Progress Energy

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

Ref: 10 CFR 50.90

May 25, 2006
3F0506-03

50-302

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

Subject: Crystal River Unit 3 – License Amendment Request #264, Revision 0 Application to Modify Improved Technical Specifications Regarding Steam Generator Tube Integrity

References:

1. NRC Generic Letter 2006-01 dated January 20, 2006, "Steam Generator Tube Integrity and Associated Technical Specifications"
2. Crystal River Unit 3 to NRC Letter dated February 13, 2006, "Crystal River Unit 3 – 30-Day Response to NRC Generic Letter 2006-01, "Steam Generator Tube Integrity and Associated Technical Specifications"

Dear Sir:

In accordance with the provisions of 10 CFR 50.90, Florida Power Corporation (FPC), doing business as Progress Energy Florida, Inc. (PEF), hereby submits License Amendment Request #264, 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. This submittal is consistent with NRC-approved Revision 4 to Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler TSTF-449, "Steam Generator Tube Integrity." The availability of this ITS improvement was announced in the Federal Register on May 6, 2005 (70 FR 24126) as part of the consolidated line item improvement process (CLIIP).

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 formats for the related Bases sections.

PEF requests approval of the proposed license amendment by September 30, 2006, with the amendment to be implemented within ninety days of issuance.

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

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

A001

This letter establishes no new regulatory commitments.

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

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

Sincerely,

Dale E. Young
Vice President
Crystal River Nuclear Plant

DEY/dar

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 25th day of May, 2006, 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 #264, REVISION 0

Application to Modify Improved Technical Specifications Regarding Steam Generator Tube Integrity

ATTACHMENT A

Description and Assessment

Description and Assessment

1.0 INTRODUCTION

The proposed license amendment revises the requirements in the Crystal River Unit 3 (CR-3) Improved Technical Specification (ITS) related to steam generator tube integrity. The changes are consistent with NRC approved Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-449, "Steam Generator Tube Integrity," Revision 4. The availability of this technical specification improvement was announced in the Federal Register on May 6, 2005 as part of the consolidated line item improvement process (CLIIP).

2.0 DESCRIPTION OF PROPOSED AMENDMENT

Consistent with the NRC-approved Revision 4 of TSTF-449, the proposed ITS changes include:

- Revised ITS definition of LEAKAGE
- Revised ITS 3.4.12, RCS [Reactor Coolant System] Operational Leakage
- New ITS 3.4.16, Steam Generator (OTSG) Tube Integrity
- Revised ITS 5.6.2.10, Steam Generator (OTSG) Program
- Revised ITS 5.7.2.c, d, and e, Steam Generator Tube Inspection Report(s)

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

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

Progress Energy Florida, Inc. (PEF) has reviewed the safety evaluation (SE) published on March 2, 2005 (70 FR 10298) as part of the CLIIP Notice for Comment. This included the NRC staff's SE, the supporting information provided to support TSTF-449, and the changes associated with Revision 4 to TSTF-449. PEF 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.

6.0 REGULATORY ANALYSIS

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):	*177FA*	
Effective Full Power Years (EFPY) of service for currently installed OTSGs	*Approximately 19.2 as of Refuel 14 (Nov. 05)*	
Tubing Material	*Alloy 600 Stress Relieved*	
Number of tubes per OTSG	*15,531*	
Number and percentage of tubes plugged in each OTSG	*OTSG A* *351 (2.3%)*	*OTSG B* *862 (5.6%)*
Number of Tubes repaired in each OTSG *Tubes w/ sleeves (Inservice)* *Tubes w/ repair rolls (Inservice)*	*OTSG A* *159* *948*	*OTSG B* *156* *1401*
Degradation mechanism(s) identified	- *Primary Water Stress Corrosion Cracking (PWSCC)* - *Outside Diameter Intergranular Attack/Stress Corrosion Cracking (OD IGA/SCC)* - *Wear / Fretting / Thinning*	
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): 1. *First Span IGA*	- Approved by: *Amendment 158 dated 10/28/97* - Applicability: *Inservice tubes with pit-like IGA indications in the first span of OTSG B* - Any special limits on allowable accident leakage: *None* - Any exceptions or clarifications to the structural performance criteria that apply to the ARC: *None*
2. *Tube End Cracks (TECs)*	- Approved by: *Amendments 188 dated 10/01/99 and 222 dated 10/31/05* - Applicability: *Inservice tubes with axially-oriented TECs in either OTSG* - Any special limits on allowable accident leakage: *1 gallon per minute (gpm) minus 150 gpd for TECs combined with all other postulated accident leakage* - Any exceptions or clarifications to the structural performance criteria that apply to the ARC: *None*
Approved OTSG Tube Repair Methods 1. *Sleeves*	- Approved by: *Amendment 136 dated 09/11/91* - Applicability limits, if any: *(ITS 5.6.2.10.4.a.11.a) No more than five thousand sleeves may be installed in each OTSG.* - Repair criteria: *40% of the sleeve wall thickness*
2. *Repair Rolls*	- Approved by: *Amendment 198 dated 09/10/01* - Applicability limits, if any: *None.* - Repair criteria: *40% of the initial wall thickness*
Performance criteria for accident leakage	- Primary to secondary leak rate values assumed in licensing basis accident analysis, including assumed temperature conditions: *1 gpm at room temperature assumed in the CR-3 Final Safety Analysis Report*

7.0 NO SIGNIFICANT HAZARDS CONSIDERATION

PEF has reviewed the proposed no significant hazards consideration determination published on March 2, 2005 (70 FR 10298) as part of the CLIIP. PEF has concluded that the proposed determination presented in the notice is applicable to CR-3 and the determination is hereby incorporated by reference to satisfy the requirements of 10 CFR 50.91(a).

8.0 ENVIRONMENTAL EVALUATION

PEF has reviewed the environmental evaluation included in the model SE published on March 2, 2005 (70 FR 10298) as part of the CLIIP. PEF has concluded that the staff's findings presented in that evaluation are applicable to CR-3 and the evaluation is hereby incorporated by reference for this application.

9.0 PRECEDENT

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

10.0 REFERENCES

Federal Register Notices:

Notice for Comment published on March 2, 2005 (70 FR 10298)

Notice of Availability published on May 6, 2005 (70 FR 24126)

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50-302 / LICENSE NUMBER DPR-72

LICENSE AMENDMENT REQUEST #264, REVISION 0

Application to Modify Improved Technical Specifications Regarding Steam Generator Tube Integrity

ATTACHMENT B

Proposed Improved Technical Specification Changes (Mark-up)

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

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(continued)

(continued)

1.1 Definitions

LEAKAGE (continued)	3. Reactor Coolant System (RCS) LEAKAGE through a steam generator ~~(OTSG) tube~~ to the secondary system (primary to secondary LEAKAGE).
	b. Unidentified LEAKAGE All LEAKAGE that is not identified LEAKAGE.
	c. Pressure Boundary LEAKAGE LEAKAGE (except ~~OTSG tube leakage~~ primary to secondary LEAKAGE) through a non-isolable fault in an RCS component body, pipe wall, or vessel wall.
MODE	A MODE shall correspond to any one inclusive combination of core reactivity condition, power level, average reactor coolant temperature, and reactor vessel head closure bolt tensioning specified in Table 1.1-1.
NUCLEAR HEAT FLUX HOT CHANNEL FACTOR ($F_Q(Z)$)	$F_Q(Z)$ shall be the maximum local linear power density in the core divided by the core average fuel rod linear power density, assuming nominal fuel pellet and fuel rod dimensions.
NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR ($F^N_{\Delta H}$)	$F^N_{\Delta H}$ shall be the ratio of the integral of linear power along the fuel rod on which minimum departure from nucleate boiling ratio occurs to the average fuel rod power.
OPERABLE-OPERABILITY	A system, subsystem, train, component, or device shall be OPERABLE when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication and other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).
PHYSICS TESTS	PHYSICS TESTS shall be those tests performed to measure the fundamental nuclear characteristics of the reactor core and related instrumentation.

(continued)

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.12 RCS Operational LEAKAGE

LCO 3.4.12 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE;

b. 1 gpm unidentified LEAKAGE;

c. 10 gpm identified LEAKAGE; and

d. 150 gpd of primary to secondary LEAKAGE through any one steam generator (OTSG).

~~Two OTSGs shall be OPERABLE.~~

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RCS operational LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE or primary to secondary LEAKAGE.	A.1 Reduce LEAKAGE to within limits.	4 hours
B. Required Action and associated Completion Time not met. OR Pressure boundary LEAKAGE exists. OR Primary to secondary LEAKAGE not within limit.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.12.1	---------------NOTES---------------------- 1. Not required to be performed in MODE 4. Not required in MODE 3 until 12 hours of steady state operation. 2. Not applicable to primary to secondary LEAKAGE. -- Verify RCS operational LEAKAGE is within limits by performance of ~~Perform~~ RCS water inventory balance ~~during steady state operation~~.	72 hours
SR 3.4.12.2	--------------NOTE--------------------- Not required to be performed until 12 hours after establishment of steady state operation. -- ~~Verify steam generator tube integrity is in accordance with the Steam Generator Tube Surveillance Program.~~ Verify primary to secondary LEAKAGE is ≤ 150 gallons per day through any one steam generator.	~~In accordance with the Steam Generator Tube Surveillance Program.~~ 72 hours

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 (continued)~~

~~5.6.2.10 Steam Generator (OTSG) Tube Surveillance Program~~

~~Each OTSG shall be demonstrated OPERABLE by performance of the following augmented inservice inspection program.~~

~~1. Each OTSG shall be determined OPERABLE during shutdown by selecting and inspecting at least the minimum number of OTSGs specified in Table 5.6.2-1.~~

~~2. The OTSG tube minimum sample size, inspection result classification, and the corresponding action required shall be as specified in Table 5.6.2-2. The inservice inspection of OTSG tubes shall be performed at the frequencies specified in Specification 5.6.2.10.3 and the inspected tubes shall be verified acceptable per the acceptance criteria of Specification 5.6.2.10.4. The tubes selected for each inservice inspection shall include at least 3% of the total number of tubes in all OTSGs. The tubes selected for these inspections shall be selected on a random basis except:~~

~~a. Where experience in similar plants with similar water chemistry indicates critical areas to be inspected, then at least 50% of the tubes inspected shall be from these critical areas.~~

~~b. The first inservice inspection (subsequent to the preservice inspection) of each OTSG shall include:~~

~~1. All nonplugged tubes that previously had detectable wall penetrations (>20%), and~~

~~2. Tubes in those areas where experience has indicated potential problems.~~

~~c. The second and third inservice inspections may be less than a full tube inspection by concentrating (selecting at least 50% of the tubes to be inspected) the inspection on those areas of the tube sheet array and on those portions of the tubes where tubes with imperfections were previously found.~~

~~d. Tubes in specific limited areas which are distinguished by unique operating conditions or physical construction may be excluded from random samples if all such tubes~~

(continued)

~~5.6 Procedures, Programs and Manuals~~

~~5.6.2.10 OTSG Tube Surveillance Program (continued)~~

~~in the specific area of an OTSG are inspected with the inspection result classification and the corresponding action required as specified in Table 5.6.2-3. No credit will be taken for these tubes in meeting minimum sample size requirements. Degraded or defective tubes found in these areas will not be considered in determining the inspection results category as long as the mode of degradation is unique to that area and not random in nature.~~

~~e. Inservice tubes with pit-like IGA indications in the first span of the B OTSG, identified in the OTSG Inservice Inspection Surveillance Procedure, 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. No credit is to be taken for this inspection in meeting minimum sample size requirements for the random inspection. Defective tubes found during this inspection are to be plugged or sleeved. Degraded or defective tubes found during this inspection are not to be considered in determining the inspection results category for the random inspection, unless the degradation mechanism identified is a mechanism other than pit-like IGA.~~

~~f. 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 during each subsequent inspection. No credit is to be taken for this inspection for meeting the minimum sample size requirement for random sample inspection.~~

~~Tubes identified with TEC that meet the alternate repair criteria will be added to the existing list of tubes in the OTSG Inservice Inspection Surveillance procedure. Tubes identified with TEC during the previous inspection which meet the criteria to remain in-service will not be included when calculating the inspection category of the OTSG.~~

(continued)

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Tube Surveillance Program (continued)

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 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 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.

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 are defective tubes, 100% of the tubes with TEC in the other OTSG shall be examined in the location of the TEC.

Tubes with crack-like indications within the carbon steel portion of the tubesheet shall be repaired or removed from service using the appropriate approved method. Tubes with circumferentially oriented TEC or volumetric indications within the Inconel clad region of the tubesheet shall be repaired or removed from service using the appropriate approved method.

The results of each bobbin coil sample inspection shall be classified into one of the following three categories:

---NOTE---
In all inspections, previously degraded tubes whose degradation has not been spanned by a sleeve must exhibit significant (>10%) further wall penetrations to be included in the below percentage calculations.

---NOTE---
For the inspection conducted in accordance with 5.6.2.10.2.f, only tubes with TEC indications identified after the 1997 inspection will be included in the below percentage calculations.

(continued)

~~5.6 Procedures, Programs and Manuals~~

~~5.6.2.10 OTSG Tube Surveillance Program (continued)~~

~~Category~~	~~Inspection Results~~
~~C-1~~	~~Less than 5% of the total tubes inspected are degraded tubes and none of the inspected tubes are defective.~~
~~C-2~~	~~One or more tubes, but not more than 1% of the total tubes inspected are defective, or between 5% and 10% of the total tubes inspected are degraded tubes.~~
~~C-3~~	~~More than 10% of the total tubes inspected are degraded tubes or more than 1% of the inspected tubes are defective.~~

~~3. The above-required inservice inspections of OTSG tubes shall be performed at the following frequencies:~~

~~a. Inservice inspections shall be performed at intervals of not less than 12 nor more than 24 calendar months after the previous inspection. If two consecutive inspections following service under all volatile treatment (AVT) conditions, not including the preservice inspection, result in all inspection results falling into the C-1 category, or if two consecutive inspections demonstrate that previously observed degradation has not continued and no additional degradation has occurred, the inspection interval may be extended to a maximum of once per 40 months.~~

~~b. If the inservice inspection of an OTSG, conducted in accordance with Table 5.6.2-2 or Table 5.6.2-3 requires a third sample inspection whose results fall in Category C-3, the inspection frequency shall be reduced to at least once per 20 months. The reduction in inspection frequency shall apply until a subsequent inspection demonstrates that a third sample inspection is not required. If the C-3 inspection results classification is due to including new tubes with TEC indications that meet the criteria to remain in-service, no reduction in inspection frequency is required.~~

~~c. Additional unscheduled inservice inspections shall be performed on each OTSG in accordance with the first sample inspection specified in Table 5.6.2-2 or Table 5.6.2-3 during the shutdown subsequent to any of the following conditions:~~

~~1. Primary-to-secondary tube leaks (not including leaks originating from tube-to-tube sheet welds) in excess of the limits of Specification 3.4.12,~~

~~2. A seismic occurrence greater than the Operating Basis Earthquake,~~

~~3. A loss-of-coolant accident requiring actuation of the engineered safeguards, or~~

~~4. A main steam line or feedwater line break.~~

(continued)

~~5.6 Procedures, Programs and Manuals~~

~~5.6.2.10 OTSG Tube Surveillance Program (continued)~~

~~4. Acceptance criteria:~~

~~a. Vocabulary as used in this Specification:~~

~~1. Tubing or Tube means that portion of the tube or sleeve which forms the primary system to secondary system pressure boundary.~~

~~2. Imperfection means an exception to the dimensions, finish or contour of a tube from that required by fabrication drawings or specifications. Eddy-current testing indications below 20% of the nominal tube wall thickness, if detectable, may be considered as imperfections.~~

~~3. Degradation means a service-induced cracking, wastage, wear, or general corrosion occurring on either inside or outside of a tube.~~

~~4. Degraded Tube means a tube containing degradation ≥ 20% through-wall but < 40% through-wall in the pressure boundary.~~

~~5. % Degradation/% Through-wall means the percentage of the tube (pressure boundary) wall thickness affected or removed by degradation.~~

~~6. Defective Tube means a tube containing degradation ≥ 40% through-wall in the pressure boundary. Any tube which does not permit the passage of the eddy-current inspection probe shall be deemed a defective tube.~~

~~7. 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.~~

(continued)

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Tube Surveillance Program (continued)

8. Plugging/Repair Limit means the extent of pressure boundary degradation beyond which the tube shall either be removed from service by installation of plugs or the area of degradation shall be removed from service (a new pressure boundary established) using an Approved Repair Technique. The plugging/repair limit is 40% through-wall for all pressure boundary degradation.

9. Unserviceable describes the condition of a tube if it leaks or contains a defect large enough to affect its structural integrity in the event of an Operating Basis Earthquake, a loss-of-coolant accident, or a main steam line or feedwater line break, as specified in 5.6.2.10.3.c, above.

10. Tube Inspection means an inspection of the OTSG tube pressure boundary.

11. Approved Repair Technique means a technique, other than plugging, that has been accepted by the NRC as a methodology to remove or repair degraded or defective portions of the pressure boundary and to establish a new pressure boundary. Following are Approved Repair Techniques:

a) 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.

b) 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 imperfections and degradation for the repair to be considered acceptable.

(continued)

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Tube Surveillance Program (continued)

The repair roll in each tube will be inspected during each subsequent inservice inspection while the tube with a repair roll is in service. The repair roll will be considered a specific limited area and will be excluded from the random sampling. No credit will be taken for meeting the minimum sample size.

If primary-to-secondary leakage results in a shutdown of the plant and the cause is determined to be degradation in a repair roll, 100% of the repair rolls in that OTSG shall be examined. If that inspection results in entering Category C-2 or C-3 for specific limited area inspection, as detailed in Table 5.6.2-3, 100% of the repair rolls shall be examined in the other OTSG.

12. 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.

b. The OTSG shall be determined OPERABLE after completing the corresponding actions (plug or repair all tubes exceeding the plugging/repair limit) required by Table 5.6.2-2 (and Table 5.6.2-3 if the provisions of Specification 5.6.2.10.2.d are utilized).

c. 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 throughwall value from the current inspection shall be compared to the indicated percentage throughwall value from the 1997 inspection.

(continued)

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, 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, except for specific types of degradation at specific locations as described in paragraph c of the Steam Generator Program.

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

c. Provisions for OTSG tube 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.

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

1. Inservice tubes with pit-like intergranular attack (IGA) indications in the first span of the B OTSG, identified in the OTSG Inservice Inspection Surveillance Procedure, 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. No credit is to be taken for this inspection in meeting minimum sample size requirements for the random inspection. Tubes found during this inspection that exceed the 40% of tube wall thickness repair criterion are to be plugged or sleeved. Degraded or defective tubes found during this inspection are not to be considered in determining the inspection results category for the random inspection, unless the degradation mechanism identified is a mechanism other than pit-like IGA.

(continued)

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Program (continued)

2. 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 during each subsequent inspection. No credit is to be taken for this inspection for meeting the minimum sample size requirement for random sample inspection.

Tubes identified with TEC that meet the alternate repair criteria will be added to the existing list of tubes in the OTSG Inservice Inspection Surveillance procedure. Tubes identified with TEC during the previous inspection which meet the criteria to remain in-service will not be included when calculating the inspection category of the OTSG.

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 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 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.

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 are defective, 100% of the tubes with TEC in the other OTSG shall be examined in the location of the TEC.

(continued)

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Program (continued)

Tubes with crack-like indications within the carbon steel portion of the tubesheet shall be repaired or removed from service using the appropriate approved method. Tubes with circumferentially oriented TEC or volumetric indications within the Inconel clad region of the tubesheet shall be repaired or removed from service using the appropriate approved method.

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, d.2, and 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 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the OTSGs. No OTSG shall operate for more than 24 effective full power months or one refueling outage (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)

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 imperfections and degradation for the repair to be considered acceptable.

   The repair roll in each tube will be inspected during each subsequent inservice inspection while the tube with a repair roll is in service.

(continued)

~~TABLE 5.6.2-1 (page 1 of 1)~~
~~MINIMUM NUMBER OF STEAM GENERATORS (OTSGs) TO BE INSPECTED DURING INSERVICE INSPECTION~~

~~Preservice Inspection~~	~~Yes~~
~~Number of OTSGs~~	~~Two~~
~~First Inservice Inspection~~	~~One~~
~~Second and Subsequent Inservice Inspections~~	~~One[1]~~

~~[1] The inservice inspection may be limited to one OTSG on a rotating schedule encompassing 6% of the tubes if the results of the first or previous inspections indicate that both OTSGs are performing in a like manner. Note that under some circumstances, the operating conditions in one OTSG may be found to be more severe than those in the other OTSG. Under such circumstances the sample sequence shall be modified to inspect the most severe conditions.~~

TABLE 5.6.2-2 (page 1 of 1)
OTSG TUBE INSPECTION

1st Sample Inspection			2nd Sample Inspection		3rd Sample Inspection	
Sample Size	Result	Action Required	Result	Action Required	Result	Action Required
A minimum of S tubes per OTSG	C-1	None	N/A	N/A	N/A	N/A
	C-2	Plug or repair defective tubes and inspect an additional 2S tubes in this OTSG.	C-1	None	N/A	N/A
			C-2	Plug or repair defective tubes and inspect additional 4S tubes in this OTSG.	C-1	None
					C-2	Plug or repair defective tubes.
					C-3	Perform action for C-3 result of first sample.
			C-3	Perform action for C-3 result of first sample.	N/A	N/A
	C-3	Inspect all tubes in this OTSG, plug or repair defective tubes, inspect 2S tubes in each other OTSG, and notify NRC per 10CFR50.72	All other OTSGs are C-1	None	N/A	N/A
			Some OTSGs C-2 but no additional OTSGs are C-3	Perform action for C-2 result of second sample.	N/A	N/A
			Additional OTSG is C-3	Inspect all tubes in each OTSG, plug or repair defective tubes, and notify NRC per 10CFR50.72.	N/A	N/A

S = 3 N/n % Where N is the number of OTSGs in the unit and n is the number of OTSGs inspected during inspection period.

~~TABLE 5.6.2-3 (page 1 of 1)~~
~~SPECIFIC LIMITED AREA INSPECTION~~

~~1st Sample Inspection of a "Specific Limited Area"~~			~~2nd Sample Inspection of a "Specific Limited Area"~~	
~~Sample Size~~	~~Result~~	~~Action Required~~	~~Result~~	~~Action Required~~
~~100% of area in both OTSGs~~	~~C-1~~	~~None~~	~~N/A~~	~~N/A~~
	~~C-2~~	~~Plug or repair defective tubes.~~	~~N/A~~	~~N/A~~
	~~C-3~~	~~Plug or repair defective tubes.~~	~~N/A~~	~~N/A~~
~~100% of area in one OTSG~~	~~C-1~~	~~None~~	~~N/A~~	~~N/A~~
	~~C-2~~	~~Plug or repair defective tubes and inspect 100% of corresponding area in other OTSG~~	~~C-1~~	~~None~~
			~~C-2~~	~~Plug or repair defective tubes.~~
			~~C-3~~	~~Plug or repair defective tubes.~~
	~~C-3~~	~~Plug or repair defective tubes and inspect 100% of corresponding area in other OTSG.~~	~~C-1~~	~~None~~
			~~C-2~~	~~Plug or repair defective tubes.~~
			~~C-3~~	~~Plug or repair defective tubes.~~

5.7 Reporting Requirements

5.7.1.2 Not Used

5.7.2 Special Reports

Special Reports shall be submitted in accordance with 10 CFR 50.4 within the time period specified for each report.

The following Special Reports shall be submitted:

a. When a Special 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.

b. Any abnormal degradation of the containment structure found during the inspection performed in accordance with ITS 5.6.2.8 shall be reported to the NRC within 30 days of the current surveillance completion. The abnormal degradation shall be defined as findings such as delamination of the dome concrete, widespread corrosion of the liner plate, corrosion of prestressing elements (wires, strands, bars) or anchorage components extending to more than two tendons and group tendons force trends not meeting the requirements of 10CFR50.55a(b)(2)(ix)(B). The report shall include the description of degradation, operability determination, root cause determination and the corrective actions.

c. 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 5.6.2.10, Steam Generator (OTSG) Program. The report shall include:

1. The scope of inspections performed on each OTSG,

2. Active degradation mechanisms found,

3. Nondestructive examination techniques utilized for each degradation mechanism,

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

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

(continued)

5.7 Reporting Requirements

5.7.2 Special Reports (continued)

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,

~~c. Following each inservice inspection of steam generator (OTSG) tubes, the NRC shall be notified of the following prior to ascension into MODE 4:~~

~~1. Number of tubes plugged and repaired;~~

~~2. Crack-like indications and assessment of growth for indications in the first span;~~

~~3. Results of in-situ pressure testing, if performed; and~~

~~4. Number of tubes and axially oriented TEC indications left in-service, the projected accident leakage, and an assessment of growth for TEC indications.~~

(continued)

~~5.7 Reporting Requirements~~

~~5.7.2 Special Reports (continued)~~

~~d. Results of OTSG tube inspections that fall into Category C-3 shall be reported to the NRC in accordance with 10CFR50.72.~~

~~e. The complete results of the OTSG tube inservice inspection shall be submitted to the NRC within 90 days after breaker closure following restart. The report shall include:~~

~~1. Number and extent of tubes inspected,~~

~~2. Location and percent of wall-thickness penetration for each indication of an imperfection,~~

~~3.~~ 10. Location, bobbin coil amplitude, and axial and circumferential extent (if determined) for each first span IGA indication, and

~~4. Identification of tubes plugged or repaired and specification of the repair methodology implemented for each tube.~~

~~5.~~ 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. 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.

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50-302 / LICENSE NUMBER DPR-72

LICENSE AMENDMENT REQUEST #264, REVISION 0

Application to Modify Improved Technical Specifications Regarding Steam Generator Tube Integrity

ATTACHMENT C

Proposed Improved Technical Specification Changes (Revision Bar Format)

(continued)

(continued)

1.1 Definitions

LEAKAGE (continued)	3. Reactor Coolant System (RCS) LEAKAGE through a steam generator to the secondary system (primary to secondary LEAKAGE).
	b. Unidentified LEAKAGE All LEAKAGE that is not identified LEAKAGE.
	c. Pressure Boundary LEAKAGE LEAKAGE (except primary to secondary LEAKAGE) through a non-isolable fault in an RCS component body, pipe wall, or vessel wall.
MODE	A MODE shall correspond to any one inclusive combination of core reactivity condition, power level, average reactor coolant temperature, and reactor vessel head closure bolt tensioning specified in Table 1.1-1.
NUCLEAR HEAT FLUX HOT CHANNEL FACTOR ($F_Q(Z)$)	$F_Q(Z)$ shall be the maximum local linear power density in the core divided by the core average fuel rod linear power density, assuming nominal fuel pellet and fuel rod dimensions.
NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR ($F^N_{\Delta H}$)	$F^N_{\Delta H}$ shall be the ratio of the integral of linear power along the fuel rod on which minimum departure from nucleate boiling ratio occurs to the average fuel rod power.
OPERABLE-OPERABILITY	A system, subsystem, train, component, or device shall be OPERABLE when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication and other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).
PHYSICS TESTS	PHYSICS TESTS shall be those tests performed to measure the fundamental nuclear characteristics of the reactor core and related instrumentation.

(continued)

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.12 RCS Operational LEAKAGE

LCO 3.4.12 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE;

b. 1 gpm unidentified LEAKAGE;

c. 10 gpm identified LEAKAGE; and

d. 150 gpd of primary to secondary LEAKAGE through any one steam generator (OTSG).

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RCS operational LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE or primary to secondary LEAKAGE.	A.1 Reduce LEAKAGE to within limits.	4 hours
B. Required Action and associated Completion Time not met. OR Pressure boundary LEAKAGE exists. OR Primary to secondary LEAKAGE not within limit.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.12.1	---------------NOTES--------------- 1. Not required to be performed in MODE 4. Not required in MODE 3 until 12 hours of steady state operation. 2. Not applicable to primary to secondary LEAKAGE. ----------------------------------- Verify RCS operational LEAKAGE is within limits by performance of RCS water inventory balance.	72 hours
SR 3.4.12.2	---------------NOTE--------------- Not required to be performed until 12 hours after establishment of steady state operation. ----------------------------------- Verify primary to secondary LEAKAGE is ≤ 150 gallons per day through any one steam generator.	72 hours

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, 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, except for specific types of degradation at specific locations as described in paragraph c of the Steam Generator Program.

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

c. Provisions for OTSG tube 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.

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

1. Inservice tubes with pit-like intergranular attack (IGA) indications in the first span of the B OTSG, identified in the OTSG Inservice Inspection Surveillance Procedure, 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. No credit is to be taken for this inspection in meeting minimum sample size requirements for the random inspection. Tubes found during this inspection that exceed the 40% of tube wall thickness repair criterion are to be plugged or sleeved. Degraded or defective tubes found during this inspection are not to be considered in determining the inspection results category for the random inspection, unless the degradation mechanism identified is a mechanism other than pit-like IGA.

(continued)

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Program (continued)

2. 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 during each subsequent inspection. No credit is to be taken for this inspection for meeting the minimum sample size requirement for random sample inspection.

   Tubes identified with TEC that meet the alternate repair criteria will be added to the existing list of tubes in the OTSG Inservice Inspection Surveillance procedure. Tubes identified with TEC during the previous inspection which meet the criteria to remain in-service will not be included when calculating the inspection category of the OTSG.

   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 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 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.

   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 are defective, 100% of the tubes with TEC in the other OTSG shall be examined in the location of the TEC.

(continued)

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Program (continued)

Tubes with crack-like indications within the carbon steel portion of the tubesheet shall be repaired or removed from service using the appropriate approved method. Tubes with circumferentially oriented TEC or volumetric indications within the Inconel clad region of the tubesheet shall be repaired or removed from service using the appropriate approved method.

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, d.2, and 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 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the OTSGs. No OTSG shall operate for more than 24 effective full power months or one refueling outage (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)

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 imperfections and degradation for the repair to be considered acceptable.

   The repair roll in each tube will be inspected during each subsequent inservice inspection while the tube with a repair roll is in service.

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5.7 Reporting Requirements

5.7.1.2 Not Used

5.7.2 Special Reports

Special Reports shall be submitted in accordance with 10 CFR 50.4 within the time period specified for each report.

The following Special Reports shall be submitted:

a. When a Special 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.

b. Any abnormal degradation of the containment structure found during the inspection performed in accordance with ITS 5.6.2.8 shall be reported to the NRC within 30 days of the current surveillance completion. The abnormal degradation shall be defined as findings such as delamination of the dome concrete, widespread corrosion of the liner plate, corrosion of prestressing elements (wires, strands, bars) or anchorage components extending to more than two tendons and group tendons force trends not meeting the requirements of 10CFR50.55a(b)(2)(ix)(B). The report shall include the description of degradation, operability determination, root cause determination and the corrective actions.

c. 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 5.6.2.10, Steam Generator (OTSG) Program. The report shall include:

   1. The scope of inspections performed on each OTSG,

   2. Active degradation mechanisms found,

   3. Nondestructive examination techniques utilized for each degradation mechanism,

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

(continued)

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

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. 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.

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50-302 / LICENSE NUMBER DPR-72

LICENSE AMENDMENT REQUEST #264, REVISION 0

Application to Modify Improved Technical Specifications Regarding Steam Generator Tube Integrity

ATTACHMENT D

Proposed Improved Technical Specification Bases Pages (Mark-up)

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

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.12 RCS Operational LEAKAGE

BASES

BACKGROUND

During the life of the plant, the joint and valve interfaces contained in the RCS can produce varying amounts of reactor coolant LEAKAGE, through either normal operational wear or mechanical deterioration. The purpose of the RCS Operational LEAKAGE LCO is to limit system operation in the presence of LEAKAGE from these sources to amounts that do not compromise safety. This LCO specifies the types and amounts of LEAKAGE.

10 CFR 50, Appendix A, GDC 30 (Ref. 1), requires means for detecting and, to the extent practical, identifying the source of reactor coolant LEAKAGE. Regulatory Guide 1.45 (Ref. 2) describes acceptable methods for selecting leakage detection systems. OPERABILITY of the leakage detection systems is addressed in LCO 3.4.14, "RCS Leakage Detection Instrumentation."

The safety significance of RCS LEAKAGE varies widely depending on its source, rate, and duration. Therefore, detecting, monitoring, and quantifying reactor coolant LEAKAGE is critical. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE is necessary to provide quantitative information to the operators, allowing them to take corrective action should a leak occur.

A limited amount of leakage inside containment is expected from auxiliary systems that cannot be made 100% leaktight. Leakage from these systems should be detected, located, and isolated from the containment atmosphere, if possible, to not interfere with RCS leakage detection.

APPLICABLE SAFETY ANALYSES

Except for primary to secondary LEAKAGE, the safety analyses do not address operational LEAKAGE. However, other operational LEAKAGE is related to the safety analyses for a LOCA in that the amount of leakage can affect the probability of such an event. The safety analysis for an event resulting in steam discharge to the atmosphere assumes ~~1 gpm primary to secondary LEAKAGE as the initial condition.~~

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

that primary to secondary LEAKAGE from all steam generators (OTSGs) is one gallon per minute or increases to one gallon per minute as a result of accident induced conditions. The LCO requirement to limit primary to secondary LEAKAGE through any one OTSG to less than or equal to 150 gallons per day is significantly less than the conditions assumed in the safety analysis.

The FSAR (Ref. 3) analysis for steam generator tube rupture (SGTR) assumes the contaminated secondary fluid is only briefly released via safety valves and the majority is steamed to the condenser. The 1 gpm primary to secondary LEAKAGE safety analysis assumption is relatively inconsequential in terms of offsite dose.

The safety analysis for the Steam Line Break (SLB) accident assumes the entire 1 gpm primary to secondary LEAKAGE ~~in one~~ is through the affected generator as an initial condition (Ref. 4). The dose consequences resulting from the SLB accident meet the acceptance criteria defined in 10 CFR 50.67.

RCS operational LEAKAGE satisfies Criterion 2 of the NRC Policy Statement.

LCO

RCS operational LEAKAGE shall be limited to:

a. Pressure Boundary LEAKAGE

No pressure boundary LEAKAGE is allowed, being indicative of material deterioration. LEAKAGE of this type is unacceptable as the leak itself could cause further deterioration, resulting in higher LEAKAGE. Violation of this LCO could result in continued degradation of the reactor coolant pressure boundary (RCPB). LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.

b. Unidentified LEAKAGE

One gallon per minute (gpm) of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the containment atmosphere and sump level monitoring equipment can detect within a reasonable time period. Violation of this LCO could result in continued degradation of the RCPB, if the LEAKAGE is from the pressure boundary.

(continued)

BASES

LCO

c. Identified LEAKAGE

Up to 10 gpm of identified LEAKAGE is considered allowable because LEAKAGE is from known sources that do not interfere with the detection of unidentified LEAKAGE and is well within the capability of the RCS makeup system. Identified LEAKAGE includes LEAKAGE to the containment from specifically known and located sources, but does not include pressure boundary LEAKAGE or controlled reactor coolant pump (RCP) seal leakoff (a normal function not considered LEAKAGE). Violation of this LCO could result in continued degradation of a component or system.

~~d. Primary to Secondary LEAKAGE through Any One Steam Generator (OTSG)~~

~~This LEAKAGE limit is established to ensure that tubes initially leaking during normal operation do not contribute excessively to total leakage during postulated accident conditions. The 150 gpd limit is a conservative limit which is consistent with the operational leakage limit specified in NRC Generic Letter 95-05 for plants implementing Alternate Repair Criteria. CR-3 has elected to voluntarily adopt this conservative limit to ensure plant shutdown in a timely manner in response to detection of primary to secondary LEAKAGE. Primary to secondary LEAKAGE must be included in the total allowable limit for identified LEAKAGE.~~

~~Two OTSGs are also required to be OPERABLE. This requirement is met by satisfying the augmented inservice inspection requirements of the Steam Generator Tube Surveillance Program (Specification 5.6.2.10).~~

d. Primary to Secondary LEAKAGE through Any One OTSG

The limit of 150 gallons per day per OTSG is based on the operational LEAKAGE performance criterion in NEI 97-06, Steam Generator Program Guidelines (Ref. 5). The Steam Generator Program operational LEAKAGE performance criterion in NEI 97-06 states, "The RCS operational primary to secondary leakage through any one SG shall be limited to 150 gallons per day." The limit is based on operating experience with OTSG tube degradation mechanisms that result in tube leakage. The operational leakage rate criterion in conjunction with the implementation of the Steam Generator Program is an effective measure for minimizing the frequency of steam generator tube ruptures.

(continued)

BASES

ACTIONS

A.1

If unidentified LEAKAGE, or identified LEAKAGE, or primary to secondary LEAKAGE are is in excess of the LCO limits, the LEAKAGE must be reduced to within limits within 4 hours. This Completion Time allows time to verify leakage rates and either identify unidentified LEAKAGE or reduce LEAKAGE to within limits before the reactor must be shut down. This action is necessary to prevent further deterioration of the RCPB.

B.1 and B.2

If any pressure boundary LEAKAGE exists or primary to secondary LEAKAGE is not within limits, or if unidentified, or identified, or primary to secondary LEAKAGE cannot be reduced to within limits within 4 hours, the reactor must be placed in a lower pressure condition to reduce the severity of the LEAKAGE and its potential consequences. The reactor must be placed in MODE 3 within 6 hours and MODE 5 within 36 hours. This action reduces the LEAKAGE and also reduces the stresses that tend to degrade the pressure boundary.

The Completion Times allowed are reasonable, based on operating experience, to reach the required conditions from full power conditions in an orderly manner and without challenging plant systems. In MODE 5, the pressure stresses acting on the RCPB are much lower and further deterioration is much less likely.

SURVEILLANCE REQUIREMENTS

SR 3.4.12.1

Verifying RCS LEAKAGE within the LCO limits ensures that the integrity of the RCPB is maintained. Pressure boundary LEAKAGE would at first appear as unidentified LEAKAGE and can only be positively identified by inspection. Unidentified LEAKAGE and identified LEAKAGE are determined by performance of an RCS water inventory balance. Primary to secondary LEAKAGE is also measured by performance of an RCS water inventory balance in conjunction with effluent monitoring within the secondary steam and condensate systems.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.12.1 (continued)

The RCS water inventory balance must be performed with the reactor at steady state operating conditions and with RCS temperature greater than 400°F. The test must be performed prior to entry into MODE 2 if it has not been performed within the past 72 hours near normal operating pressure. This surveillance is modified by two notes. Note 1 states that it is not required to be performed for entry into MODE 4 ~~or MODE 3~~ or for non-steady state conditions in MODE 3, but must be performed in MODE 3 above 400°F if 12 hours of steady state operation are achieved. If the test is not performed prior to all other requirements for entry into MODE 2 being satisfied, entry into MODE 2 must be delayed until steady state operation is established and the requirements of SR 3.0.4 are satisfied.

Steady state operation is required to perform a meaningful water inventory balance; calculations during maneuvering are not useful. For RCS operational LEAKAGE determination by water inventory balance, steady state is defined as stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP pump seal injection and return flows.

Note 2 states that this SR is not applicable to primary to secondary LEAKAGE because LEAKAGE of 150 gallons per day cannot be measured accurately by an RCS water inventory balance.

The 72 hour Frequency is reasonable to trend LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents.

SR 3.4.12.2

~~This SR provides the means necessary to determine OTSG OPERABILITY in an operational MODE. The requirement to demonstrate OTSG tube integrity in accordance with the Steam Generator Tube Surveillance Program emphasizes the importance of OTSG tube integrity, even though this Surveillance cannot be performed at normal operating conditions.~~

(continued)

BASES

This SR verifies that primary to secondary LEAKAGE is less than or equal to 150 gallons per day through any one OTSG. Satisfying the primary to secondary LEAKAGE limit ensures that the operational LEAKAGE performance criterion in the Steam Generator Program is met. If this SR is not met, compliance with LCO 3.4.16, "Steam Generator Tube Integrity," should be evaluated. The 150 gallons per day limit is measured at room temperature as described in Reference 6. The operational LEAKAGE rate limit applies to LEAKAGE through any one OTSG. If it is not practical to assign the LEAKAGE to an individual OTSG, all the primary to secondary LEAKAGE should be conservatively assumed to be from one OTSG.

The Surveillance is modified by a Note which states that the Surveillance is not required to be performed until 12 hours after establishment of steady state operation. For RCS primary to secondary LEAKAGE determination, steady state is defined as stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows.

The Surveillance Frequency of 72 hours is a reasonable interval to trend primary to secondary LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents. The primary to secondary LEAKAGE is determined using continuous process radiation monitors or radiochemical grab sampling in accordance with the EPRI guidelines (Ref. 6).

REFERENCES

1. 10 CFR 50, Appendix A, GDC 30.

2. Regulatory Guide 1.45, May 1973.

3. FSAR, Section 14.2.2.2.

4. FSAR, Section 14.2.2.1.

5. NEI 97-06, "Steam Generator Program Guidelines."

6. EPRI, "Pressurized Water Reactor Primary-to-Secondary Leak Guidelines."

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.16 Steam Generator (OTSG) Tube Integrity

BASES

BACKGROUND

Steam generator (OTSG) tubes are small diameter, thin walled tubes that carry primary coolant through the primary to secondary heat exchanges. The OTSG tubes have a number of important safety functions. Steam generator 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. The OTSG tubes isolate the radioactive fission products in the primary coolant from the secondary system. In addition, as part of the RCPB, the OTSG tubes are unique in that they act as the heat transfer surface between the primary and secondary systems to remove heat from the primary system. This Specification addresses only the RCPB integrity function of the OTSG. The OTSG heat removal function is addressed by LCO 3.4.4, "RCS Loops - MODE 3," LCO 3.4.5, "RCS Loops - MODE 4," LCO 3.4.6, "RCS Loops - MODE 5, Loops Filled," and is implicitly required in MODES 1 and 2 in order to prevent a Reactor Protection System actuation (LCO 3.3.1).

OTSG tube integrity means that the tubes are capable of performing their intended RCPB safety function consistent with the licensing basis, including applicable regulatory requirements.

Steam generator tubing is subject to a variety of degradation mechanisms. Steam generator tubes may experience tube degradation related to corrosion phenomena, such as wastage, pitting, intergranular attack, and stress corrosion cracking, along with other mechanically induced phenomena such as denting and wear. These degradation mechanisms can impair tube integrity if they are not managed effectively. The OTSG performance criteria are used to manage OTSG tube degradation.

Specification 5.6.2.10, "Steam Generator (OTSG) Program," requires that a program be established and implemented to ensure that OTSG tube integrity is maintained. Pursuant to Specification 5.6.2.10, tube integrity is maintained when the OTSG performance criteria are met. There are three OTSG performance criteria: structural integrity, accident induced leakage, and operational LEAKAGE. The OTSG

(continued)

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 50.36I(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

LCO (continued)

is considered significant when the addition of such loads in the assessment of the structural integrity performance criterion could cause a lower structural limit or limiting burst/collapse condition to be established." For tube integrity evaluations, except for circumferential degradation, axial thermal loads are classified as secondary loads. For circumferential degradation, the classification of axial thermal loads as primary or secondary loads will be evaluated on a case-by-case basis. The division between primary and secondary classifications will be based on detailed analysis and/or testing.

Structural integrity requires that the primary membrane stress intensity in a tube not exceed the yield strength for all ASME Code, Section III, Service Level A (normal operating conditions) and Service Level B (upset or abnormal conditions) transients included in the design specification. This includes safety factors and applicable design basis loads based on ASME Code, Section III, Subsection NB (Ref. 4) and Draft Regulatory Guide 1.121 (Ref. 5).

The accident induced leakage performance criterion ensures that the primary to secondary LEAKAGE caused by a design basis accident, other than a SGTR, is within the accident analysis assumptions. The accident analysis assumes that accident induced leakage does not exceed one gallon per minute per OTSG, except for specific types of degradation at specific locations where the NRC has approved greater accident induced leakage. The accident induced leakage rate includes any primary to secondary LEAKAGE existing prior to the accident in addition to primary to secondary LEAKAGE induced during the accident.

The operational LEAKAGE performance criterion provides an observable indication of OTSG tube conditions during plant operation. The limit on operational LEAKAGE is contained in LCO 3.4.12, "RCS Operational LEAKAGE," and limits primary to secondary LEAKAGE through any one OTSG 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.

(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 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."

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50-302 / LICENSE NUMBER DPR-72

LICENSE AMENDMENT REQUEST #264, REVISION 0

Application to Modify Improved Technical Specifications Regarding Steam Generator Tube Integrity

ATTACHMENT E

Proposed Improved Technical Specification Bases Pages (Revision Bar Format)

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.12 RCS Operational LEAKAGE

BASES

BACKGROUND

During the life of the plant, the joint and valve interfaces contained in the RCS can produce varying amounts of reactor coolant LEAKAGE, through either normal operational wear or mechanical deterioration. The purpose of the RCS Operational LEAKAGE LCO is to limit system operation in the presence of LEAKAGE from these sources to amounts that do not compromise safety. This LCO specifies the types and amounts of LEAKAGE.

10 CFR 50, Appendix A, GDC 30 (Ref. 1), requires means for detecting and, to the extent practical, identifying the source of reactor coolant LEAKAGE. Regulatory Guide 1.45 (Ref. 2) describes acceptable methods for selecting leakage detection systems. OPERABILITY of the leakage detection systems is addressed in LCO 3.4.14, "RCS Leakage Detection Instrumentation."

The safety significance of RCS LEAKAGE varies widely depending on its source, rate, and duration. Therefore, detecting, monitoring, and quantifying reactor coolant LEAKAGE is critical. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE is necessary to provide quantitative information to the operators, allowing them to take corrective action should a leak occur.

A limited amount of leakage inside containment is expected from auxiliary systems that cannot be made 100% leaktight. Leakage from these systems should be detected, located, and isolated from the containment atmosphere, if possible, to not interfere with RCS leakage detection.

APPLICABLE SAFETY ANALYSES

Except for primary to secondary LEAKAGE, the safety analyses do not address operational LEAKAGE. However, other operational LEAKAGE is related to the safety analyses for a LOCA in that the amount of leakage can affect the probability of such an event. The safety analysis for an event resulting in steam discharge to the atmosphere assumes

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BASES

APPLICABLE SAFETY ANALYSES (continued)

that primary to secondary LEAKAGE from all steam generators (OTSGs) is one gallon per minute or increases to one gallon per minute as a result of accident induced conditions. The LCO requirement to limit primary to secondary LEAKAGE through any one OTSG to less than or equal to 150 gallons per day is significantly less than the conditions assumed in the safety analysis.

The FSAR (Ref. 3) analysis for steam generator tube rupture (SGTR) assumes the contaminated secondary fluid is only briefly released via safety valves and the majority is steamed to the condenser. The 1 gpm primary to secondary LEAKAGE safety analysis assumption is relatively inconsequential in terms of offsite dose.

The safety analysis for the Steam Line Break (SLB) accident assumes the entire 1 gpm primary to secondary LEAKAGE is through the affected generator as an initial condition (Ref. 4). The dose consequences resulting from the SLB accident meet the acceptance criteria defined in 10 CFR 50.67.

RCS operational LEAKAGE satisfies Criterion 2 of the NRC Policy Statement.

LCO

RCS operational LEAKAGE shall be limited to:

a. <u>Pressure Boundary LEAKAGE</u>

No pressure boundary LEAKAGE is allowed, being indicative of material deterioration. LEAKAGE of this type is unacceptable as the leak itself could cause further deterioration, resulting in higher LEAKAGE. Violation of this LCO could result in continued degradation of the reactor coolant pressure boundary (RCPB). LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.

b. <u>Unidentified LEAKAGE</u>

One gallon per minute (gpm) of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the containment atmosphere and sump level monitoring equipment can detect within a reasonable time period. Violation of this LCO could result in continued degradation of the RCPB, if the LEAKAGE is from the pressure boundary.

(continued)

BASES

LCO

c. Identified LEAKAGE

Up to 10 gpm of identified LEAKAGE is considered allowable because LEAKAGE is from known sources that do not interfere with the detection of unidentified LEAKAGE and is well within the capability of the RCS makeup system. Identified LEAKAGE includes LEAKAGE to the containment from specifically known and located sources, but does not include pressure boundary LEAKAGE or controlled reactor coolant pump (RCP) seal leakoff (a normal function not considered LEAKAGE). Violation of this LCO could result in continued degradation of a component or system.

d. Primary to Secondary LEAKAGE through Any One OTSG

The limit of 150 gallons per day per OTSG is based on the operational LEAKAGE performance criterion in NEI 97-06, Steam Generator Program Guidelines (Ref. 5). The Steam Generator Program operational LEAKAGE performance criterion in NEI 97-06 states, "The RCS operational primary to secondary leakage through any one SG shall be limited to 150 gallons per day." The limit is based on operating experience with OTSG tube degradation mechanisms that result in tube leakage. The operational leakage rate criterion in conjunction with the implementation of the Steam Generator Program is an effective measure for minimizing the frequency of steam generator tube ruptures.

(continued)

BASES

ACTIONS

A.1

If unidentified LEAKAGE or identified LEAKAGE is in excess of the LCO limits, the LEAKAGE must be reduced to within limits within 4 hours. This Completion Time allows time to verify leakage rates and either identify unidentified LEAKAGE or reduce LEAKAGE to within limits before the reactor must be shut down. This action is necessary to prevent further deterioration of the RCPB.

B.1 and B.2

If any pressure boundary LEAKAGE exists or primary to secondary LEAKAGE is not within limits, or if unidentified or identified LEAKAGE cannot be reduced to within limits within 4 hours, the reactor must be placed in a lower pressure condition to reduce the severity of the LEAKAGE and its potential consequences. The reactor must be placed in MODE 3 within 6 hours and MODE 5 within 36 hours. This action reduces the LEAKAGE and also reduces the stresses that tend to degrade the pressure boundary.

The Completion Times allowed are reasonable, based on operating experience, to reach the required conditions from full power conditions in an orderly manner and without challenging plant systems. In MODE 5, the pressure stresses acting on the RCPB are much lower and further deterioration is much less likely.

SURVEILLANCE REQUIREMENTS

SR 3.4.12.1

Verifying RCS LEAKAGE within the LCO limits ensures that the integrity of the RCPB is maintained. Pressure boundary LEAKAGE would at first appear as unidentified LEAKAGE and can only be positively identified by inspection. Unidentified LEAKAGE and identified LEAKAGE are determined by performance of an RCS water inventory balance.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.12.1 (continued)

The RCS water inventory balance must be performed with the reactor at steady state operating conditions and with RCS temperature greater than 400°F. The test must be performed prior to entry into MODE 2 if it has not been performed within the past 72 hours near normal operating pressure. This surveillance is modified by two notes. Note 1 states that it is not required to be performed for entry into MODE 4 or for non-steady state conditions in MODE 3, but must be performed in MODE 3 above 400°F if 12 hours of steady state operation are achieved. If the test is not performed prior to all other requirements for entry into MODE 2 being satisfied, entry into MODE 2 must be delayed until steady state operation is established and the requirements of SR 3.0.4 are satisfied.

Steady state operation is required to perform a meaningful water inventory balance; calculations during maneuvering are not useful. For RCS operational LEAKAGE determination by water inventory balance, steady state is defined as stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP pump seal injection and return flows.

Note 2 states that this SR is not applicable to primary to secondary LEAKAGE because LEAKAGE of 150 gallons per day cannot be measured accurately by an RCS water inventory balance.

The 72 hour Frequency is reasonable to trend LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents.

SR 3.4.12.2

This SR verifies that primary to secondary LEAKAGE is less than or equal to 150 gallons per day through any one OTSG. Satisfying the primary to secondary LEAKAGE limit ensures that the operational LEAKAGE performance criterion in the Steam Generator Program is met. If this SR is not met, compliance with LCO 3.4.16, "Steam Generator Tube Integrity," should be evaluated. The 150 gallons per day limit is measured at room temperature as described in Reference 6. The operational LEAKAGE rate limit applies to

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.12.2 (continued)

LEAKAGE through any one OTSG. If it is not practical to assign the LEAKAGE to an individual OTSG, all the primary to secondary LEAKAGE should be conservatively assumed to be from one OTSG.

The Surveillance is modified by a Note which states that the Surveillance is not required to be performed until 12 hours after establishment of steady state operation. For RCS primary to secondary LEAKAGE determination, steady state is defined as stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows.

The Surveillance Frequency of 72 hours is a reasonable interval to trend primary to secondary LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents. The primary to secondary LEAKAGE is determined using continuous process radiation monitors or radiochemical grab sampling in accordance with the EPRI guidelines (Ref. 6).

REFERENCES

1. 10 CFR 50, Appendix A, GDC 30.
2. Regulatory Guide 1.45, May 1973.
3. FSAR, Section 14.2.2.2.
4. FSAR, Section 14.2.2.1.
5. NEI 97-06, “Steam Generator Program Guidelines.”
6. EPRI, “Pressurized Water Reactor Primary-to-Secondary Leak Guidelines.”

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.16 Steam Generator (OTSG) Tube Integrity

BASES

BACKGROUND

Steam generator (OTSG) tubes are small diameter, thin walled tubes that carry primary coolant through the primary to secondary heat exchanges. The OTSG tubes have a number of important safety functions. Steam generator 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. The OTSG tubes isolate the radioactive fission products in the primary coolant from the secondary system. In addition, as part of the RCPB, the OTSG tubes are unique in that they act as the heat transfer surface between the primary and secondary systems to remove heat from the primary system. This Specification addresses only the RCPB integrity function of the OTSG. The OTSG heat removal function is addressed by LCO 3.4.4, "RCS Loops - MODE 3," LCO 3.4.5, "RCS Loops - MODE 4," LCO 3.4.6, "RCS Loops - MODE 5, Loops Filled," and is implicitly required in MODES 1 and 2 in order to prevent a Reactor Protection System actuation (LCO 3.3.1).

OTSG tube integrity means that the tubes are capable of performing their intended RCPB safety function consistent with the licensing basis, including applicable regulatory requirements.

Steam generator tubing is subject to a variety of degradation mechanisms. Steam generator tubes may experience tube degradation related to corrosion phenomena, such as wastage, pitting, intergranular attack, and stress corrosion cracking, along with other mechanically induced phenomena such as denting and wear. These degradation mechanisms can impair tube integrity if they are not managed effectively. The OTSG performance criteria are used to manage OTSG tube degradation.

Specification 5.6.2.10, "Steam Generator (OTSG) Program," requires that a program be established and implemented to ensure that OTSG tube integrity is maintained. Pursuant to Specification 5.6.2.10, tube integrity is maintained when the OTSG performance criteria are met. There are three OTSG performance criteria: structural integrity, accident induced leakage, and operational LEAKAGE.

(continued)

BASES

BACKGROUND (continued)	The OTSG 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

LCO (continued)

is considered significant when the addition of such loads in the assessment of the structural integrity performance criterion could cause a lower structural limit or limiting burst/collapse condition to be established." For tube integrity evaluations, except for circumferential degradation, axial thermal loads are classified as secondary loads. For circumferential degradation, the classification of axial thermal loads as primary or secondary loads will be evaluated on a case-by-case basis. The division between primary and secondary classifications will be based on detailed analysis and/or testing.

Structural integrity requires that the primary membrane stress intensity in a tube not exceed the yield strength for all ASME Code, Section III, Service Level A (normal operating conditions) and Service Level B (upset or abnormal conditions) transients included in the design specification. This includes safety factors and applicable design basis loads based on ASME Code, Section III, Subsection NB (Ref. 4) and Draft Regulatory Guide 1.121 (Ref. 5).

The accident induced leakage performance criterion ensures that the primary to secondary LEAKAGE caused by a design basis accident, other than a SGTR, is within the accident analysis assumptions. The accident analysis assumes that accident induced leakage does not exceed one gallon per minute per OTSG, except for specific types of degradation at specific locations where the NRC has approved greater accident induced leakage. The accident induced leakage rate includes any primary to secondary LEAKAGE existing prior to the accident in addition to primary to secondary LEAKAGE induced during the accident.

The operational LEAKAGE performance criterion provides an observable indication of OTSG tube conditions during plant operation. The limit on operational LEAKAGE is contained in LCO 3.4.12, "RCS Operational LEAKAGE," and limits primary to secondary LEAKAGE through any one OTSG 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.

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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 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.

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

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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."