c. Provisions for SG tube **plugging [or** repair**]** criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding [40%] of the nominal tube wall thickness shall be plugged [or repaired].

----------REVIEWER'S NOTE----------
Alternate tube **plugging [or** repair**]** criteria currently permitted by plant technical specifications are listed here. The description of these alternate tube **plugging [or** repair**]** criteria should be equivalent to the descriptions in current technical specifications and should also include any allowed accident induced leakage rates for specific types of degradation at specific locations associated with tube **plugging [or** repair**]** criteria.

[The following alternate tube **plugging [or** repair**]** criteria may be applied as an alternative to the 40% depth based criteria:

1. . . .]

----------REVIEWER'S NOTE----------
The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.
----

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet **[except for any portions of the tube that are exempt from inspection by alternate repair criteria]**, and that may satisfy the applicable tube **plugging [or** repair**]** criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A~~n assessment of~~ degradation **assessment** shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

----------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. The third Item 2 is applicable to SGs with Alloy 690 thermally treated tubing.
---

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

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 24 effective full power months, which defines the inspection period.]** ~~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. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection period may be extended to 72 effective full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region.]** ~~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. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 96 effective full power**

months, which defines the inspection period.]~~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.]~~

----------REVIEWER'S NOTE----------
The bracketed phrases in Paragraph 3 are only applicable to SGs with Alloy 600 thermally treated tubing.
----

3. If crack indications are found in any SG tube **[excluding any region that is exempt from inspection by alternate repair criteria]**, then the next inspection for each **affected and potentially affected** SG for the degradation mechanism that caused the crack indication shall **be at the next** ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever is less)~~ **[, but may be deferred to the following refueling outage if the 100% inspection of all SGs was performed with enhanced probes as described in paragraph d.2]**. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary to secondary LEAKAGE.

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

[f. Provisions for SG tube repair methods. ~~Steam generator~~**SG** tube repair methods shall provide the means to reestablish the RCS pressure boundary integrity of SG tubes without removing the tube from service. For the purposes of these Specifications, tube plugging is not a repair. All acceptable tube repair methods are listed below.

----------REVIEWER'S NOTE----------
Tube repair methods currently permitted by plant technical specifications are to be listed here. The description of these tube repair methods should be equivalent to the descriptions in current technical specifications. If there are no approved tube repair methods, this section should not be used.
----

1. . . .]

5.5.10 Secondary Water Chemistry Program

5.6 Reporting Requirements

5.6.4 RCS PRESSURE AND TEMPERATURE LIMITS REPORT (continued)

7. The minimum temperature requirements of Appendix G to 10 CFR Part 50 shall be incorporated into the pressure and temperature limit curves.

8. Licensees who have removed two or more capsules should compare for each surveillance material the measured increase in reference temperature (RT_{NDT}) to the predicted increase in RT_{NDT}; where the predicted increase in RT_{NDT} is based on the mean shift in RT_{NDT} plus the two standard deviation value ($2\sigma_{\Delta}$) specified in Regulatory Guide 1.99, Revision 2. If the measured value exceeds the predicted value (increase RT_{NDT} + $2\sigma_{\Delta}$), the licensee should provide a supplement to the PTLR to demonstrate how the results affect the approved methodology.

5.6.5 Post Accident Monitoring Report

When a report is required by Condition B or F of LCO 3.3.[3], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.6 [Tendon Surveillance Report

Any abnormal degradation of the containment structure detected during the tests required by the Pre-stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.]

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:

a. The scope of inspections performed on each SG;~~,~~

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;

c. For each degradation mechanism found:

1. The nondestructive examination techniques utilized;

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported;

3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;

4. The number of tubes plugged [or repaired] during the inspection outage; and

[5. The repair methods utilized and the number of tubes repaired by each repair method.]

d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;

~~b. Active degradation mechanisms found,~~

~~c. Nondestructive examination techniques utilized for each degradation mechanism,~~

5.6 Reporting Requirements

5.6.7 Steam Generator Tube Inspection Report (continued)

~~d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,~~

~~e. Number of tubes plugged [or repaired] during the inspection outage for each active degradation mechanism,~~

e~~f~~. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each SG;~~Total number and percentage of tubes plugged [or repaired] to date,~~

f. The results of any SG secondary side inspections; and

[g. Insert any plant-specific reporting requirements, if applicable.]

~~g. The results of condition monitoring, including the results of tube pulls and in-situ testing,~~

~~[h. The effective plugging percentage for all plugging [and tube repairs] in each SG, and]~~

~~[i. Repair method utilized and the number of tubes repaired by each repair method.]~~

BASES

APPLICABLE SAFETY ANALYSES

The steam generator tube rupture (SGTR) accident is the limiting design basis event for SG tubes and avoiding an SGTR is the basis for this Specification. The analysis of a SGTR event assumes a bounding primary to secondary LEAKAGE rate equal to the operational LEAKAGE rate limits in LCO 3.4.13, "RCS Operational LEAKAGE," plus the leakage rate associated with a double-ended rupture of a single tube. The accident analysis for a SGTR assumes the contaminated secondary fluid is only briefly released to the atmosphere via safety valves and the majority is discharged to the main condenser.

The analysis for design basis accidents and transients other than a SGTR assume the SG tubes retain their structural integrity (i.e., they are assumed not to rupture.) In these analyses, the steam discharge to the atmosphere is based on the total primary to secondary LEAKAGE from all SGs of [1 gallon per minute] or is assumed to increase to [1 gallon per minute] as a result of accident induced conditions. For accidents that do not involve fuel damage, the primary coolant activity level of DOSE EQUIVALENT I-131 is assumed to be equal to the LCO 3.4.16, "RCS Specific Activity," limits. For accidents that assume fuel damage, the primary coolant activity is a function of the amount of activity released from the damaged fuel. The dose consequences of these events are within the limits of GDC 19 (Ref. 2), 10 CFR 100 (Ref. 3) or the NRC approved licensing basis (e.g., a small fraction of these limits).

Steam generator tube integrity satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO requires that SG tube integrity be maintained. The LCO also requires that all SG tubes that satisfy the plugging [or repair] criteria be plugged [or repaired] in accordance with the Steam Generator Program.

During an SG inspection, any inspected tube that satisfies the Steam Generator Program plugging [or repair] criteria is [repaired or] removed from service by plugging. If a tube was determined to satisfy the plugging [or repair] criteria but was not plugged [or repaired], the tube may still have tube integrity.

In the context of this Specification, a SG tube is defined as the entire length of the tube, including the tube wall [and any repairs made to it], between the tube-to-tubesheet weld at the tube inlet and the tube-to-tubesheet weld at the tube outlet. The tube-to-tubesheet weld is not considered part of the tube.

A SG tube has tube integrity when it satisfies the SG performance criteria. The SG performance criteria are defined in Specification 5.5.9, "Steam Generator Program," and describe acceptable SG tube performance. The Steam Generator Program also provides the evaluation process for determining conformance with the SG performance criteria.

BASES

LCO (continued)

The operational LEAKAGE performance criterion provides an observable indication of SG tube conditions during plant operation. The limit on operational LEAKAGE is contained in LCO 3.4.13, "RCS Operational LEAKAGE," and limits primary to secondary LEAKAGE through any one SG to 150 gallons per day. This limit is based on the assumption that a single crack leaking this amount would not propagate to a SGTR under the stress conditions of a LOCA or a main steam line break. If this amount of LEAKAGE is due to more than one crack, the cracks are very small, and the above assumption is conservative.

APPLICABILITY

Steam generator tube integrity is challenged when the pressure differential across the tubes is large. Large differential pressures across SG tubes can only be experienced in MODE 1, 2, 3, or 4.

RCS conditions are far less challenging in MODES 5 and 6 than during MODES 1, 2, 3, and 4. In MODES 5 and 6, primary to secondary differential pressure is low, resulting in lower stresses and reduced potential for LEAKAGE.

ACTIONS

The ACTIONS are modified by a Note clarifying that the Conditions may be entered independently for each SG tube. This is acceptable because the Required Actions provide appropriate compensatory actions for each affected SG tube. Complying with the Required Actions may allow for continued operation, and subsequent affected SG tubes are governed by subsequent Condition entry and application of associated Required Actions.

A.1 and A.2

Condition A applies if it is discovered that one or more SG tubes examined in an inservice inspection satisfy the tube plugging [or repair] criteria but were not plugged [or repaired] in accordance with the Steam Generator Program as required by SR 3.4.20.2. An evaluation of SG tube integrity of the affected tube(s) must be made. Steam generator tube integrity is based on meeting the SG performance criteria described in the Steam Generator Program. The SG plugging [or repair] criteria define limits on SG tube degradation that allow for flaw growth between inspections while still providing assurance that the SG performance criteria will continue to be met. In order to determine if a SG tube that should have been plugged [or repaired] has tube integrity, an evaluation must be completed that demonstrates that the SG performance criteria will continue to be met until the next refueling outage or SG tube inspection. The tube integrity

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Steam Generator Program determines the scope of the inspection and the methods used to determine whether the tubes contain flaws satisfying the tube plugging [or repair] criteria. Inspection scope (i.e., which tubes or areas of tubing within the SG are to be inspected) is a function of existing and potential degradation locations. The Steam Generator Program also specifies the inspection methods to be used to find potential degradation. Inspection methods are a function of degradation morphology, non-destructive examination (NDE) technique capabilities, and inspection locations.

The Steam Generator Program defines the Frequency of SR 3.4.20.1. The Frequency is determined by the operational assessment and other limits in the SG examination guidelines (Ref. 6). The Steam Generator Program uses information on existing degradations and growth rates to determine an inspection Frequency that provides reasonable assurance that the tubing will meet the SG performance criteria at the next scheduled inspection. In addition, Specification 5.5.9 contains prescriptive requirements concerning inspection intervals to provide added assurance that the SG performance criteria will be met between scheduled inspections. If crack indications are found in any SG tube, the maximum inspection interval for all affected and potentially affected SGs is restricted by Specification 5.5.9 until subsequent inspections support extending the inspection interval.

SR 3.4.20.2

During an SG inspection, any inspected tube that satisfies the Steam Generator Program plugging [or repair] criteria is [repaired or] removed from service by plugging. The tube plugging [or repair] criteria delineated in Specification 5.5.9 are intended to ensure that tubes accepted for continued service satisfy the SG performance criteria with allowance for error in the flaw size measurement and for future flaw growth. In addition, the tube plugging [or repair] criteria, in conjunction with other elements of the Steam Generator Program, ensure that the SG performance criteria will continue to be met until the next inspection of the subject tube(s). Reference 1 provides guidance for performing operational assessments to verify that the tubes remaining in service will continue to meet the SG performance criteria.

[Steam generator tube repairs are only performed using approved repair methods as described in the Steam Generator Program.]

The Frequency of prior to entering MODE 4 following a SG inspection ensures that the Surveillance has been completed and all tubes meeting

the plugging [or repair] criteria are plugged [or repaired] prior to subjecting the SG tubes to significant primary to secondary pressure differential.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.18 Steam Generator (SG) Tube Integrity

LCO 3.4.18 SG tube integrity shall be maintained.

AND

All SG tubes satisfying the tube plugging [or repair] criteria shall be plugged [or repaired] in accordance with the Steam Generator Program.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each SG tube.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more SG tubes satisfying the tube plugging [or repair] criteria and not plugged [or repaired] in accordance with the Steam Generator Program.	A.1 Verify tube integrity of the affected tube(s) is maintained until the next refueling outage or SG tube inspection. AND A.2 Plug [or repair] the affected tube(s) in accordance with the Steam Generator Program.	7 days Prior to entering MODE 4 following the next refueling outage or SG tube inspection
B. Required Action and associated Completion Time of Condition A not met. OR SG tube integrity not maintained.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.18.1	Verify SG tube integrity in accordance with the Steam Generator Program.	In accordance with the Steam Generator Program
SR 3.4.18.2	Verify that each inspected SG tube that satisfies the tube plugging [or repair] criteria is plugged [or repaired] in accordance with the Steam Generator Program.	Prior to entering MODE 4 following a SG tube inspection

5.5 Programs and Manuals

5.5.7 Reactor Coolant Pump Flywheel Inspection Program

This program shall provide for the inspection of each reactor coolant pump flywheel per the recommendation of Regulatory position c.4.b of Regulatory Guide 1.14, Revision 1, August 1975.

5.5.8 Inservice Testing Program

This program provides controls for inservice testing of ASME Code Class 1, 2, and 3 components. The program shall include the following:

a. Testing frequencies applicable to the ASME Code for Operations and Maintenance of Nuclear Power Plants (ASME OM Code) and applicable Addenda as follows:

ASME OM Code and applicable Addenda terminology for inservice testing activities	Required Frequencies for performing inservice testing activities
Weekly	At least once per 7 days
Monthly	At least once per 31 days
Quarterly or every 3 months	At least once per 92 days
Semiannually or every 6 months	At least once per 184 days
Every 9 months	At least once per 276 days
Yearly or annually	At least once per 366 days
Biennially or every 2 years	At least once per 731 days

b. The provisions of SR 3.0.2 are applicable to the above required Frequencies and to other normal and accelerated Frequencies specified as 2 years or less in the Inservice Testing Program for performing inservice testing activities,

c. The provisions of SR 3.0.3 are applicable to inservice testing activities, and

d. Nothing in the ASME OM Code shall be construed to supersede the requirements of any TS.

5.5.9 Steam Generator (SG) Program

A**n** ~~Steam Generator~~**SG** Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the **SG** ~~Steam Generator~~ Program shall include the following ~~provisions~~:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the "as found" condition of the tubing with respect to the performance criteria for structural integrity and accident

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging [or repair] of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected, plugged, [or repaired] to confirm that the performance criteria are being met.

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

1. Structural integrity performance criterion: All in-service **SG** ~~steam generator~~ tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down**),** ~~and~~ all anticipated transients included in the design specification~~,~~) and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to exceed [1 gpm] per SG [, except for specific types of degradation at specific locations as described in paragraph c of the **SG** ~~Steam Generator~~ Program.**]**

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.13, "RCS Operational LEAKAGE."

c. Provisions for SG tube **plugging [or** repair**]** criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding [40%] of the nominal tube wall thickness shall be plugged [or repaired].

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

----------REVIEWER'S NOTE----------
Alternate tube **plugging [or** repair**]** criteria currently permitted by plant technical specifications are listed here. The description of these alternate tube **plugging [or** repair**]** criteria should be equivalent to the descriptions in current technical specifications and should also include any allowed accident induced leakage rates for specific types of degradation at specific locations associated with tube **plugging [or** repair**]** criteria.

[The following alternate tube **plugging [or** repair**]** criteria may be applied as an alternative to the 40% depth based criteria:

1. . . .]

----------REVIEWER'S NOTE----------
The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.
---

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet **[except for any portions of the tube that are exempt from inspection by alternate repair criteria]**, and that may satisfy the applicable tube **plugging [or** repair**]** criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A~~n assessment of~~ degradation **assessment** shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

----------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. The third Item 2 is applicable to SGs with Alloy 690 thermally treated tubing.
---

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

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 24 effective full power months, which defines the inspection period.]**~~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.]~~

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection period may be extended to 72 effective full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region.]** ~~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. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 96 effective full power months, which defines the inspection period.]**~~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.]~~

----------REVIEWER'S NOTE----------
The bracketed phrases in Paragraph 3 are only applicable to SGs with Alloy 600 thermally treated tubing.
----

3. If crack indications are found in any SG tube **[excluding any region that is exempt from inspection by alternate repair criteria]**, then the next inspection for each **affected and potentially affected** SG for the degradation mechanism that caused the crack indication shall **be at the next** ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever is less)~~ **[, but may be deferred to the following refueling outage if the 100% inspection of all SGs was performed with enhanced probes as described in paragraph d.2]**. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary to secondary LEAKAGE.

[f. Provisions for SG tube repair methods. **SG** ~~Steam generator~~ tube repair methods shall provide the means to reestablish the RCS pressure boundary integrity of SG tubes without removing the tube from service. For the purposes of these Specifications, tube plugging is not a repair. All acceptable tube repair methods are listed below.

----------REVIEWER'S NOTE----------
Tube repair methods currently permitted by plant technical specifications are to be listed here. The description of these tube repair methods should be equivalent to the descriptions in current technical specifications. If there are no approved tube repair methods, this section should not be used.
----

1. . . .]

5.6 Reporting Requirements

5.6.4 RCS Pressure and Temperature Limits Report (continued)

7. Licensees who have removed two or more capsules should compare for each surveillance material the measured increase in reference temperature (RT_{NDT}) to the predicted increase in RT_{NDT}; where the predicted increase in RT_{NDT} is based on the mean shift in RT_{NDT} plus the two standard deviation value ($2\sigma_{\Delta}$) specified in Regulatory Guide 1.99, Revision 2. If the measured value exceeds the predicted value (increase in RT_{NDT} + $2\sigma_{\Delta}$), the licensee should provide a supplement to the PTLR to demonstrate how the results affect the approved methodology.

5.6.5 Post Accident Monitoring Report

When a report is required by Condition B or F of LCO 3.3.[11], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.6 Tendon Surveillance Report

[Any abnormal degradation of the containment structure detected during the tests required by the Pre-stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.]

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:

a. The scope of inspections performed on each SG;~~,~~

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;

c. For each degradation mechanism found:

1. The nondestructive examination techniques utilized;

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported;

3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;

4. The number of tubes plugged [or repaired] during the inspection outage; and

[5. The repair methods utilized and the number of tubes repaired by each repair method.]

d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;

~~b. Active degradation mechanisms found,~~

~~c. Nondestructive examination techniques utilized for each degradation mechanism,~~

~~d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,~~

5.6 Reporting Requirements

5.6.7 Steam Generator Tube Inspection Report (continued)

~~e. Number of tubes plugged [or repaired] during the inspection outage for each active degradation mechanism,~~

e~~f~~. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each SG;~~Total number and percentage of tubes plugged [or repaired] to date,~~

f. The results of any SG secondary side inspections; and

[g. Insert any plant-specific reporting requirements, if applicable.]

~~g. The results of condition monitoring, including the results of tube pulls and in-situ testing,~~

~~[h. The effective plugging percentage for all plugging [and tube repairs] in each SG, and]~~

~~[i. Repair method utilized and the number of tubes repaired by each repair method.]~~

BASES

APPLICABLE SAFETY ANALYSES

The steam generator tube rupture (SGTR) accident is the limiting design basis event for SG tubes and avoiding an SGTR is the basis for this Specification. The analysis of a SGTR event assumes a bounding primary to secondary LEAKAGE rate equal to the operational LEAKAGE rate limits in LCO 3.4.13, "RCS Operational LEAKAGE," plus the leakage rate associated with a double-ended rupture of a single tube. The accident analysis for a SGTR assumes the contaminated secondary fluid is only briefly released to the atmosphere via safety valves and the majority is discharged to the main condenser.

The analysis for design basis accidents and transients other than a SGTR assume the SG tubes retain their structural integrity (i.e., they are assumed not to rupture.) In these analyses, the steam discharge to the atmosphere is based on the total primary to secondary LEAKAGE from all SGs of [1 gallon per minute] or is assumed to increase to [1 gallon per minute] as a result of accident induced conditions. For accidents that do not involve fuel damage, the primary coolant activity level of DOSE EQUIVALENT I-131 is assumed to be equal to the LCO 3.4.16, "RCS Specific Activity," limits. For accidents that assume fuel damage, the primary coolant activity is a function of the amount of activity released from the damaged fuel. The dose consequences of these events are within the limits of GDC 19 (Ref. 2), 10 CFR 100 (Ref. 3) or the NRC approved licensing basis (e.g., a small fraction of these limits).

Steam generator tube integrity satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO requires that SG tube integrity be maintained. The LCO also requires that all SG tubes that satisfy the plugging [or repair] criteria be plugged [or repaired] in accordance with the Steam Generator Program.

During an SG inspection, any inspected tube that satisfies the Steam Generator Program plugging [or repair] criteria is [repaired or] removed from service by plugging. If a tube was determined to satisfy the plugging [or repair] criteria but was not plugged [or repaired], the tube may still have tube integrity.

In the context of this Specification, a SG tube is defined as the entire length of the tube, including the tube wall [and any repairs made to it], between the tube-to-tubesheet weld at the tube inlet and the tube-to-tubesheet weld at the tube outlet. The tube-to-tubesheet weld is not considered part of the tube.

A SG tube has tube integrity when it satisfies the SG performance criteria. The SG performance criteria are defined in Specification 5.5.9, "Steam Generator Program," and describe acceptable SG tube performance. The Steam Generator Program also provides the evaluation process for determining conformance with the SG performance criteria.

BASES

LCO (continued)

The operational LEAKAGE performance criterion provides an observable indication of SG tube conditions during plant operation. The limit on operational LEAKAGE is contained in LCO 3.4.13, "RCS Operational LEAKAGE," and limits primary to secondary LEAKAGE through any one SG to 150 gallons per day. This limit is based on the assumption that a single crack leaking this amount would not propagate to a SGTR under the stress conditions of a LOCA or a main steam line break. If this amount of LEAKAGE is due to more than one crack, the cracks are very small, and the above assumption is conservative.

APPLICABILITY

Steam generator tube integrity is challenged when the pressure differential across the tubes is large. Large differential pressures across SG tubes can only be experienced in MODE 1, 2, 3, or 4.

RCS conditions are far less challenging in MODES 5 and 6 than during MODES 1, 2, 3, and 4. In MODES 5 and 6, primary to secondary differential pressure is low, resulting in lower stresses and reduced potential for LEAKAGE.

ACTIONS

The ACTIONS are modified by a Note clarifying that the Conditions may be entered independently for each SG tube. This is acceptable because the Required Actions provide appropriate compensatory actions for each affected SG tube. Complying with the Required Actions may allow for continued operation, and subsequent affected SG tubes are governed by subsequent Condition entry and application of associated Required Actions.

A.1 and A.2

Condition A applies if it is discovered that one or more SG tubes examined in an inservice inspection satisfy the tube plugging [or repair] criteria but were not plugged [or repaired] in accordance with the Steam Generator Program as required by SR 3.4.18.2. An evaluation of SG tube integrity of the affected tube(s) must be made. Steam generator tube integrity is based on meeting the SG performance criteria described in the Steam Generator Program. The SG plugging [or repair] criteria define limits on SG tube degradation that allow for flaw growth between inspections while still providing assurance that the SG performance criteria will continue to be met. In order to determine if a SG tube that should have been plugged [or repaired] has tube integrity, an evaluation must be completed that demonstrates that the SG performance criteria will continue to be met until the next refueling outage or SG tube inspection. The tube integrity

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Steam Generator Program determines the scope of the inspection and the methods used to determine whether the tubes contain flaws satisfying the tube plugging [or repair] criteria. Inspection scope (i.e., which tubes or areas of tubing within the SG are to be inspected) is a function of existing and potential degradation locations. The Steam Generator Program also specifies the inspection methods to be used to find potential degradation. Inspection methods are a function of degradation morphology, non-destructive examination (NDE) technique capabilities, and inspection locations.

The Steam Generator Program defines the Frequency of SR 3.4.18.1. The Frequency is determined by the operational assessment and other limits in the SG examination guidelines (Ref. 6). The Steam Generator Program uses information on existing degradations and growth rates to determine an inspection Frequency that provides reasonable assurance that the tubing will meet the SG performance criteria at the next scheduled inspection. In addition, Specification 5.5.9 contains prescriptive requirements concerning inspection intervals to provide added assurance that the SG performance criteria will be met between scheduled inspections. If crack indications are found in any SG tube, the maximum inspection interval for all affected and potentially affected SGs is restricted by Specification 5.5.9 until subsequent inspections support extending the inspection interval.

SR 3.4.18.2

During an SG inspection, any inspected tube that satisfies the Steam Generator Program plugging [or repair] criteria is [repaired or] removed from service by plugging. The tube plugging [or repair] criteria delineated in Specification 5.5.9 are intended to ensure that tubes accepted for continued service satisfy the SG performance criteria with allowance for error in the flaw size measurement and for future flaw growth. In addition, the tube plugging [or repair] criteria, in conjunction with other elements of the Steam Generator Program, ensure that the SG performance criteria will continue to be met until the next inspection of the subject tube(s). Reference 1 provides guidance for performing operational assessments to verify that the tubes remaining in service will continue to meet the SG performance criteria.

[Steam generator tube repairs are only performed using approved repair methods as described in the Steam Generator Program.]

The Frequency of prior to entering MODE 4 following a SG inspection ensures that the Surveillance has been completed and all tubes meeting

the plugging [or repair] criteria are plugged [or repaired] prior to subjecting the SG tubes to significant primary to secondary pressure differential.

Changes to the Technical Specifications Based on TSTF-510

5.5 Programs and Manuals

5.5.8 Inservice Testing Program (continued)

ASME OM Code and applicable Addenda terminology for inservice testing activities	Required Frequencies for performing inservice testing activities
Weekly	At least once per 7 days
Monthly	At least once per 31 days
Quarterly or every 3 months	At least once per 92 days
Semiannually or every 6 months	At least once per 184 days
Every 9 months	At least once per 276 days
Yearly or annually	At least once per 366 days
Biennially or every 2 years	At least once per 731 days

b. The provisions of SR 3.0.2 are applicable to the above required Frequencies and other normal and accelerated Frequencies specified in the Inservice Testing Program for performing inservice testing activities,

c. The provisions of SR 3.0.3 are applicable to inservice testing activities, and

d. Nothing in the ASME OM Code shall be construed to supersede the requirements of any TS.

5.5.9 Steam Generator (SG) Program

A**n SG**~~Steam Generator~~ Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the **SG** ~~Steam Generator~~ Program shall include the following:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the "as found" condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging [or repair] of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected, plugged, [or repaired] to confirm that the performance criteria are being met.

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

1. Structural integrity performance criterion: All in-service **SG** ~~steam generator~~ tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down), all anticipated transients included in the design specification, and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to exceed [1 gpm] per SG [, except for specific types of degradation at specific locations as described in paragraph c of the **SG** ~~Steam Generator~~ Program].

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.13, "RCS Operational LEAKAGE."

c. Provisions for SG tube plugging [or repair] criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding [40%] of the nominal tube wall thickness shall be plugged [or repaired].

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

----------REVIEWER'S NOTE----------
Alternate tube plugging [or repair] criteria currently permitted by plant technical specifications are listed here. The description of these alternate tube plugging [or repair] criteria should be equivalent to the descriptions in current technical specifications and should also include any allowed accident induced leakage rates for specific types of degradation at specific locations associated with tube plugging [or repair] criteria.

[The following alternate tube plugging [or repair] criteria may be applied as an alternative to the 40% depth based criteria:

1. . . .]

----------REVIEWER'S NOTE----------
The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.
---

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet **[except for any portions of the tube that are exempt from inspection by alternate repair criteria]**, and that may satisfy the applicable tube plugging [or repair] criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A degradation assessment shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

----------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. The third Item 2 is applicable to SGs with Alloy 690 thermally treated tubing.
---

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

[2. After the first refueling outage following SG installation, inspect **100% of the tubes in** each **SG** ~~steam generator~~ at least every 24 effective full power months**, which defines the inspection period.]** ~~or at least every refueling outage (whichever results in more frequent inspections). In addition, inspect 100% of the tubes at sequential periods of 60 effective full power months beginning after the first refueling outage inspection following SG installation. Each 60 effective full power month inspection period may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period.~~

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection period may be extended to 72 effective full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region.]** ~~After the first refueling outage following SG installation, inspect each SG at least every 48 effective full power months or at least every other refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the~~

~~number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, and c below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~
~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~
~~----------~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 120 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period; and~~

~~c) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the third and subsequent inspection periods.~~

[2. After the first refueling outage following SG installation, inspect **100% of the tubes in** each SG at least every **96**~~72~~ effective full power months**, which defines the inspection period.]**~~or at least every third refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, c and d below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria, the minimum number of locations inspected with such a capable inspection technique during the~~

~~remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~
~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~
~~----------~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 144 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 120 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period;~~

~~c) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the third inspection period; and~~

~~d) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the fourth and subsequent inspection periods.~~

----------REVIEWER'S NOTE----------
The bracketed phrases in Paragraph 3 are only applicable to SGs with Alloy 600 thermally treated tubing.
----

3. If crack indications are found in any SG tube **[excluding any region that is exempt from inspection by alternate repair criteria]**, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall **be at the next** ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever results in more frequent inspections)~~ **[, but may be deferred to the following refueling outage if the 100% inspection of all SGs was performed with enhanced probes as described in paragraph d.2]**. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary to secondary LEAKAGE.

[f. Provisions for SG tube repair methods. **SG** ~~Steam generator~~ tube repair methods shall provide the means to reestablish the RCS pressure boundary integrity of SG tubes without removing the tube from service. For the purposes of these Specifications, tube plugging is not a repair. All acceptable tube repair methods are listed below.

----------REVIEWER'S NOTE----------
Tube repair methods currently permitted by plant technical specifications are to be listed here. The description of these tube repair methods should be equivalent to the descriptions in current technical specifications. If there are no approved tube repair methods, this section should not be used.
---

1. . . .]

5.6 Reporting Requirements

5.6.5 Post Accident Monitoring Report

When a report is required by Condition B or F of LCO 3.3.[17], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.6 [Tendon Surveillance Report

Any abnormal degradation of the containment structure detected during the tests required by the Pre-stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.]

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:

a. The scope of inspections performed on each SG;~~,~~

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;

c. For each degradation mechanism found:

1. The nondestructive examination techniques utilized;

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported;

3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;

4. The number of tubes plugged [or repaired] during the inspection outage; and

[5. The repair methods utilized and the number of tubes repaired by each repair method.]

d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;

~~b. Degradation mechanisms found,~~

~~c. Nondestructive examination techniques utilized for each degradation mechanism,~~

~~d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,~~

~~e. Number of tubes plugged [or repaired] during the inspection outage for each degradation mechanism,~~

e~~f~~. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each SG~~steam generator;~~,

f. The results of any SG secondary side inspections; and

[g. Insert any plant-specific reporting requirements, if applicable.]

~~g. The results of condition monitoring, including the results of tube pulls and in-situ testing,~~

~~[h. Repair method utilized and the number of tubes repaired by each repair method.]~~

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program

A**n SG**~~Steam Generator~~ Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the **SG** ~~Steam Generator~~ Program shall include the following:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the “as found” condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging [or repair] of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected, plugged, [or repaired] to confirm that the performance criteria are being met.

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

1. Structural integrity performance criterion: All in-service **SG** ~~steam generator~~ tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down), all anticipated transients included in the design specification, and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to exceed [1 gpm] per SG [, except for specific types of degradation at specific locations as described in paragraph c of the **SG** ~~Steam Generator~~ Program].

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.13, "RCS Operational LEAKAGE."

c. Provisions for SG tube plugging [or repair] criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding [40%] of the nominal tube wall thickness shall be plugged [or repaired].

----------REVIEWER'S NOTE----------
Alternate tube plugging [or repair] criteria currently permitted by plant technical specifications are listed here. The description of these alternate tube plugging [or repair] criteria should be equivalent to the descriptions in current technical specifications and should also include any allowed accident induced leakage rates for specific types of degradation at specific locations associated with tube plugging [or repair] criteria.

[The following alternate tube plugging [or repair] criteria may be applied as an alternative to the 40% depth based criteria:

1. . . .]

----------REVIEWER'S NOTE----------
The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.
---

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet **[except for any portions of the tube that are exempt from inspection by alternate repair criteria]**, and that may satisfy the applicable tube plugging [or repair] criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A degradation assessment shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

----------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. The third Item 2 is applicable to SGs with Alloy 690 thermally treated tubing.
---

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

[2. After the first refueling outage following SG installation, inspect **100% of the tubes in** each **SG** ~~steam generator~~ at least every 24 effective full power months**, which defines the inspection period.]** ~~or at least every refueling outage (whichever results in more frequent inspections). In addition, inspect 100% of the tubes at sequential periods of 60 effective full power months beginning after the first refueling outage inspection following SG installation. Each 60 effective full power month inspection period may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period.~~

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection period may be extended to 72 effective full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet**

except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region.] ~~After the first refueling outage following SG installation, inspect each SG at least every 48 effective full power months or at least every other refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, and c below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~
~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~
~~---~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 120 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period; and~~

~~c) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the third and subsequent inspection periods.~~

[2. After the first refueling outage following SG installation, inspect **100% of the tubes in** each SG at least every **96**~~72~~ effective full power months**, which defines the inspection period.]** ~~or at least every third refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the~~

~~number of SG inspection outages scheduled in each inspection period as defined in a, b, c and d below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~
~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~
~~----------~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 144 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 120 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period;~~

~~c) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the third inspection period; and~~

~~d) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the fourth and subsequent inspection periods.~~

----------REVIEWER'S NOTE----------
The bracketed phrases in Paragraph 3 are only applicable to SGs with Alloy 600 thermally treated tubing.
----

3. If crack indications are found in any SG tube **[excluding any region that is exempt from inspection by alternate repair criteria]**, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall **be at the next** ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever results in more frequent inspections)~~ **[, but may be deferred to the following refueling outage if the 100% inspection**

of all SGs was performed with enhanced probes as described in paragraph d.2]. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary to secondary LEAKAGE.

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

[f. Provisions for SG tube repair methods. **SG** ~~Steam generator~~ tube repair methods shall provide the means to reestablish the RCS pressure boundary integrity of SG tubes without removing the tube from service. For the purposes of these Specifications, tube plugging is not a repair. All acceptable tube repair methods are listed below.

----------REVIEWER'S NOTE----------
Tube repair methods currently permitted by plant technical specifications are to be listed here. The description of these tube repair methods should be equivalent to the descriptions in current technical specifications. If there are no approved tube repair methods, this section should not be used.
---

1. . . .]

5.5.10 Secondary Water Chemistry Program

This program provides controls for monitoring secondary water chemistry to inhibit SG tube degradation and low pressure turbine disc stress corrosion cracking. The program shall include:

a. Identification of a sampling schedule for the critical variables and control points for these variables,

b. Identification of the procedures used to measure the values of the critical variables,

c. Identification of process sampling points, which shall include monitoring the discharge of the condensate pumps for evidence of condenser in leakage,

d. Procedures for the recording and management of data,

e. Procedures defining corrective actions for all off control point chemistry conditions, and

f. A procedure identifying the authority responsible for the interpretation of the data and the sequence and timing of administrative events, which is required to initiate corrective action.

5.6 Reporting Requirements

5.6.5 Post Accident Monitoring Report

When a report is required by Condition B or F of LCO 3.3.[3], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.6 [Tendon Surveillance Report

Any abnormal degradation of the containment structure detected during the tests required by the Pre-stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.]

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:

a. The scope of inspections performed on each SG;~~,~~

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;

c. For each degradation mechanism found:

1. The nondestructive examination techniques utilized;

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported;

3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;

4. The number of tubes plugged [or repaired] during the inspection outage; and

[5. The repair methods utilized and the number of tubes repaired by each repair method.]

d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;

~~b. Degradation mechanisms found,~~

~~c. Nondestructive examination techniques utilized for each degradation mechanism,~~

~~d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,~~

~~e. Number of tubes plugged [or repaired] during the inspection outage for each degradation mechanism,~~

e~~f~~. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each SG~~steam generator;~~,

f. The results of any SG secondary side inspections; and

[g. Insert any plant-specific reporting requirements, if applicable.]

~~g. The results of condition monitoring, including the results of tube pulls and in-situ testing,~~

~~[h. Repair method utilized and the number of tubes repaired by each repair method.]~~

5.5 Programs and Manuals

5.5.8 Inservice Testing Program (continued)

ASME OM Code and applicable Addenda terminology for inservice testing activities	Required Frequencies for performing inservice testing activities
Weekly	At least once per 7 days
Monthly	At least once per 31 days
Quarterly or every 3 months	At least once per 92 days
Semiannually or every 6 months	At least once per 184 days
Every 9 months	At least once per 276 days
Yearly or annually	At least once per 366 days
Biennially or every 2 years	At least once per 731 days

b. The provisions of SR 3.0.2 are applicable to the above required Frequencies and other normal and accelerated Frequencies specified in the Inservice Testing Program for performing inservice testing activities,

c. The provisions of SR 3.0.3 are applicable to inservice testing activities, and

d. Nothing in the ASME OM Code shall be construed to supersede the requirements of any TS.

5.5.9 Steam Generator (SG) Program

A**n SG**~~Steam Generator~~ Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the **SG** ~~Steam Generator~~ Program shall include the following:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the "as found" condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging [or repair] of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected, plugged, [or repaired] to confirm that the performance criteria are being met.

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

1. Structural integrity performance criterion: All in-service **SG** ~~steam generator~~ tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down), all anticipated transients included in the design specification, and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to exceed [1 gpm] per SG [, except for specific types of degradation at specific locations as described in paragraph c of the **SG** ~~Steam Generator~~ Program.]

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.13, "RCS Operational LEAKAGE."

c. Provisions for SG tube plugging [or repair] criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding [40%] of the nominal tube wall thickness shall be plugged [or repaired].

----------REVIEWER'S NOTE----------
Alternate tube plugging [or repair] criteria currently permitted by plant technical specifications are listed here. The description of these alternate tube plugging [or repair] criteria should be equivalent to the descriptions in current technical specifications and should also include any allowed accident induced leakage rates for specific types of degradation at specific locations associated with tube plugging [or repair] criteria.

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

[The following alternate tube plugging [or repair] criteria may be applied as an alternative to the 40% depth based criteria:

1. . . .]

----------**REVIEWER'S NOTE**----------
The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.
---

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet **[except for any portions of the tube that are exempt from inspection by alternate repair criteria]**, and that may satisfy the applicable tube plugging [or repair] criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A degradation assessment shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

----------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. The third Item 2 is applicable to SGs with Alloy 690 thermally treated tubing.
---

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

[2. After the first refueling outage following SG installation, inspect **100% of the tubes in** each **SG** ~~steam generator~~ at least every 24 effective full power months**, which defines the inspection period.]** ~~or at least every refueling outage (whichever results in more frequent inspections). In addition, inspect 100% of the tubes at sequential periods of 60 effective full power months beginning after the first refueling outage inspection following SG installation. Each 60 effective full power month inspection period may be extended up to 3 effective~~

~~full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period.~~

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection period may be extended to 72 effective full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region.]** ~~After the first refueling outage following SG installation, inspect each SG at least every 48 effective full power months or at least every other refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, and c below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the~~

~~inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~
~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~
~~----------~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 120 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period; and~~

~~c) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the third and subsequent inspection periods.~~

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program (continued)

[2. After the first refueling outage following SG installation, inspect **100% of the tubes in** each SG at least every **96**~~72~~ effective full power months**, which defines the inspection period.]**~~ or at least every third refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, c and d below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~
~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~
~~----------~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 144 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 120 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period;~~

~~c) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the third inspection period; and~~

~~d) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the fourth and subsequent inspection periods.~~

----------REVIEWER'S NOTE----------
The bracketed phrases in Paragraph 3 are only applicable to SGs with Alloy 600 thermally treated tubing.
----

3. If crack indications are found in any SG tube **[excluding any region that is exempt from inspection by alternate repair criteria]**, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall **be at the next** ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever results in more frequent inspections)~~ **[, but may be deferred to the following refueling outage if the 100% inspection of all SGs was performed with enhanced probes as described in paragraph d.2]**. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary to secondary LEAKAGE.

[f. Provisions for SG tube repair methods. **SG** ~~Steam generator~~ tube repair methods shall provide the means to reestablish the RCS pressure boundary integrity of SG tubes without removing the tube from service. For the purposes of these Specifications, tube plugging is not a repair. All acceptable tube repair methods are listed below.

----------REVIEWER'S NOTE----------
Tube repair methods currently permitted by plant technical specifications are to be listed here. The description of these tube repair methods should be equivalent to the descriptions in current technical specifications. If there are no approved tube repair methods, this section should not be used.

---

1. . . .]

5.5.10 Secondary Water Chemistry Program

This program provides controls for monitoring secondary water chemistry to inhibit SG tube degradation and low pressure turbine disc stress corrosion cracking. The program shall include:

a. Identification of a sampling schedule for the critical variables and control points for these variables,

5.6 Reporting Requirements

5.6.5 Post Accident Monitoring Report

When a report is required by Condition B or F of LCO 3.3.[11], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.6 Tendon Surveillance Report

[Any abnormal degradation of the containment structure detected during the tests required by the Pre-stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.]

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:

a. The scope of inspections performed on each SG;~~,~~

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;

c. For each degradation mechanism found:

1. The nondestructive examination techniques utilized;

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported;

3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;

4. The number of tubes plugged [or repaired] during the inspection outage; and

[5. The repair methods utilized and the number of tubes repaired by each repair method.]

d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;

~~b. Degradation mechanisms found,~~

~~c. Nondestructive examination techniques utilized for each degradation mechanism,~~

~~d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,~~

~~e. Number of tubes plugged [or repaired] during the inspection outage for each degradation mechanism,~~

e~~f~~. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each SG~~steam generator;~~,

f. The results of any SG secondary side inspections; and

[g. Insert any plant-specific reporting requirements, if applicable.]

~~g. The results of condition monitoring, including the results of tube pulls and in-situ testing,~~

~~[h. Repair method utilized and the number of tubes repaired by each repair method.]~~

Changes to Revision 5 of the Standard Technical Specifications

5.5 Programs and Manuals

5.5.6 Pre-Stressed Concrete Containment Tendon Surveillance Program (continued)

accordance with Section XI, Subsection IWL of the ASME Boiler and Pressure Vessel Code and applicable addenda as required by 10 CFR50.55a, except where an alternative, exemption, or relief has been authorized by the NRC.

The provisions of SR 3.0.3 are applicable to the Tendon Surveillance Program inspection frequencies.]

5.5.7 Reactor Coolant Pump Flywheel Inspection Program

This program shall provide for the inspection of each reactor coolant pump flywheel per the recommendation of Regulatory position c.4.b of Regulatory Guide 1.14, Revision 1, August 1975.

5.5.8 Steam Generator (SG) Program

A**n SG** ~~Steam Generator~~ Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the **SG** ~~Steam Generator~~ Program shall include the following:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the "as found" condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging [or repair] of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected, plugged, [or repaired] to confirm that the performance criteria are being met.

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

1. Structural integrity performance criterion: All in-service **SG** ~~steam generator~~ tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down), all anticipated transients included in the design specification and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to exceed [1 gpm] per SG [, except for specific types of degradation at specific locations as described in paragraph c of the **SG**~~Steam Generator~~ Program].

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.13, "RCS Operational LEAKAGE."

c. Provisions for SG tube plugging [or repair] criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding [40%] of the nominal tube wall thickness shall be plugged [or repaired].

----------REVIEWER'S NOTE----------
Alternate tube plugging [or repair] criteria currently permitted by plant technical specifications are listed here. The description of these alternate tube plugging [or repair] criteria should be equivalent to the descriptions in current technical specifications and should also include any allowed accident induced leakage rates for specific types of degradation at specific locations associated with tube plugging [or repair] criteria.

[The following alternate tube plugging [or repair] criteria may be applied as an alternative to the 40% depth based criteria:

1. . . .]

----------REVIEWER'S NOTE----------
The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.
----

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be

present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet **[except for any portions of the tube that are exempt from inspection by alternate repair criteria]**, and that may satisfy the applicable tube plugging [or repair] criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A degradation assessment shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

----------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. The third Item 2 is applicable to SGs with Alloy 690 thermally treated tubing.
---

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

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 24 effective full power months, which defines the inspection period.]**~~After the first refueling outage following SG installation, inspect each steam generator at least every 24 effective full power months or at least every refueling outage (whichever results in more frequent inspections). In addition, inspect 100% of the tubes at sequential periods of 60 effective full power months beginning after the first refueling outage inspection following SG installation. Each 60 effective full power month inspection period may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging [or repair] criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of~~

~~degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period.]~~

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection period may be extended to 72 effective full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region.]** ~~After the first refueling outage following SG installation, inspect each SG at least every 48 effective full power months or at least every other refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, and c below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging [or repair] criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~
~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~
~~----------~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 120 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period; and~~

~~c) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the third and subsequent inspection periods.]~~

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 96 effective full power months, which defines the inspection period.]**~~After the first refueling outage following SG installation, inspect each SG at least every 72 effective full power months or at least every third refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, c, and d below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging [or repair] criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~

~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 144 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 120 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period;~~

~~c) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the third inspection period; and~~

~~d) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the fourth and subsequent inspection periods.]~~

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

----------REVIEWER'S NOTE----------
The bracketed phrases in Paragraph 3 are only applicable to SGs with Alloy 600 thermally treated tubing.
---

3. If crack indications are found in any SG tube **[excluding any region that is exempt from inspection by alternate repair criteria]**, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall **be at the next** ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever results in more frequent inspections)~~ **[, but may be deferred to the following refueling outage if the 100% inspection of all SGs was performed with enhanced probes as described in paragraph d.2]**. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary to secondary LEAKAGE.

[f. Provisions for SG tube repair methods. **SG** ~~Steam generator~~ tube repair methods shall provide the means to reestablish the RCS pressure boundary integrity of SG tubes without removing the tube from service. For the purposes of these Specifications, tube plugging is not a repair. All acceptable tube repair methods are listed below.

----------REVIEWER'S NOTE----------
Tube repair methods currently permitted by plant technical specifications are to be listed here. The description of these tube repair methods should be

equivalent to the descriptions in current technical specifications. If there are no approved tube repair methods, this section should not be used.
---

1. . . .]

5.5.9 Secondary Water Chemistry Program

This program provides controls for monitoring secondary water chemistry to inhibit SG tube degradation and low pressure turbine disc stress corrosion cracking. The program shall include:

a. Identification of a sampling schedule for the critical variables and control points for these variables,

b. Identification of the procedures used to measure the values of the critical variables,

c. Identification of process sampling points, which shall include monitoring the discharge of the condensate pumps for evidence of condenser in leakage,

d. Procedures for the recording and management of data,

e. Procedures defining corrective actions for all off control point chemistry conditions, and

5.6 Reporting Requirements

5.6.4 RCS PRESSURE AND TEMPERATURE LIMITS REPORT (continued)

7. Licensees who have removed two or more capsules should compare for each surveillance material the measured increase in reference temperature (RT_{NDT}) to the predicted increase in RT_{NDT}; where the predicted increase in RT_{NDT} is based on the mean shift in RT_{NDT} plus the two standard deviation value ($2\sigma_{\Delta}$) specified in Regulatory Guide 1.99, Revision 2. If the measured value exceeds the predicted value (increase in RT_{NDT} + $2\sigma_{\Delta}$), the licensee should provide a supplement to the PTLR to demonstrate how the results affect the approved methodology.

5.6.5 Post Accident Monitoring Report

When a report is required by Condition B or F of LCO 3.3.[17], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

[5.6.6 Tendon Surveillance Report

Any abnormal degradation of the containment structure detected during the tests required by the Pre-stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.]

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:

a. The scope of inspections performed on each SG;~~,~~

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;

c. For each degradation mechanism found:

1. The nondestructive examination techniques utilized;

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at

support structures less than 20 percent through-wall, only the total number of indications needs to be reported;

3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;

4. The number of tubes plugged [or repaired] during the inspection outage; and

[5. The repair methods utilized and the number of tubes repaired by each repair method.]

d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;

~~b. Degradation mechanisms found,~~

~~c. Nondestructive examination techniques utilized for each degradation mechanism,~~

~~d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,~~

5.6 Reporting Requirements

5.6.7 Steam Generator Tube Inspection Report (continued)

~~e. Number of tubes plugged [or repaired] during the inspection outage for each degradation mechanism,~~

~~e~~**f**. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each **SG**~~steam generator,~~**;**

f. The results of any SG secondary side inspections; and

[g. Insert any plant-specific reporting requirements, if applicable.]

~~g. The results of condition monitoring, including the results of tube pulls and in-situ testing,~~

~~[h. Repair method utilized and the number of tubes repaired by each repair method.]~~

5.5 Programs and Manuals

5.5.7 Reactor Coolant Pump Flywheel Inspection Program

This program shall provide for the inspection of each reactor coolant pump flywheel per the recommendations of Regulatory Position C.4.b of Regulatory Guide 1.14, Revision 1, August 1975.

In lieu of Position C.4.b(1) and C.4.b(2), a qualified in-place UT examination over the volume from the inner bore of the flywheel to the circle one-half of the outer radius or a surface examination (MT and/or PT) of exposed surfaces of the removed flywheels may be conducted at 20 year intervals.

----------REVIEWER'S NOTE----------
The inspection interval and scope for RCP flywheels stated above can be applied to plants that satisfy the requirements in WCAP-15666, "Extension of Reactor Coolant Pump Motor Flywheel Examination."

5.5.8 Steam Generator (SG) Program

A**n SG** ~~Steam Generator~~ Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the **SG** ~~Steam Generator~~ Program shall include the following:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the “as found” condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging [or repair] of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected, plugged, [or repaired] to confirm that the performance criteria are being met.

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

   1. Structural integrity performance criterion: All in-service **SG** ~~steam generator~~ tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down), all anticipated transients included in the design specification and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to exceed [1 gpm] per SG [, except for specific types of degradation at specific locations as described in paragraph c of the **SG**~~Steam Generator~~ Program.]

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.13, "RCS Operational LEAKAGE."

c. Provisions for SG tube plugging [or repair] criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding [40%] of the nominal tube wall thickness shall be plugged [or repaired].

----------REVIEWER'S NOTE----------
Alternate tube plugging [or repair] criteria currently permitted by plant technical specifications are listed here. The description of these alternate tube plugging [or repair] criteria should be equivalent to the descriptions in current technical specifications and should also include any allowed accident induced leakage rates for specific types of degradation at specific locations associated with tube plugging [or repair] criteria.

[The following alternate tube plugging [or repair] criteria may be applied as an alternative to the 40% depth based criteria:

1. . . .]

----------REVIEWER'S NOTE----------
The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.
----

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any

type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet **[except for any portions of the tube that are exempt from inspection by alternate repair criteria]**, and that may satisfy the applicable tube plugging [or repair] criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A degradation assessment shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

----------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. The third Item 2 is applicable to SGs with Alloy 690 thermally treated tubing.
---

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

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 24 effective full power months, which defines the inspection period.]**~~After the first refueling outage following SG installation, inspect each steam generator at least every 24 effective full power months or at least every refueling outage (whichever results in more frequent inspections). In addition, inspect 100% of the tubes at sequential periods of 60 effective full power months beginning after the first refueling outage inspection following SG installation. Each 60 effective full power month inspection period may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging [or repair] criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for~~

~~this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period.]~~

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection period may be extended to 72 effective full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region.]** ~~After the first refueling outage following SG installation, inspect each SG at least every 48 effective full power months or at least every other refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, and c below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging [or repair] criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~
~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~
~~----------~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 120 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period; and~~

~~c) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the third and subsequent inspection periods.]~~

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 96 effective full power months, which defines the inspection period.]**~~After the first refueling outage following SG installation, inspect each SG at least every 72 effective full power months or at least every third refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the~~

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

~~number of SG inspection outages scheduled in each inspection period as defined in a, b, c, and d below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging [or repair] criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~
~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~
~~----------~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 144 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 120 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period;~~

~~c) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the third inspection period; and~~

~~d) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the fourth and subsequent inspection periods.]~~

----------REVIEWER'S NOTE----------
The bracketed phrases in Paragraph 3 are only applicable to SGs with Alloy 600 thermally treated tubing.
----

3. If crack indications are found in any SG tube **[excluding any region that is exempt from inspection by alternate repair criteria]**, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall **be at the next** ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever results in more frequent inspections)~~ **[, but may be deferred to the following refueling outage if the 100% inspection of all SGs was performed with enhanced probes as described in paragraph d.2]**. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing,

5.5.8 Steam Generator (SG) Program (continued)

or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary to secondary LEAKAGE.

[f. Provisions for SG tube repair methods. **SG** ~~Steam generator~~ tube repair methods shall provide the means to reestablish the RCS pressure boundary integrity of SG tubes without removing the tube from service. For the purposes of these Specifications, tube plugging is not a repair. All acceptable tube repair methods are listed below.

----------REVIEWER'S NOTE----------
Tube repair methods currently permitted by plant technical specifications are to be listed here. The description of these tube repair methods should be equivalent to the descriptions in current technical specifications. If there are no approved tube repair methods, this section should not be used.
---

1. . . .]

5.5.9 Secondary Water Chemistry Program

This program provides controls for monitoring secondary water chemistry to inhibit SG tube degradation and low pressure turbine disc stress corrosion cracking. The program shall include:

a. Identification of a sampling schedule for the critical variables and control points for these variables,

b. Identification of the procedures used to measure the values of the critical variables,

c. Identification of process sampling points, which shall include monitoring the discharge of the condensate pumps for evidence of condenser in leakage,

d. Procedures for the recording and management of data,

e. Procedures defining corrective actions for all off control point chemistry conditions, and

f. A procedure identifying the authority responsible for the interpretation of the data and the sequence and timing of administrative events, which is required to initiate corrective action.

5.6 Reporting Requirements

5.6.4 RCS PRESSURE AND TEMPERATURE LIMITS REPORT (continued)

7. The minimum temperature requirements of Appendix G to 10 CFR Part 50 shall be incorporated into the pressure and temperature limit curves.

8. Licensees who have removed two or more capsules should compare for each surveillance material the measured increase in reference temperature (RT_{NDT}) to the predicted increase in RT_{NDT}; where the predicted increase in RT_{NDT} is based on the mean shift in RT_{NDT} plus the two standard deviation value ($2\sigma_{\Delta}$) specified in Regulatory Guide 1.99, Revision 2. If the measured value exceeds the predicted value (increase RT_{NDT} + $2\sigma_{\Delta}$), the licensee should provide a supplement to the PTLR to demonstrate how the results affect the approved methodology.

5.6.5 Post Accident Monitoring Report

When a report is required by Condition B or F of LCO 3.3.[3], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

[5.6.6 Tendon Surveillance Report

Any abnormal degradation of the containment structure detected during the tests required by the Pre-stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.]

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:

a. The scope of inspections performed on each SG~~;~~,

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;

c. For each degradation mechanism found:

1. The nondestructive examination techniques utilized;

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported;

3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;

4. The number of tubes plugged [or repaired] during the inspection outage; and

[5. The repair methods utilized and the number of tubes repaired by each repair method.]

d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;

~~b. Degradation mechanisms found,~~

~~c. Nondestructive examination techniques utilized for each degradation mechanism,~~

5.6 Reporting Requirements

5.6.7 Steam Generator Tube Inspection Report (continued)

~~d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,~~

~~e. Number of tubes plugged [or repaired] during the inspection outage for each degradation mechanism,~~

~~e~~f. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each **SG**~~steam generator,~~**;**

f. The results of any SG secondary side inspections; and

[g. Insert any plant-specific reporting requirements, if applicable.]

~~g. The results of condition monitoring, including the results of tube pulls and in-situ testing,~~

~~[h. Repair method utilized and the number of tubes repaired by each repair method.]~~

5.5 Programs and Manuals

5.5.7 Reactor Coolant Pump Flywheel Inspection Program

This program shall provide for the inspection of each reactor coolant pump flywheel per the recommendation of Regulatory position c.4.b of Regulatory Guide 1.14, Revision 1, August 1975.

5.5.8 Steam Generator (SG) Program

A**n SG** ~~Steam Generator~~ Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the **SG**~~Steam Generator~~ Program shall include the following:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the "as found" condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging [or repair] of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected, plugged, [or repaired] to confirm that the performance criteria are being met.

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

1. Structural integrity performance criterion: All in-service **SG** ~~steam generator~~ tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down), all anticipated transients included in the design specification, and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

all SGs and leakage rate for an individual SG. Leakage is not to exceed [1 gpm] per SG [, except for specific types of degradation at specific locations as described in paragraph c of the **SG**~~Steam Generator~~ Program.]

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.13, "RCS Operational LEAKAGE."

c. Provisions for SG tube plugging [or repair] criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding [40%] of the nominal tube wall thickness shall be plugged [or repaired].

----------REVIEWER'S NOTE----------
Alternate tube plugging [or repair] criteria currently permitted by plant technical specifications are listed here. The description of these alternate tube plugging [or repair] criteria should be equivalent to the descriptions in current technical specifications and should also include any allowed accident induced leakage rates for specific types of degradation at specific locations associated with tube plugging [or repair] criteria.

[The following alternate tube plugging [or repair] criteria may be applied as an alternative to the 40% depth based criteria:

1. . . .]

----------REVIEWER'S NOTE----------
The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.
----

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet **[except for any portions of the tube that are exempt from inspection by alternate repair criteria]**, and that may satisfy the applicable tube plugging [or repair] criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A degradation assessment shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to

determine which inspection methods need to be employed and at what locations.

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

----------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. The third Item 2 is applicable to SGs with Alloy 690 thermally treated tubing.
---

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

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 24 effective full power months, which defines the inspection period.]**~~After the first refueling outage following SG installation, inspect each steam generator at least every 24 effective full power months or at least every refueling outage (whichever results in more frequent inspections). In addition, inspect 100% of the tubes at sequential periods of 60 effective full power months beginning after the first refueling outage inspection following SG installation. Each 60 effective full power month inspection period may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging [or repair] criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period.]~~

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection**

period may be extended to 72 effective full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region.] ~~After the first refueling outage following SG installation, inspect each SG at least every 48 effective full power months or at least every other refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, and c below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging [or repair] criteria, the minimum number of locations inspected~~

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

~~with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~Reviewer's Note~~

~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 120 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period; and~~

~~c) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the third and subsequent inspection periods.]~~

[2. **After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 96 effective full power months, which defines the inspection period.]**~~After the first refueling outage following SG installation, inspect each SG at least every 72 effective full power months or at least every third refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, c, and d below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube plugging [or repair] criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times~~

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

~~the SG is scheduled to be inspected in the inspection period after the determination that a new form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~---------- Reviewer's Note ----------~~
~~A licensee may elect to retain historical and existing inspection period lengths in order to not revise those inspection periods.~~
~~----------~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 144 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 120 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period;~~

~~c) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the third inspection period; and~~

~~d) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the fourth and subsequent inspection periods.]~~

----------REVIEWER'S NOTE----------
The bracketed phrases in Paragraph 3 are only applicable to SGs with Alloy 600 thermally treated tubing.
---

3. If crack indications are found in any SG tube **[excluding any region that is exempt from inspection by alternate repair criteria]**, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall **be at the next** ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever results in more frequent inspections)~~ **[, but may be deferred to the following refueling outage if the 100% inspection of all SGs was performed with enhanced probes as described in paragraph d.2]**. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary to secondary LEAKAGE.

[f. Provisions for SG tube repair methods. **SG** ~~Steam generator~~ tube repair methods shall provide the means to reestablish the RCS pressure boundary integrity of SG tubes without removing the tube from service. For the purposes of these Specifications, tube plugging is not a repair. All acceptable tube repair methods are listed below.

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

----------REVIEWER'S NOTE----------
Tube repair methods currently permitted by plant technical specifications are to be listed here. The description of these tube repair methods should be equivalent to the descriptions in current technical specifications. If there are no approved tube repair methods, this section should not be used.
---

1. . . .]

5.5.9 Secondary Water Chemistry Program

5.6 Reporting Requirements

5.6.4 RCS Pressure and Temperature Limits Report (continued)

7. Licensees who have removed two or more capsules should compare for each surveillance material the measured increase in reference temperature (RT_{NDT}) to the predicted increase in RT_{NDT}; where the predicted increase in RT_{NDT} is based on the mean shift in RT_{NDT} plus the two standard deviation value ($2\sigma_{\Delta}$) specified in Regulatory Guide 1.99, Revision 2. If the measured value exceeds the predicted value (increase in RT_{NDT} + $2\sigma_{\Delta}$), the licensee should provide a supplement to the PTLR to demonstrate how the results affect the approved methodology.

5.6.5 Post Accident Monitoring Report

When a report is required by Condition B or F of LCO 3.3.[11], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.6 Tendon Surveillance Report

[Any abnormal degradation of the containment structure detected during the tests required by the Pre-stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.]

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:

a. The scope of inspections performed on each SG;~~,~~

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;

c. For each degradation mechanism found:

1. The nondestructive examination techniques utilized;

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported;

3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;

4. The number of tubes plugged [or repaired] during the inspection outage; and

[5. The repair methods utilized and the number of tubes repaired by each repair method.]

d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;

~~b. Degradation mechanisms found,~~

~~c. Nondestructive examination techniques utilized for each degradation mechanism,~~

~~d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,~~

5.6 Reporting Requirements

5.6.7 Steam Generator Tube Inspection Report (continued)

~~e. Number of tubes plugged [or repaired] during the inspection outage for each degradation mechanism,~~

~~e~~**f**. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each **SG**~~steam generator;,~~

f. The results of any SG secondary side inspections; and

[g. Insert any plant-specific reporting requirements, if applicable.]

~~g. The results of condition monitoring, including the results of tube pulls and in-situ testing,~~

~~[h. Repair method utilized and the number of tubes repaired by each repair method.]~~

Changes to NUREG-2194

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.17 Steam Generator (SG) Tube Integrity

LCO 3.4.17 SG tube integrity shall be maintained.

AND

All SG tubes satisfying the tube plugging [or repair] criteria shall be plugged [or repaired] in accordance with the Steam Generator Program.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each SG tube.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more SG tubes satisfying the tube plugging [or repair] criteria and not plugged [or repaired] in accordance with the Steam Generator Program.	A.1 Verify tube integrity of the affected tube(s) is maintained until the next refueling outage or SG tube inspection. AND A.2 Plug [or repair] the affected tube(s) in accordance with the Steam Generator Program.	7 days Prior to entering MODE 4 following the next refueling outage or SG tube inspection

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met. OR SG tube integrity not maintained.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.17.1	Verify SG tube integrity in accordance with the Steam Generator Program.	In accordance with the Steam Generator Program
SR 3.4.17.2	Verify each inspected SG tube that satisfies the tube plugging [or repair] criteria is plugged [or repaired] in accordance with the Steam Generator Program.	Once prior to entering MODE 4 following a SG tube inspection

5.5 Programs and Manuals

5.5.3 Inservice Testing Program

This program provides control for inservice testing of ASME Code Class 1, 2, and 3 components. The program shall include the following:

a. Testing frequencies applicable to the ASME Code for Operations and Maintenance of Nuclear Power Plants (ASME OM Code) and applicable Addenda as follows:

ASME OM Code and applicable Addenda Terminology for inservice testing activities	Required Frequencies for performing inservice testing activities
Weekly	At least once per 7 days
Monthly	At least once per 31 days
Quarterly or every 3 months	At least once per 92 days
Semiannually or every 6 months	At least once per 184 days
Every 9 months	At least once per 276 days
Yearly or annually	At least once per 366 days
Biennially or every 2 years	At least once per 731 days

b. The provisions of SR 3.0.2 are applicable to the above required Frequencies and to other normal and accelerated Frequencies specified as 2 years or less in the Inservice Testing Program for performing inservice testing activities;

c. The provisions of SR 3.0.3 are applicable to inservice testing activities;

d. Nothing in the ASME OM Code shall be construed to supersede the requirements of any TS.

5.5.4 Steam Generator (SG) Program

An SG ~~Steam Generator~~ Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the SG ~~Steam Generator~~ Program shall include the following:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the “as found” condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The “as found” condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging [or repair] of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected or plugged, [or repaired] to confirm that the performance criteria are being met.

5.5 Programs and Manuals

5.5.4 Steam Generator (SG) Program (continued)

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

1. Structural integrity performance criterion: All in-service SG ~~steam generator~~ tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down), all anticipated transients included in the design specification, and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to exceed 150 gpd per SG[, except for specific types of degradation at specific locations as described in paragraph c of the SG Program.].

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.7, “RCS Operational LEAKAGE.”

c. Provisions for SG tube plugging [or repair] criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding 40% of the nominal tube wall thickness shall be plugged [or repaired].

----------REVIEWER'S NOTE----------
Alternate tube plugging [or repair] criteria currently permitted by plant technical specifications are listed here. The description of these alternate tube plugging [or repair] criteria should be equivalent to the descriptions in current technical specifications and should also include any allowed accident induced leakage rates for specific types of degradation at specific locations associated with tube plugging [or repair] criteria.

[The following alternate tube plugging [or repair] criteria may be applied as an alternative to the 40% depth based criteria:

1. . . .]

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet, and that may satisfy the applicable tube plugging [or repair] criteria. The tube-to-tubesheet weld is not

5.5 Programs and Manuals

5.5.4 Steam Generator (SG) Program (continued)

part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A degradation assessment shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

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

2. After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 96~~72~~ effective full power months, which defines the inspection period. ~~or at least every third refueling outage (whichever results in more frequent inspections). In addition, the minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all SGs divided by the number of SG inspection outages scheduled in each inspection period as defined in a, b, c and d below. If a degradation assessment indicates the potential for a type of degradation to occur at a location not previously inspected with a technique capable of detecting this type of degradation at this location and that may satisfy the applicable tube repair criteria, the minimum number of locations inspected with such a capable inspection technique during the remainder of the inspection period may be prorated. The fraction of locations to be inspected for this potential type of degradation at this location at the end of the inspection period shall be no less than the ratio of the number of times the SG is scheduled to be inspected in the inspection period after the determination that a new~~

~~form of degradation could potentially be occurring at this location divided by the total number of times the SG is scheduled to be inspected in the inspection period. Each inspection period defined below may be extended up to 3 effective full power months to include a SG inspection outage in an inspection period and the subsequent inspection period begins at the conclusion of the included SG inspection outage.~~

~~a) After the first refueling outage following SG installation, inspect 100% of the tubes during the next 144 effective full power months. This constitutes the first inspection period;~~

~~b) During the next 120 effective full power months, inspect 100% of the tubes. This constitutes the second inspection period;~~

5.5 Programs and Manuals

5.5.4 Steam Generator (SG) Program (continued)

~~c) During the next 96 effective full power months, inspect 100% of the tubes. This constitutes the third inspection period; and~~

~~d) During the remaining life of the SGs, inspect 100% of the tubes every 72 effective full power months. This constitutes the fourth and subsequent inspection periods.~~

3. If crack indications are found in any SG tube, then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall be at the next ~~not exceed 24 effective full power months or one~~ refueling outage ~~(whichever results in more frequent inspections)~~. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary to secondary LEAKAGE.

[f. Provisions for SG tube repair methods. SG tube repair methods shall provide the means to reestablish the RCS pressure boundary integrity of SG tubes without removing the tube from service. For the purposes of these Specifications, tube plugging is not a repair. All acceptable tube repair methods are listed below.

----------REVIEWER'S NOTE----------
Tube repair methods currently permitted by plant technical specifications are to be listed here. The description of these tube repair methods should be equivalent to the descriptions in current technical specifications. If there are no approved tube repair methods, this section should not be used.
----

1. . . .]

5.5.5 Secondary Water Chemistry Program

This program provides controls for monitoring secondary water chemistry to inhibit SG tube degradation and low pressure turbine disc stress corrosion cracking. The program shall include:

a. Identification of a sampling schedule for the critical variables and control points for these variables;

b. Identification of the procedures used to measure the values of the critical variables;

c. Identification of process sampling points, which shall include monitoring the discharge of the condensate pumps for evidence of condenser in leakage;

d. Procedures for the recording and management of data;

e. Procedures defining corrective actions for all off control point chemistry conditions; and

f. A procedure identifying the authority responsible for the interpretation of the data and the sequence and timing of administrative events, which is required to initiate corrective action.

5.5 Programs and Manuals

5.5.6 Technical Specifications (TS) Bases Control Program

This program provides a means for processing changes to the Bases of these Technical Specifications.

a. Changes to the Bases of the TS shall be made under appropriate administrative controls and reviews.

b. Licensees may make changes to Bases without prior NRC approval provided the changes do not require either of the following:

1. A change in the TS incorporated in the license; or

5.6 Reporting Requirements

5.6.6 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 5.5.4, "Steam Generator (SG) Program." The report shall include:

a. The scope of inspections performed on each SG;~~,~~

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;

c. For each degradation mechanism found:

1. The nondestructive examination techniques utilized;

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported;

3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;

4. The number of tubes plugged [or repaired] during the inspection outage; and

[5. The repair methods utilized and the number of tubes repaired by each repair method.]

d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;

~~b. Degradation mechanisms found,~~

~~c. Nondestructive examination techniques utilized for each degradation mechanism,~~

~~d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,~~

~~e. Number of tubes plugged during the inspection outage for each degradation mechanism,~~

e~~f~~. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each SG;~~The number and percentage of tubes plugged to date, and the effective plugging percentage in each steam generator, and~~

f. The results of any SG secondary side inspections; and

[g. Insert any plant-specific reporting requirements, if applicable.]

~~g. The results of condition monitoring, including the results of tube pulls and in-situ testing.~~

BASES

APPLICABLE SAFETY ANALYSES

The steam generator tube rupture (SGTR) accident is the limiting design basis event for SG tubes and avoiding an SGTR is the basis for this Specification. The analysis of a SGTR event assumes a bounding primary to secondary LEAKAGE rate equal to the operational LEAKAGE rate limits in LCO 3.4.7, "RCS Operational LEAKAGE," plus the leakage rate associated with a double-ended rupture of a single tube. The accident analysis for a SGTR assumes the contaminated secondary fluid is only briefly released to the atmosphere via safety valves and the majority is discharged to the main condenser.

The analysis for design basis accidents and transients other than a SGTR assume the SG tubes retain their structural integrity (i.e., they are assumed not to rupture.) In these analyses, the steam discharge to the atmosphere includes primary to secondary SG tube LEAKAGE equivalent to the operational leakage limit of 150 gpd per SG. For accidents that do not involve fuel damage, the primary coolant activity level of DOSE EQUIVALENT I-131 is assumed to be equal to the LCO 3.4.10, "RCS Specific Activity," limits. For accidents that assume fuel damage, the primary coolant activity is a function of the amount of activity released from the damaged fuel. The dose consequences of these events are within the limits of GDC 19 (Ref. 2), 10 CFR 50.34 (Ref. 3) or the NRC approved licensing basis (e.g., a small fraction of these limits).

Steam generator tube integrity satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO requires that SG tube integrity be maintained. The LCO also requires that all SG tubes that satisfy the plugging [or repair] criteria be plugged [or repaired] in accordance with the Steam Generator Program.

During an SG inspection, any inspected tube that satisfies the Steam Generator Program plugging [or repair] criteria is [repaired or] removed from service by plugging. If a tube was determined to satisfy the plugging [or repair] criteria but was not plugged [or repaired], the tube may still have tube integrity.

In the context of this Specification, a SG tube is defined as the entire length of the tube, including the tube wall, between the tube-to-tubesheet weld at the tube inlet and the tube-to-tubesheet weld at the tube outlet. The tube-to-tubesheet weld is not considered part of the tube.

BASES

ACTIONS (continued)

A.1 and A.2

Condition A applies if it is discovered that one or more SG tubes examined in an inservice inspection satisfy the tube plugging [or repair] criteria but were not plugged [or repaired] in accordance with the Steam Generator Program as required by SR 3.4.17.2. An evaluation of SG tube integrity of the affected tube(s) must be made. Steam generator tube integrity is based on meeting the SG performance criteria described in the Steam Generator Program. The SG plugging [or repair] criteria define limits on SG tube degradation that allow for flaw growth between inspections while still providing assurance that the SG performance criteria will continue to be met. In order to determine if a SG tube that should have been plugged [or repaired] has tube integrity, an evaluation must be completed that demonstrates that the SG performance criteria will continue to be met until the next refueling outage or SG tube inspection. The tube integrity determination is based on the estimated condition of the tube at the time the situation is discovered and the estimated growth of the degradation prior to the next SG tube inspection. If it is determined that tube integrity is not being maintained, Condition B applies.

A Completion Time of 7 days is sufficient to complete the evaluation while minimizing the risk of plant operation with a SG tube that may not have tube integrity.

If the evaluation determines that the affected tube(s) have tube integrity, Required Action A.2 allows plant operation to continue until the next refueling outage or SG inspection provided the inspection interval continues to be supported by an operational assessment that reflects the affected tubes. However, the affected tube(s) must be plugged [or repaired] prior to entering MODE 4 following the next refueling outage or SG inspection. This Completion Time is acceptable since operation until the next inspection is supported by the operational assessment.

B.1 and B.2

If the Required Actions and associated Completion Times of Condition A are not met or if SG tube integrity is not being maintained, the reactor must be brought to MODE 3 within 6 hours and MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the desired plant conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.17.1

During shutdown periods the SGs are inspected as required by this SR and the Steam Generator Program. NEI 97-06, Steam Generator Program Guidelines (Ref. 1), and its referenced EPRI Guidelines, establish the content of the Steam Generator Program. Use of the Steam Generator Program ensures that the inspection is appropriate and consistent with accepted industry practices.

During SG inspections a condition monitoring assessment of the SG tubes is performed. The condition monitoring assessment determines the "as found" condition of the SG tubes. The purpose of the condition monitoring assessment is to ensure that the SG performance criteria have been met for the previous operating period.

The Steam Generator Program determines the scope of the inspection and the methods used to determine whether the tubes contain flaws satisfying the tube plugging [or repair] criteria. Inspection scope (i.e., which tubes or areas of tubing within the SG are to be inspected) is a function of existing and potential degradation locations. The Steam Generator Program also specifies the inspection methods to be used to find potential degradation. Inspection methods are a function of degradation morphology, non-destructive examination (NDE) technique capabilities, and inspection locations.

The Steam Generator Program defines the Frequency of SR 3.4.17.1. The Frequency is determined by the operational assessment and other limits in the SG examination guidelines (Ref. 6). The Steam Generator Program uses information on existing degradations and growth rates to determine an inspection Frequency that provides reasonable assurance that the tubing will meet the SG performance criteria at the next scheduled inspection. In addition, Specification 5.5.4 contains prescriptive requirements concerning inspection intervals to provide added assurance that the SG performance criteria will be met between scheduled inspections. If crack indications are found in any SG tube, the maximum inspection interval for all affected and potentially affected SGs is restricted by Specification 5.5.4 until subsequent inspections support extending the inspection interval.

SR 3.4.17.2

During an SG inspection, any inspected tube that satisfies the Steam Generator Program plugging [or repair] criteria is [repaired or] removed from service by plugging. The tube plugging [or repair] criteria delineated in Specification 5.5.4 are intended to ensure that tubes accepted for

continued service satisfy the SG performance criteria with allowance for error in the flaw size measurement and for future flaw growth. In addition, the tube plugging [or repair] criteria, in conjunction with other elements of the Steam Generator

BASES

SURVEILLANCE REQUIREMENTS (continued)

Program, ensure that the SG performance criteria will continue to be met until the next inspection of the subject tube(s). Reference 1 provides guidance for performing operational assessments to verify that the tubes remaining in service will continue to meet the SG performance criteria.

The Frequency of once prior to entering MODE 4 following a SG inspection ensures that the Surveillance has been completed and all tubes meeting the plugging [or repair] criteria are plugged [or repaired] prior to subjecting the SG tubes to significant primary to secondary pressure differential.

REFERENCES

1. NEI 97-06, “Steam Generator Program Guidelines.”

2. 10 CFR 50 Appendix A, GDC 19.

3. 10 CFR 50.34.

4. ASME Boiler and Pressure Vessel Code, Section III, Subsection NB.

5. Draft Regulatory Guide 1.121, “Basis for Plugging Degraded Steam Generator Tubes,” August 1976.

6. EPRI, “Pressurized Water Reactor Steam Generator Examination Guidelines.”

Example Clean-Typed Affected Pages of NUREG-1431 Incorporating the Proposed Changes

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.20 Steam Generator (SG) Tube Integrity

LCO 3.4.20 SG tube integrity shall be maintained.

AND

All SG tubes satisfying the tube plugging [or repair] criteria shall be plugged [or repaired] in accordance with the Steam Generator Program.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each SG tube.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more SG tubes satisfying the tube plugging [or repair] criteria and not plugged [or repaired] in accordance with the Steam Generator Program.	A.1 Verify tube integrity of the affected tube(s) is maintained until the next refueling outage or SG tube inspection. AND A.2 Plug [or repair] the affected tube(s) in accordance with the Steam Generator Program.	7 days Prior to entering MODE 4 following the next refueling outage or SG tube inspection
B. Required Action and associated Completion Time of Condition A not met. OR SG tube integrity not maintained.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.20.1	Verify SG tube integrity in accordance with the Steam Generator Program.	In accordance with the Steam Generator Program
SR 3.4.20.2	Verify that each inspected SG tube that satisfies the tube plugging [or repair] criteria is plugged [or repaired] in accordance with the Steam Generator Program.	Prior to entering MODE 4 following a SG tube inspection

5.5 Programs and Manuals

5.5.7 Reactor Coolant Pump Flywheel Inspection Program

This program shall provide for the inspection of each reactor coolant pump flywheel per the recommendations of Regulatory Position C.4.b of Regulatory Guide 1.14, Revision 1, August 1975.

In lieu of Position C.4.b(1) and C.4.b(2), a qualified in-place UT examination over the volume from the inner bore of the flywheel to the circle one-half of the outer radius or a surface examination (MT and/or PT) of exposed surfaces of the removed flywheels may be conducted at 20 year intervals.

----------REVIEWER'S NOTE----------
The inspection interval and scope for RCP flywheels stated above can be applied to plants that satisfy the requirements in WCAP-15666, "Extension of Reactor Coolant Pump Motor Flywheel Examination."

5.5.8 Steam Generator (SG) Program

An SG Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the SG Program shall include the following:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the “as found” condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging [or repair] of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected, plugged, [or repaired] to confirm that the performance criteria are being met.

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

1. Structural integrity performance criterion: All in-service SG tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down), all anticipated transients included in the design specification and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to exceed [1 gpm] per SG [, except for specific types of degradation at specific locations as described in paragraph c of the SG Program.]

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.13, "RCS Operational LEAKAGE."

c. Provisions for SG tube plugging [or repair] criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding [40%] of the nominal tube wall thickness shall be plugged [or repaired].

----------REVIEWER'S NOTE----------
Alternate tube plugging [or repair] criteria currently permitted by plant technical specifications are listed here. The description of these alternate tube plugging [or repair] criteria should be equivalent to the descriptions in current technical specifications and should also include any allowed accident induced leakage rates for specific types of degradation at specific locations associated with tube plugging [or repair] criteria.

[The following alternate tube plugging [or repair] criteria may be applied as an alternative to the 40% depth based criteria:

1. . . .]

----------REVIEWER'S NOTE----------
The bracketed phrase in Paragraph d regarding exempt portions of the tube is only applicable to SGs with Alloy 600 thermally treated tubing.
---

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet [except for any portions of the tube that are exempt from inspection by alternate repair criteria], and that may satisfy the applicable tube plugging [or repair] criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. A degradation assessment shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

----------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. The third Item 2 is applicable to SGs with Alloy 690 thermally treated tubing.
---

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

[2. After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 24 effective full power months, which defines the inspection period.]

[2. After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 54 effective full power months, which defines the inspection period. If none of the SG tubes have ever experienced cracking other than in regions that are exempt from inspection by alternate repair criteria and the SG inspection was performed with enhanced probes, the inspection period may be extended to 72 effective full power months. Enhanced probes have a capability to detect flaws of any type equivalent to or better than array probe technology. The enhanced probes shall be used from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet except any portions of the tube that are exempt from inspection by alternate repair criteria. If there are regions where enhanced probes cannot be used, the tube inspection techniques shall be capable of detecting all forms of existing and potential degradation in that region.]

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

[2. After the first refueling outage following SG installation, inspect 100% of the tubes in each SG at least every 96 effective full power months, which defines the inspection period.]

----------REVIEWER'S NOTE----------
The bracketed phrases in Paragraph 3 are only applicable to SGs with Alloy 600 thermally treated tubing.
---

3. If crack indications are found in any SG tube [excluding any region that is exempt from inspection by alternate repair criteria], then the next inspection for each affected and potentially affected SG for the degradation mechanism that caused the crack indication shall be at the next refueling outage [, but may be deferred to the following refueling outage if the 100% inspection of all SGs was performed with enhanced probes as described in paragraph d.2]. If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary to secondary LEAKAGE.

[f. Provisions for SG tube repair methods. SG tube repair methods shall provide the means to reestablish the RCS pressure boundary integrity of SG tubes without removing the tube from service. For the purposes of these Specifications, tube plugging is not a repair. All acceptable tube repair methods are listed below.

----------REVIEWER'S NOTE----------
Tube repair methods currently permitted by plant technical specifications are to be listed here. The description of these tube repair methods should be equivalent to the descriptions in current technical specifications. If there are no approved tube repair methods, this section should not be used.
---

1. . . .]

5.5.9 Secondary Water Chemistry Program

This program provides controls for monitoring secondary water chemistry to inhibit SG tube degradation and low pressure turbine disc stress corrosion cracking. The program shall include:

a. Identification of a sampling schedule for the critical variables and control points for these variables,

5.6 Reporting Requirements

5.6.4 RCS PRESSURE AND TEMPERATURE LIMITS REPORT (continued)

7. The minimum temperature requirements of Appendix G to 10 CFR Part 50 shall be incorporated into the pressure and temperature limit curves.

8. Licensees who have removed two or more capsules should compare for each surveillance material the measured increase in reference temperature (RT_{NDT}) to the predicted increase in RT_{NDT}; where the predicted increase in RT_{NDT} is based on the mean shift in RT_{NDT} plus the two standard deviation value ($2\sigma_{\Delta}$) specified in Regulatory Guide 1.99, Revision 2. If the measured value exceeds the predicted value (increase RT_{NDT} + $2\sigma_{\Delta}$), the licensee should provide a supplement to the PTLR to demonstrate how the results affect the approved methodology.

5.6.5 Post Accident Monitoring Report

When a report is required by Condition B or F of LCO 3.3.[3], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

[5.6.6 Tendon Surveillance Report

Any abnormal degradation of the containment structure detected during the tests required by the Pre-stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.]

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:

a. The scope of inspections performed on each SG;

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;

c. For each degradation mechanism found:

1. The nondestructive examination techniques utilized;

5.6 Reporting Requirements

5.6.7 Steam Generator Tube Inspection Report (continued)

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported;

3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;

4. The number of tubes plugged [or repaired] during the inspection outage; and

[5. The repair methods utilized and the number of tubes repaired by each repair method.]

d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;

e. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each SG;

f. The results of any SG secondary side inspections; and

[g. Insert any plant-specific reporting requirements, if applicable.]