Progress Energy

Crystal River Nuclear Plant
Docket No. 50-302
Operating License No. DPR-72

Ref: 10 CFR 50.90

August 28, 2008
3F0808-01

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

Subject: Crystal River Unit 3 – License Amendment Request #301, Revision 0: Application to Modify Improved Technical Specifications for Replacement Steam Generators

References: NRC to Crystal River Unit 3 Letter dated May 16, 2007, "Crystal River Unit 3 - Issuance of Amendment Regarding Steam Generator Tube Inspection Program (TAC NO. MD2054)"

Dear Sir:

In accordance with the provisions of 10 CFR 50.90, Florida Power Corporation (FPC), doing business as Progress Energy Florida, Inc., hereby provides License Amendment Request (LAR) #301, Revision 0. The proposed amendment would revise the Crystal River Unit 3 (CR-3) Improved Technical Specification (ITS) requirements related to steam generator tube integrity for replacement steam generators.

By the letter referenced above, License Amendment #223 was approved for CR-3. That Amendment implemented Revision 4 to Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler 449 (TSTF-449) for the existing Once Through Steam Generators (OTSGs). This LAR seeks implementation of the TSTF-449 inspection requirements for the replacement OTSGs which are being installed during the CR-3 Fall 2009 Refueling Outage. The replacement OTSGs differ from the existing OTSGs in that the tube material is Alloy 690 Thermally Treated (TT) in the replacements versus Alloy 600 in the existing OTSGs. The inspection requirements for Alloy 690 TT material permit longer periods between 100% tube population inspections and between individual OTSG inspections. Additionally, this LAR removes inspection requirements that are designated for specific damage conditions in the existing OTSGs, removes tube repair techniques approved by previous License Amendments for the existing OTSGs, and removes inspection and reporting requirements specific to those repair techniques.

Progress Energy Florida, Inc.
Crystal River Nuclear Plant
15760 W. Powerline Street
Crystal River, FL 34428

A001
NRR

Attachment A provides a description of the proposed change and confirmation of applicability. Attachment B provides the existing ITS pages marked-up to show the proposed change, and Attachment C provides those same changes presented more formally with revision bars. Attachments D and E provide similar format for the related Bases sections.

FPC requests approval of the proposed license amendment by August 28, 2009, with the amendment to be implemented upon startup from Refueling Outage 16R.

In accordance with 10 CFR 50.91, a copy of this application with enclosures is being provided to the designated Florida State Official.

The CR-3 Plant Nuclear Safety Committee has reviewed this request and recommended it for approval.

No new regulatory commitments are made in this letter.

If you have any questions regarding this submittal, please contact Mr. Daniel Westcott, Supervisor, Licensing and Regulatory Programs at (352) 563-4796.

Sincerely,

Dale E. Young
Vice President
Crystal River Nuclear Plant

DEY/scp

Attachments:
- A. Description and Assessment
- B. Proposed Improved Technical Specification Changes (Mark-up)
- C. Proposed Improved Technical Specification Changes (Revision Bar Format)
- D. Proposed Improved Technical Specification Bases Pages (Mark-up)
- E. Proposed Improved Technical Specification Bases Pages (Revision Bar Format)

xc: NRR Project Manager
Regional Administrator, Region II
Senior Resident Inspector
State Contact

STATE OF FLORIDA

COUNTY OF CITRUS

Dale E. Young states that he is the Vice President, Crystal River Nuclear Plant for Florida Power Corporation, doing business as Progress Energy Florida, Inc.; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission the information attached hereto; and that all such statements made and matters set forth therein are true and correct to the best of his knowledge, information, and belief.

Dale E. Young
Vice President
Crystal River Nuclear Plant

The foregoing document was acknowledged before me this 28 day of August, 2008, by Dale E. Young.

Signature of Notary Public
State of Florida

ELLEN DEPPOLDER
MY COMMISSION # DD 408539
EXPIRES: July 8, 2009
Bonded Thru Notary Public Underwriters

(Print, type, or stamp Commissioned
Name of Notary Public)

Personally Known ✓ -OR- Produced Identification _____

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50-302 / LICENSE NUMBER DPR-72

LICENSE AMENDMENT REQUEST #301, Revision 0

Application to Modify Improved Technical Specifications For Replacement Steam Generators

ATTACHMENT A

Description and Assessment

Description and Assessment

1.0 INTRODUCTION

By letter dated May 16, 2007, License Amendment #223 was approved for CR-3. That Amendment implemented Revision 4 to Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler 449 (TSTF-449) for the existing Once Through Steam Generators (OTSGs). This LAR seeks implementation of the TSTF-449 inspection requirements for the replacement OTSGs which are being installed during the CR-3 Fall 2009 Refueling Outage. The replacement OTSGs differ from the existing OTSGs in that the tube material is Alloy 690 Thermally Treated (TT) in the replacements versus Alloy 600 in the existing OTSGs. The inspection requirements for Alloy 690 TT material permit longer periods between 100% tube population inspections and between individual OTSG inspections. Additionally, this LAR removes inspection requirements that are designated for specific damage conditions in the existing OTSGs, removes tube repair techniques approved by previous License Amendments for the existing OTSGs, and removes inspection and reporting requirements specific to those repair techniques.

The elements of TSTF-449 regarding the Improved Technical Specification (ITS) definition of LEAKAGE and ITS 3.4.12, RCS [Reactor Coolant System] Operational LEAKAGE, were incorporated into the CR-3 ITS by License Amendment #223. Those elements are consistent with this proposed change. Since those elements are integral to the overall maintenance of replacement OTSG tube integrity, reference to them in the Federal Register Notice (Reference 1) discussions applicable to Sections 3.0 through 6.0 and 9.0 below continues to remain appropriate.

2.0 DESCRIPTION OF PROPOSED AMENDMENT

The proposed ITS changes include:

- Revised ITS 3.4.16, Steam Generator (OTSG) Tube Integrity
- Revised ITS 5.6.2.10, Steam Generator (OTSG) Program
- Revised ITS 5.7.2, Special Reports

The revisions are necessary due to two factors. The inspection frequency for Alloy 690 TT tube material, as defined in TSTF-449, differs from the inspection frequency for Alloy 600, and the tube repair processes and products in the existing Technical Specifications are not applicable to the replacement OTSGs.

ITS 3.4.16 is revised to remove references to 'repair' of steam generator tubes. There are no repair processes approved for the replacement OTSGs.

ITS 5.6.2.10 is revised to change the tube inspection frequency, as specified in TSTF-449, from that applicable to Alloy 600 to that applicable to Alloy 690 TT.

ITS 5.6.2.10 is revised to delete information on repair techniques and inspection requirements specific to tube repairs, and ITS 5.7.2 is revised to remove reporting requirements associated with the deleted repair techniques.

ITS 5.6.2.10 is also revised to delete inspection requirements that are designated for specific damage conditions in the existing OTSGs.

Proposed revisions to the ITS Bases are also included in this application for information only. As discussed in the NRC's model safety evaluation, adoption of the revised ITS Bases associated with TSTF-449, Revision 4, is an integral part of implementing this ITS improvement. The changes to the affected ITS Bases pages will be incorporated in accordance with the CR-3 ITS Bases Control Program.

3.0 BACKGROUND

The background for this application is adequately addressed by the NRC Notice of Availability published on May 6, 2005 (70 FR 24126), the NRC Notice for Comment published on March 2, 2005 (70 FR 10298), and TSTF-449, Revision 4.

The repair processes in the current CR-3 Technical Specifications were specifically approved for the existing OTSGs based on their history of operation, tube and tubesheet materials, and tube to tubesheet geometry. The analyses that form the basis for the approval of those repair processes are not applicable to the replacement OTSGs.

4.0 REGULATORY REQUIREMENTS AND GUIDANCE

The applicable regulatory requirements and guidance associated with this application are adequately addressed by the NRC Notice of Availability published on May 6, 2005 (70 FR 24126), the NRC Notice for Comment published on March 2, 2005 (70 FR 10298), and TSTF-449, Revision 4.

5.0 TECHNICAL ANALYSIS

Florida Power Corporation (FPC) has reviewed the safety evaluation published on March 2, 2005 (70 FR 10298) as part of the Consolidated Line Item Improvement Program (CLIIP) Notice for Comment. This included the NRC staff's Safety Evaluation (SE), the supporting information provided in TSTF-449, and the changes associated with Revision 4 to TSTF-449. FPC has concluded that the justifications presented in the TSTF proposal and the SE prepared by the NRC staff are applicable to CR-3 and justify this amendment for the incorporation of the changes to the CR-3 ITS.

Calculations performed by the manufacturer of the replacement OTSGs have confirmed the acceptability of the 40% through wall tube plugging limit proposed in this LAR. Those calculations were performed in accordance with the guidance and recommendations of Regulatory Guide 1.121, August 1976, "Bases for Plugging Degraded PWR Steam Generator Tubes," and Electric Power Research Institute (EPRI)

Report 1001191, January 2001, "Steam Generator Degradation Specific Management Flaw Handbook."

The proposed 100% inspection frequency and maximum interval for inspecting an OTSG are in accordance with TSTF-449 for steam generators with Alloy 690 TT tube material.

There are no repair processes approved for the replacement OTSGs, therefore, the reference to repair in ITS 3.4.16, the application of repair processes in ITS 5.6.2.10, and the reporting requirements in ITS 5.7.2 must be removed. Additionally, inspection requirements that are designated for specific damage conditions in the existing OTSGs must be removed from ITS 5.6.2.10

6.0 REGULATORY ANAYLSIS

A description of this proposed change and its relationship to applicable regulatory requirements and guidance was provided in the NRC Notice of Availability published on May 6, 2005 (70 FR 24126), the NRC Notice for Comment published on March 2, 2005 (70 FR 10298), and TSTF-449, Revision 4.

6.1 Verification and Commitments

The following information is provided to support the NRC staff's review of this amendment application:

Plant Name, Unit No.	*Crystal River Unit 3*	
Steam Generator Model(s):	*CR-3 Replacement OTSG*	
Effective Full Power Years (EFPY) of service for currently installed OTSGs	*New at startup from Refueling Outage 16R*	
Tubing Material	*Alloy 690 TT (Thermally Treated)*	
Number of tubes per OTSG	*15,607*	
Number and percentage of tubes plugged in each replacement OTSG	*OTSG A* *0 (0%) **	*OTSG B* *0 (0%) **
Number of Tubes repaired in each replacement OTSG	*OTSG A* *N/A*	*OTSG B* *N/A*
Degradation mechanism(s) identified	- *None*	
Current primary-to-secondary leakage limits:	Per SG: *150 gallons per day (gpd) per LCO 3.4.12.d* Total: *No total limit specified in ITS* Temperature condition leakage is evaluated at: *room temperature*	
Approved Alternate Tube Repair Criteria (ARC):	- *None*	

Approved replacement OTSG Tube Repair Methods	- *None*
Performance criteria for accident leakage	- Primary to secondary leak rate values assumed in licensing basis accident analysis, including assumed temperature conditions: *1 gpm at accident temperature assumed in the CR-3 Final Safety Analysis Report*

* These are the nominal values for new generators; however, pre-service inspections may identify tubes with fabrication induced flaws that require plugging. The number of tubes requiring plugging is expected to be minimal and inconsequential.

7.0 NO SIGNIFICANT HAZARDS CONSIDERATION

The proposed License Amendment Request (LAR) revises the Crystal River Unit 3 (CR-3) Improved Technical Specification (ITS) 3.4.16, Steam Generator (OTSG) Tube Integrity, ITS 5.6.2.10, Steam Generator (OTSG) Program, and ITS 5.7.2, Special Reports. The proposed changes are necessary to revise the current CR-3 Technical Specifications for replacement OTSGs to be installed in 2009.

Florida Power Corporation (FPC), doing business as Progress Energy Florida, Inc., has evaluated the proposed LAR against the criteria of 10 CFR 50.92(c) to determine if any significant hazards consideration is involved. FPC has concluded that this proposed LAR does not involve a significant hazards consideration. The following is a discussion of how each of the 10 CFR 50.92(c) criteria is satisfied.

Criterion 1 - The Proposed Change Does Not Involve a Significant Increase in the Probability or Consequences of an Accident Previously Evaluated.

The proposed change for replacement OTSGs continues to implement the current OTSG Program that includes performance criteria which provide reasonable assurance that the replacement OTSG tubing will retain integrity over the full range of operating conditions (including startup, operation in the power range, hot standby, cooldown and all anticipated transients included in the design specifications). This change removes repair criteria from the OTSG Program that were approved by previous License Amendments for the existing Steam Generators which are not applicable to the replacement OTSGs. It removes references to use of repairs and reporting of repair results in other Technical Specification sections. This change removes inspection requirements that are designated for specific damage conditions in the existing OTSGs. The change also revises the inspection interval for 100% inspections of OTSG tubes and the maximum interval for inspection of a single OTSG consistent with Technical Specification Task Force Item 449 for the Alloy 690 tube material in the replacement OTSGs. The current 100% inspection interval and maximum individual OTSG inspection interval for Alloy 600 material and the revised intervals for Alloy 690 material are considered to be equivalent for detecting tube degradation in the improved Alloy 690 material.

This change continues to implement steam generator performance criteria for tube structural integrity, accident induced leakage, and operational leakage for the replacement OTSGs. Meeting the performance criteria provides reasonable assurance that the replacement OTSG tubing will remain capable of fulfilling its specific safety function of maintaining reactor coolant pressure boundary integrity throughout each operating cycle and in the unlikely event of a design basis accident. The performance criteria are only a part of the OTSG Program required by the existing ITS. The program, defined by NEI 97-06, Steam Generator Program Guidelines, includes a framework that incorporates a balance of prevention, inspection, evaluation, repair, and leakage monitoring. These features will continue to be implemented as they are currently approved. The proposed changes do not, therefore, significantly increase the probability of an accident previously evaluated.

The consequences of design basis accidents are, in part, functions of the DOSE EQUIVALENT I-131 in the primary coolant and the primary to secondary LEAKAGE rates resulting from an accident. Therefore, limits are included in the plant technical specifications for operational leakage and for DOSE EQUIVALENT I-131 in the primary coolant to ensure the plant is operated within its analyzed condition. The analysis of the limiting design basis accident assumes that the primary to secondary leak rate, after the accident, is 1 gallon per minute with no more than 150 gallons per day in any one SG, and that the reactor coolant activity levels of DOSE EQUIVALENT I-131 are at the TS values before the accident. The proposed change to the OTSG inspection program does not affect the design of the OTSGs, their method of operation, operational leakage limits, or primary coolant chemistry controls. The proposed change does not adversely impact any other previously evaluated design basis accident. In addition, the proposed changes do not affect the consequences of a Main Steam Line Break, rod ejection, or a reactor coolant pump locked rotor event, or other previously evaluated accident. Therefore, the proposed change does not affect the consequences of a Steam Generator Tube Rupture accident and the probability of such an accident is unchanged.

Criterion 2 - The Proposed Change Does Not Create the Possibility of a New or Different Kind of Accident from any Previously Evaluated.

The proposed license amendment does not affect the design of the OTSGs, their method of operation, or primary or secondary coolant chemistry controls. In addition, the proposed amendment does not impact any other plant system or component. The change modifies existing OTSG inspection requirements for 100% inspection intervals, but establishes inspection requirements that are considered equivalent based on properties and experience with improved materials. Therefore, the proposed change does not create the possibility of a new or different type of accident from any accident previously evaluated.

Criterion 3 - The Proposed Change Does Not Involve a Significant Reduction in the Margin of Safety.

The steam generator tubes in pressurized water reactors are an integral part of the reactor coolant pressure boundary and, as such, are relied upon to maintain the primary system's

pressure and inventory. As part of the reactor coolant pressure boundary, the steam generator tubes are unique in that they are also relied upon as a heat transfer surface between the primary and secondary systems such that residual heat can be removed from the primary system. In addition, the steam generator tubes isolate the radioactive fission products in the primary coolant from the secondary system. In summary, the safety function of a steam generator is maintained by ensuring the integrity of its tubes. Steam generator tube integrity is a function of the design, environment, and the physical condition of the tube. The proposed change to the OTSG inspection program does not affect tube design or operating environment. The existing OTSG Program is maintained in this change. The repair criteria that are being removed are specific to the existing OTSGs and are not applicable to the replacement OTSGs. In the case of the roll repair that is being removed, it potentially leads to additional cracking over subsequent operating cycles due to tube cold working during the re-roll. If tube defects are detected that exceed limits in the new generators, then the tube will be removed from service. This is considered a more effective means for removing defects than repairs. For the above reasons, the margin of safety is not changed and overall plant safety will be enhanced by the proposed change to the ITS. Based upon the reasoning presented above and the previous discussion of the amendment request, the requested change does not involve a significant hazards consideration.

8.0 ENVIRONMENTAL EVALUATION

10 CFR 51.22(c)(9) provides criteria for and identification of licensing and regulatory actions eligible for categorical exclusion from performing an environmental assessment. A proposed amendment to an operating license for a facility requires no environmental assessment if the amendment changes a requirement with respect to use of a facility component within the restricted area provided that (i) the amendment involves no significant hazards consideration, (ii) there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite, and (iii) there is no significant increase in individual or cumulative occupational radiation exposure.

Florida Power Corporation (FPC) has reviewed this License Amendment Request (LAR) and has determined that it meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22, no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of the proposed license amendment. The basis for this determination is that for this amendment:

(i) The proposed license amendment does not involve a significant hazards consideration, as described in the significant hazards evaluation.

(ii) The proposed license amendment does not result in a significant change or significant increase in the release associated with any Design Basis Accident. This is an administrative change governing the inspection of replacement Once Through Steam Generators (OTSGs) that ensures the continued integrity of the replacement OTSG tubes to prevent the release of radioactivity from the primary coolant to the secondary plant. Likewise, there will be no significant change in the types or a

significant increase in the amounts of any effluents released offsite during normal operation.

(iii) This change to the OTSG Program will continue to ensure the integrity of the replacement OTSG tubes and will not change the manner in which the OTSGs are operated. Therefore, the proposed LAR does not result in a significant increase to the individual or cumulative occupational radiation exposure.

9.0 PRECEDENT

This application is being made in accordance with TSTF-449. FPC is not proposing variations or deviations from the ITS changes described in TSTF-449, Revision 4, or the NRC staff's model SE published on March 2, 2005 (70 FR 10298).

Crystal River Unit 3 (CR-3) has identified the following three precedents for the 100% inspection frequency proposed in this LAR. These precedents are deemed appropriate for the CR-3 replacement OTSGs with Alloy 690 tube material since the previous approvals are for replacement Steam Generators with Alloy 690 tube material. The precedent Safety Evaluations are: Arkansas Nuclear One, Unit 1, dated August 10, 2005 (ML052070556), Callaway dated September 29, 2005 (ML052570054), and Sequoyah, Unit 1 dated February 23, 2006 (ML060120099).

10.0 REFERENCES

1. Federal Register Notice for Comment published on March 2, 2005 (70 FR 10298)

2. Federal Register Notice of Availability published on May 6, 2005 (70 FR 24126)

3. U. S. Nuclear Regulatory Commission Regulatory Guide 1.121, August 1976, "Bases for Plugging Degraded PWR Steam Generator Tubes"

4. Electric Power Research Institute (EPRI) Report 1001191, January 2001, "Steam Generator Degradation Specific Management Flaw Handbook"

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50-302 / LICENSE NUMBER DPR-72

LICENSE AMENDMENT REQUEST #301, Revision 0

Application to Modify Improved Technical Specifications For Replacement Steam Generators

ATTACHMENT B

Proposed Improved Technical Specification Changes (Mark-up)

~~Strikeout text~~ indicates deleted text.
Highlighted text indicates added text.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.16 Steam Generator (OTSG) Tube Integrity

LCO 3.4.16 OTSG tube integrity shall be maintained.

AND

All OTSG tubes satisfying the tube 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 OTSG tube.

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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.16.1	Verify OTSG tube integrity in accordance with the Steam Generator Program.	In accordance with the Steam Generator Program
SR 3.4.16.2	Verify that each inspected OTSG tube that satisfies the tube repair criteria is plugged ~~or repaired~~ in accordance with the Steam Generator Program.	Prior to entering MODE 4 following a OTSG tube inspection

5.6 Procedures, Programs and Manuals

5.6.2.10 Steam Generator (OTSG) Program

A Steam Generator Program shall be established and implemented to ensure that OTSG tube integrity is maintained. In addition, the 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 OTSG 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 OTSG tubes are inspected~~,~~ and plugged~~, or repaired~~ to confirm that the performance criteria are being met.

b. Performance criteria for OTSG tube integrity. OTSG 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 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.

(continued)

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Program (continued)

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

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.12, "RCS Operational LEAKAGE."

c. Provisions for OTSG tube repair criteria. ~~Tubes shall be plugged if the sleeved region of a tube is found by inservice inspection to contain flaws in the (a) sleeve or (b) the pressure boundary portion of the original tube wall in the sleeve/tube assembly.~~

~~The non-sleeved region of a~~ A tube 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 except if the flaws are permitted to remain in service through application of an alternate tube repair criteria discussed below.~~

~~The following alternate tube repair criteria may be applied as an alternative to the 40% depth based criteria:~~

~~1. Pit-like Intergranular Attack (IGA) indication means a bobbin coil indication confirmed by Motorized Rotating Pancake Coil (MRPC) or other qualified inspection techniques to have a volumetric, pit-like morphology characteristic of IGA. Inservice tubes with pit-like IGA indications in the first span of the B OTSG are acceptable provided the depth of the indication is less than 40% of the nominal tube wall thickness. Inservice tubes with pit-like IGA indications in the first span of the B OTSG with a depth equal to or exceeding 40% of the nominal tube wall thickness shall be plugged.~~

(continued)

~~5.6 Procedures, Programs and Manuals~~

~~5.6.2.10 OTSG Program (continued)~~

~~2. Tube End Cracks (TEC) are those crack-like eddy current indications, circumferentially and/or axially oriented, that are within the Inconel clad region of the primary face of the upper and lower tubesheets, but do not extend into the carbon steel-to Inconel clad interface. Tubes with axially oriented TEC may be left in-service using the method described in Topical Report BAW-2346P, Revision 0, provided the combined projected leakage from all sources of primary-to-secondary leakage, including axial TEC indications left in-service, does not exceed the Main Steam Line Break (MSLB) accident leakage limit of one gallon per minute, minus 150 gallons per day, per OTSG. The contribution to MSLB leakage rates from TEC indications shall be determined utilizing the methodology in Addendum B dated August 10, 2005 to Topical Report BAW-2346P, Revision 0. The projection of TEC leakage that may develop during the next operating cycle shall be determined using the methodology in Addendum C dated August 30, 2005 to Topical Report BAW-2346P, Revision 0.~~

~~Tubes identified with TEC that are allowed to remain in service under the alternate repair criteria will be added to the existing list of tubes in the OTSG Inservice Inspection Surveillance Procedure. The inspection data for tubes with axially oriented TEC indications shall be compared to the previous inspection data to monitor the indications for growth.~~

~~Tubes with crack-like indications within the carbon steel portion of the tubesheet, circumferentially oriented TEC, or volumetric indications within the Inconel clad region of the tubesheet shall be repaired using the appropriate method from 5.6.2.10.f or removed from service by plugging the tube.~~

(continued)

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Program (continued)

d. Provisions for OTSG tube inspections. Periodic OTSG 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 repair criteria. The tube-to-tubesheet weld is not part of the tube. ~~In tubes repaired by sleeving, the portion of the original tube wall between the sleeve's joints is not an area requiring re-inspection.~~ In addition to meeting the requirements of d.1 through d.83 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that OTSG tube integrity is maintained until the next OTSG inspection. An assessment of degradation 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 OTSG during the first refueling outage following OTSG replacement.

2. Inspect 100% of the tubes at sequential periods of 144, 108, 72, and, thereafter, 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the OTSGs. 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 OTSG shall operate for more than ~~24~~ 72 effective full power months or ~~one~~ three refueling outages (whichever is less) without being inspected.

3. If crack indications are found in any OTSG tube, then the next inspection for each OTSG for the degradation mechanism that caused the crack indication shall 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.

(continued)

~~5.6 Procedures, Programs and Manuals~~

~~5.6.2.10 OTSG Program (continued)~~

~~4. Inservice tubes with pit-like IGA indications in the first span of the B OTSG must be inspected with bobbin and Motorized Rotating Pancake Coil (MRPC) eddy current techniques from the lower tube sheet secondary face to the bottom of the first tube support plate during each inservice inspection of the B OTSG.~~

~~Inservice tubes with pit-like IGA indications in the "B" OTSG first span shall be monitored for growth of these indications by using a test probe equivalent to the high frequency bobbin probe used in the 1997 inspection. The indicated percentage through-wall value from the current inspection shall be compared to the indicated percentage through-wall value from the 1997 inspection.~~

~~5. Tubes in-service with axially oriented tube end cracks (TEC) are identified in the OTSG Inservice Inspection Surveillance Procedure. The portion of the tube with the axial TEC must be inspected using the motorized rotating coil eddy current technique every 24 effective full power months or one refueling outage, whichever is less.~~

~~6. If the plant is required to shut down due to primary-to-secondary leakage and the cause is determined to be degradation of the TEC portion of the tubes, 100% of the tubes with TEC in that OTSG shall be examined in the location of the TEC. If more than 1% of the examined tubes satisfy the tube repair criteria, 100% of the tubes with TEC in the other OTSG shall be examined in the location of the TEC.~~

~~7. The repair roll in each tube will be inspected every 24 effective full power months or one refueling outage (whichever is less) while the tube with a repair roll is in service.~~

~~8. If the plant is required to shut down due to primary-to-secondary leakage and the cause is determined to be a flaw in a repair roll, 100% of the repair rolls in both OTSGs shall be examined.~~

(continued)

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Program (continued)

e. Provisions for monitoring operational primary to secondary LEAKAGE.

~~f. Provisions for OTSG tube repair methods. Steam generator tube repair methods shall provide the means to reestablish the RCS pressure boundary integrity of OTSG 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.~~

~~1. Sleeve installation in accordance with the B&W process (or method) described in report BAW-2120P. No more than five thousand sleeves may be installed in each OTSG.~~

~~2. Installation of repair rolls in the upper and lower tubesheets in accordance with BAW-2303P, Revision 4. The repair process (single, overlapping, or multiple roll) may be performed in each tube. The repair roll area will be examined using eddy-current methods following installation. The repair roll must be free of flaws for the repair to be considered acceptable. If the repair roll is unacceptable, the tube must be repaired or plugged.~~

5.7 Reporting Requirements

5.7.2 Special Reports (continued)

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

6. Total number and percentage of tubes plugged ~~or repaired~~ to date,

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

~~8. The effective plugging percentage for all plugging and tube repairs in each OTSG,~~

~~9. Repair method utilized and the number of tubes repaired by each repair method,~~

~~10. Location, bobbin coil amplitude, and axial and circumferential extent (if determined) for each first span IGA indication, and an assessment of growth for indications in the first span of OTSG B, and~~

~~11. Number of as-found and as-left tubes with TEC indications, number of as-found and as-left TEC indications, the number of as-found and as-left TEC indications as a function of tubesheet radius, the as-found, as-left, probability of detection and new TEC leakage for upper and lower tubesheet indications. The projected accident leakage and an assessment of growth for TEC indications will be provided. An assessment of the adequacy of the predictive methodology in Addendum C to Topical Report BAW-2346P, Revision 0, including assessing the distribution of indications found in each OTSG to ensure the assumption regarding the similarity of the distribution of indications remain consistent from one cycle to the next and that the assumption of a linear increase in leak rate remain valid. Corrective actions in the event that the assessment indicates the assumptions can not be fully supported.~~

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ATTACHMENT C

Proposed Improved Technical Specification Changes (Revision Bar Format)

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.16 Steam Generator (OTSG) Tube Integrity

LCO 3.4.16 OTSG tube integrity shall be maintained.

AND

All OTSG tubes satisfying the tube repair criteria shall be plugged in accordance with the Steam Generator Program.

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

ACTIONS

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

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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.16.1	Verify OTSG tube integrity in accordance with the Steam Generator Program.	In accordance with the Steam Generator Program
SR 3.4.16.2	Verify that each inspected OTSG tube that satisfies the tube repair criteria is plugged in accordance with the Steam Generator Program.	Prior to entering MODE 4 following a OTSG tube inspection

5.6 Procedures, Programs and Manuals

5.6.2.10 Steam Generator (OTSG) Program

A Steam Generator Program shall be established and implemented to ensure that OTSG tube integrity is maintained. In addition, the 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 OTSG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging of tubes. Condition monitoring assessments shall be conducted during each outage during which the OTSG tubes are inspected and plugged to confirm that the performance criteria are being met.

b. Performance criteria for OTSG tube integrity. OTSG 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 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.

(continued)

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Program (continued)

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

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.12, "RCS Operational LEAKAGE."

c. Provisions for OTSG tube repair criteria. A tube found by inservice inspection to contain flaws with a depth equal to or exceeding 40% of the nominal tube wall thickness shall be plugged.

d. Provisions for OTSG tube inspections. Periodic OTSG 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 repair criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1 through d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that OTSG tube integrity is maintained until the next OTSG inspection. An assessment of degradation 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 OTSG during the first refueling outage following OTSG replacement.

2. Inspect 100% of the tubes at sequential periods of 144, 108, 72, and, thereafter, 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the OTSGs. In addition, inspect 50% of the tubes by the refueling outage nearest the midpoint

(continued)

5.6.2.10 OTSG Program (continued)

of the period and the remaining 50% by the refueling outage nearest the end of the period. No OTSG shall operate for more than 72 effective full power months or three refueling outages (whichever is less) without being inspected.

3. If crack indications are found in any OTSG tube, then the next inspection for each OTSG for the degradation mechanism that caused the crack indication shall 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.

e. Provisions for monitoring operational primary to secondary LEAK

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5.7 Reporting Requirements

5.7.2 Special Reports (continued)

5. Number of tubes plugged during the inspection outage for each active degradation mechanism,

6. Total number and percentage of tubes plugged to date,

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

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ATTACHMENT D

Proposed Improved Technical Specification Bases Pages (Mark-up)

~~Strikeout text~~ indicates deleted text.
Highlighted text indicates added text.

BASES

BACKGROUND (continued)

performance criteria are described in Specification 5.6.2.10. Meeting the OTSG performance criteria provides reasonable assurance of maintaining tube integrity at normal and accident conditions.

The processes used to meet the OTSG performance criteria are defined by the Steam Generator Program Guidelines (Ref. 1).

APPLICABLE SAFETY ANALYSES

The steam generator tube rupture (SGTR) accident is the limiting design basis event for OTSG 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 3.4.12, "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 OTSG 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 OTSGs of one gallon per minute or is assumed to increase to one 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 3.4.15, "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 50.67 (Ref. 3) or the NRC approved licensing bases (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 OTSG tube integrity be maintained. The LCO also requires that all OTSG tubes that satisfy the repair criteria be plugged ~~or repaired~~ in accordance with the Steam Generator Program.

(continued)

BASES

LCO (continued)

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

In the context of this Specification, an OTSG 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.

An OTSG tube has tube integrity when it satisfies the OTSG performance criteria. The OTSG performance criteria are defined in Specification 5.6.2.10, "Steam Generator Program," and describe acceptable OTSG tube performance. The Steam Generator Program also provides the evaluation process for determining conformance with the OTSG performance criteria.

There are three OTSG performance criteria: structural integrity, accident induced leakage, and operational LEAKAGE. Failure to meet any one of these criteria is considered failure to meet the LCO.

The structural integrity performance criterion provides a margin of safety against tube burst or collapse under normal and accident conditions, and ensures structural integrity of the OTSG tubes under all anticipated transients included in the design specification. Tube burst is defined as, "The gross structural failure of the tube wall. The condition typically corresponds to an unstable opening displacement (e.g., opening area increased in response to constant pressure) accompanied by ductile (plastic) tearing of the tube material at the ends of the degradation." Tube collapse is defined as, "For the load displacement curve for a given structure, collapse occurs at the top of the load versus displacement curve where the slope of the curve becomes zero." The structural integrity performance criterion provides guidance on assessing loads that have a significant effect on burst or collapse. In that context, the term "significant" is defined as "An accident loading condition other than differential pressure

(continued)

BASES

APPLICABILITY

Steam generator tube integrity is challenged when the pressure differential across the tubes is large. Large differential pressures across OTSG 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 OTSG tube. This is acceptable because the Required Actions provide appropriate compensatory actions for each affected OTSG tube. Complying with the Required Actions may allow for continued operation, and subsequent affected OTSG 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 OTSG tubes examined in an inservice inspection satisfy the tube repair criteria but were not plugged ~~or repaired~~ in accordance with the Steam Generator Program as required by SR 3.4.16.2. An evaluation of OTSG tube integrity of the affected tube(s) must be made. Steam generator tube integrity is based on meeting the OTSG performance criteria described in the Steam Generator Program. The OTSG repair criteria define limits on OTSG tube degradation that allow for flaw growth between inspections while still providing assurance that the OTSG performance criteria will continue to be met. In order to determine if an OTSG tube that should have been plugged ~~or repaired~~ has tube integrity, an evaluation must be completed that demonstrates that the OTSG performance criteria will continue to be met until the next refueling outage or OTSG 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 OTSG tube inspection. If it is determined that tube integrity is not being maintained, Condition B applies.

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

A Completion Time of 7 days is sufficient to complete the evaluation while minimizing the risk of plant operation with an OTSG 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 OTSG 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 OTSG 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 OTSG 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.

SURVEILLANCE REQUIREMENTS

SR 3.4.16.1

During shutdown periods the OTSGs 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 OTSG inspections a condition monitoring assessment of the OTSG tubes is performed. The condition monitoring assessment determines the "as found" condition of the OTSG tubes. The purpose of the condition monitoring assessment is to ensure that the OTSG performance criteria have been met for the previous operating period.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.16.1 (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 repair criteria. Inspection scope (i.e., which tubes or areas of tubing within the OTSG 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 3.4.16.1. The Frequency is determined by the operational assessment and other limits in the OTSG 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 OTSG performance criteria at the next scheduled inspection. In addition, Specification 5.6.2.10 contains prescriptive requirements concerning inspection intervals to provide added assurance that the OTSG performance criteria will be met between scheduled inspections.

SR 3.4.16.2

During an OTSG inspection, any inspected tube that satisfies the Steam Generator Program repair criteria is ~~repaired or~~ removed from service by plugging. The tube repair criteria delineated in Specification 5.6.2.10 are intended to ensure that tubes accepted for continued service satisfy the OTSG performance criteria with allowance for error in the flaw size measurement and for future flaw growth. In addition, the tube repair criteria, in conjunction with other elements of the Steam Generator Program, ensure that the OTSG 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 OTSG performance criteria.

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

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.16.2 (continued)

The Frequency of prior to entering MODE 4 following a OTSG inspection ensures that the Surveillance has been completed and all tubes meeting the repair criteria are plugged ~~or repaired~~ prior to subjecting the OTSG 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 50.67.
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."

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ATTACHMENT E

Proposed Improved Technical Specification Bases Pages (Revision Bar Format)

BASES

BACKGROUND (continued)

performance criteria are described in Specification 5.6.2.10. Meeting the OTSG performance criteria provides reasonable assurance of maintaining tube integrity at normal and accident conditions.

The processes used to meet the OTSG performance criteria are defined by the Steam Generator Program Guidelines (Ref. 1).

APPLICABLE SAFETY ANALYSES

The steam generator tube rupture (SGTR) accident is the limiting design basis event for OTSG 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 3.4.12, "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 OTSG 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 OTSGs of one gallon per minute or is assumed to increase to one 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 3.4.15, "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 50.67 (Ref. 3) or the NRC approved licensing bases (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 OTSG tube integrity be maintained. The LCO also requires that all OTSG tubes that satisfy the repair criteria be plugged in accordance with the Steam Generator Program.

(continued)

BASES

LCO (continued)

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

In the context of this Specification, an OTSG 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.

An OTSG tube has tube integrity when it satisfies the OTSG performance criteria. The OTSG performance criteria are defined in Specification 5.6.2.10, "Steam Generator Program," and describe acceptable OTSG tube performance. The Steam Generator Program also provides the evaluation process for determining conformance with the OTSG performance criteria.

There are three OTSG performance criteria: structural integrity, accident induced leakage, and operational LEAKAGE. Failure to meet any one of these criteria is considered failure to meet the LCO.

The structural integrity performance criterion provides a margin of safety against tube burst or collapse under normal and accident conditions, and ensures structural integrity of the OTSG tubes under all anticipated transients included in the design specification. Tube burst is defined as, "The gross structural failure of the tube wall. The condition typically corresponds to an unstable opening displacement (e.g., opening area increased in response to constant pressure) accompanied by ductile (plastic) tearing of the tube material at the ends of the degradation." Tube collapse is defined as, "For the load displacement curve for a given structure, collapse occurs at the top of the load versus displacement curve where the slope of the curve becomes zero." The structural integrity performance criterion provides guidance on assessing loads that have a significant effect on burst or collapse. In that context, the term "significant" is defined as "An accident loading condition other than differential pressure

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BASES

APPLICABILITY

Steam generator tube integrity is challenged when the pressure differential across the tubes is large. Large differential pressures across OTSG 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 OTSG tube. This is acceptable because the Required Actions provide appropriate compensatory actions for each affected OTSG tube. Complying with the Required Actions may allow for continued operation, and subsequent affected OTSG 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 OTSG tubes examined in an inservice inspection satisfy the tube repair criteria but were not plugged in accordance with the Steam Generator Program as required by SR 3.4.16.2. An evaluation of OTSG tube integrity of the affected tube(s) must be made. Steam generator tube integrity is based on meeting the OTSG performance criteria described in the Steam Generator Program. The OTSG repair criteria define limits on OTSG tube degradation that allow for flaw growth between inspections while still providing assurance that the OTSG performance criteria will continue to be met. In order to determine if an OTSG tube that should have been plugged has tube integrity, an evaluation must be completed that demonstrates that the OTSG performance criteria will continue to be met until the next refueling outage or OTSG 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 OTSG tube inspection. If it is determined that tube integrity is not being maintained, Condition B applies.

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

A Completion Time of 7 days is sufficient to complete the evaluation while minimizing the risk of plant operation with an OTSG 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 OTSG 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 prior to entering MODE 4 following the next refueling outage or OTSG 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 OTSG 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.

SURVEILLANCE REQUIREMENTS

SR 3.4.16.1

During shutdown periods the OTSGs 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 OTSG inspections a condition monitoring assessment of the OTSG tubes is performed. The condition monitoring assessment determines the "as found" condition of the OTSG tubes. The purpose of the condition monitoring assessment is to ensure that the OTSG performance criteria have been met for the previous operating period.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.16.1 (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 repair criteria. Inspection scope (i.e., which tubes or areas of tubing within the OTSG 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 3.4.16.1. The Frequency is determined by the operational assessment and other limits in the OTSG 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 OTSG performance criteria at the next scheduled inspection. In addition, Specification 5.6.2.10 contains prescriptive requirements concerning inspection intervals to provide added assurance that the OTSG performance criteria will be met between scheduled inspections.

SR 3.4.16.2

During an OTSG inspection, any inspected tube that satisfies the Steam Generator Program repair criteria is removed from service by plugging. The tube repair criteria delineated in Specification 5.6.2.10 are intended to ensure that tubes accepted for continued service satisfy the OTSG performance criteria with allowance for error in the flaw size measurement and for future flaw growth. In addition, the tube repair criteria, in conjunction with other elements of the Steam Generator Program, ensure that the OTSG 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 OTSG performance criteria.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.16.2 (continued)

The Frequency of prior to entering MODE 4 following a OTSG inspection ensures that the Surveillance has been completed and all tubes meeting the repair criteria are plugged prior to subjecting the OTSG 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 50.67.

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."