FENOC

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January 27, 2006
L-06-013

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

Subject: Beaver Valley Power Station, Unit No. 2
BV-2 Docket No. 50-412, License No. NPF-73
Supplement to License Amendment Request No. 183
Revised Steam Generator Inspection Scope (TAC No. MC6768)

By letter dated April 11, 2005, FirstEnergy Nuclear Operating Company (FENOC) submitted License Amendment Request (LAR) 183 that would revise Steam Generator inspection scope by using the F* methodology for Beaver Valley Power Station Unit No. 2. By letter dated October 28, 2005, the NRC forwarded a request for additional information (RAI) regarding the FENOC LAR. The FENOC responses to this RAI were provided in a letter dated December 2, 2005, in which FENOC committed to revise and resubmit proposed Technical Specifications and Technical Specification Bases as a supplement to LAR 183.

Therefore, Attachments A and B to this letter are provided as replacements to Attachments A and B of the April 11, 2005 submittal. Attachment C to this letter is a tabulation of changes that have been incorporated in the revised Attachments A and B. Please note that the FENOC response to the RAI was very specific with respect to how the proposed Technical Specifications would be revised in some cases. Although proposed wording in Attachments A and B differs from changes described in RAI Items 1 and 7, the differences are enhancements that continue to satisfy the purpose of the underlying RAI item. It has been determined that proposed changes described in Attachments A and B have no impact on the no significant hazards consideration determination originally provided in the April 11, 2005 submittal.

No new regulatory commitments are contained in this submittal. If there are any questions or if additional information is required, please contact Mr. Gregory A. Dunn, Manager – FENOC Fleet Licensing, at (330) 315-7243.

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I declare under penalty of perjury that the foregoing is true and correct. Executed on January 27, 2006.

Sincerely,

James H. Lash

Attachments
A. Proposed Technical Specification Changes
B. Proposed Technical Specification Bases Changes
C. Summary of Changes to Proposed Technical Specifications and Bases

References:
1. Beaver Valley Unit No. 2 License Amendment Request No. 183 - Revised Steam Generator Inspection Scope, Letter L-05-061 dated April 11, 2005
2. Beaver Valley Power Station, Unit No. 2 - Revised Steam Generator Inspection Scope - Request for Additional Information (TAC No. 6768), dated October 28, 2005
3. Beaver Valley Unit No. 2 - Response to Request for Additional Information on License Amendment Request regarding Revised Steam Generator Inspection Scope (TAC No. 6768), Letter L-05-190 dated December 2, 2005

c: Mr. T. G. Colburn, NRR Senior Project Manager
Mr. P. C. Cataldo, NRC Senior Resident Inspector
Mr. S. J. Collins, NRC Region I Administrator
Mr. D. A. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)

ATTACHMENT A

Beaver Valley Power Station, Unit No. 2
License Amendment Request No. 183

Proposed Technical Specification Changes

The following are the affected pages:

3/4 4-11*

3/4 4-12

3/4 4-13*

3/4 4-14*

3/4 4-14a

3/4 4-14b*

3/4 4-14c*

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* No changes are proposed for this page. It is provided for readability only.

3/4.4.5 STEAM GENERATORS

LIMITING CONDITION FOR OPERATION

3.4.5 Each steam generator shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With one or more steam generators inoperable, restore the inoperable generator(s) to OPERABLE status prior to increasing T_{avg} above 200°F.

SURVEILLANCE REQUIREMENTS

4.4.5.1 Steam Generator Sample Selection and Inspection - Each steam generator shall be determined OPERABLE during shutdown by selecting and inspecting at least the minimum number of steam generators specified in Table 4.4-1.

4.4.5.2 Steam Generator Tube Sample Selection and Inspection - The steam generator tube minimum sample size, inspection result classification, and the corresponding action required shall be as specified in Table 4.4-2. The inservice inspection of steam generator tubes shall be performed at the frequencies specified in Specification 4.4.5.3 and the inspected tubes shall be verified acceptable per the acceptance criteria of Specification 4.4.5.4. Steam generator tubes shall be examined in accordance with Article 8 of Section V ("Eddy Current Examination of Tubular Products") and Appendix IV to Section XI ("Eddy Current Examination of Nonferromagnetic Steam Generator Heat Exchanger Tubing") of the applicable year and addenda of the ASME Boiler and Pressure Vessel Code required by 10CFR50, Section 50.55a(g). When applying the exceptions of 4.4.5.2.a through 4.4.5.2.c, previous defects or imperfections in the area repaired by sleeving are not considered an area requiring reinspection. The tubes selected for each inservice inspection shall include at least 3 percent of the total number of tubes in all steam generators; 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 percent of the tubes inspected shall be from these critical areas.

b. The first sample of tubes selected for each inservice inspection (subsequent to the preservice inspection) of each steam generator shall include:

SURVEILLANCE REQUIREMENTS (Continued)

1. All nonplugged tubes that previously had detectable wall penetrations greater than 20 percent, and

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

3. At least 3 percent of the total number of sleeved tubes in all three steam generators. A sample size less than 3 percent is acceptable provided all the sleeved tubes in the steam generator(s) examined during the refueling outage are inspected. These inspections will include both the tube and the sleeve, and

4. A tube inspection pursuant to Specification 4.4.5.4.a.8. If any selected tube does not permit the passage of the eddy current probe for a tube or sleeve inspection, this shall be recorded and an adjacent tube shall be selected and subjected to a tube inspection.

5. Indications left in service as a result of application of the tube support plate voltage-based repair criteria (4.4.5.4.a.10) shall be inspected by bobbin coil probe during all future refueling outages.

c. The tubes selected as the second and third samples (if required by Table 4.4-2) during each inservice inspection may be subjected to a partial tube inspection provided:

1. The tubes selected for these samples include the tubes from those areas of the tube sheet array where tubes with imperfections were previously found, and

2. The inspections include those portions of the tubes where imperfections were previously found.

d. Implementation of the steam generator tube-to-tube support plate repair criteria requires a 100-percent bobbin coil inspection for hot-leg and cold-leg tube support plate intersections down to the lowest cold-leg tube support plate with known outside diameter stress corrosion cracking (ODSCC) indications. The determination of the lowest cold-leg tube support plate intersections having ODSCC indications shall be based on the performance of at least a 20-percent random sampling of tubes inspected over their full length.

e. For implementation of the F* inspection methodology, 100 percent of the active hot leg tubes will be examined utilizing qualified eddy current techniques from the top of the tubesheet to the F* distance or to 3.0 inches below the top of the tubesheet, whichever is greater.

SURVEILLANCE REQUIREMENTS (Continued)

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

Category	Inspection Results
C-1	Less than 5 percent 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 percent of the total tubes inspected are defective, or between 5 percent and 10 percent of the total tubes inspected are degraded tubes.
C-3	More than 10 percent of the total tubes inspected are degraded tubes or more than 1 percent of the inspected tubes are defective.

Note: In all inspections, previously degraded tubes or sleeves must exhibit significant (greater than 10 percent) further wall penetrations to be included in the above percentage calculations.

4.4.5.3 Inspection Frequencies - The above required inservice inspections of steam generator tubes shall be performed at the following frequencies:

a. The first inservice inspection shall be performed after 6 Effective Full Power Months but within 24 calendar months of initial criticality. Subsequent 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.

SURVEILLANCE REQUIREMENTS (Continued)

b. If the inservice inspection of a steam generator conducted in accordance with Table 4.4-2 requires a third sample inspection whose results fall in Category C-3, the inspection frequency shall be increased to at least once per 20 months. The increase in inspection frequency shall apply until a subsequent inspection demonstrates that a third sample inspection is not required.

c. Additional, unscheduled inservice inspections shall be performed on each steam generator in accordance with the first sample inspection specified in Table 4.4-2 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 3.4.6.2,

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 steamline or feedwater line break.

4.4.5.4 Acceptance Criteria

a. As used in this Specification:

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

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

3. Degraded Tube means a tube or sleeve containing imperfections greater than or equal to 20 percent of the nominal wall thickness caused by degradation.

4. Percent Degradation means the percentage of the tube or sleeve wall thickness affected or removed by degradation.

5. Defect means an imperfection of such severity that it exceeds the plugging or repair limit. A tube containing a defect is defective. Any tube which does not permit the passage of the eddy-current inspection probe shall be deemed a defective tube.

6. Plugging or Repair Limit means the imperfection depth at or beyond which the tube shall be removed from service by plugging or repaired by sleeving in the affected area because it may become unserviceable prior to the next inspection. The plugging or repair limit imperfection depths are specified in percentage of nominal wall thickness as follows:

a) Original tube wall 40%

1.0 This definition does not apply to tube support plate intersections for which the voltage-based repair criteria are being applied. Refer to 4.4.5.4.a.10 for the repair limit applicable to these intersections.

2.0 This definition does not apply to service-induced degradation identified in unsleeved tubes within the F* distance or within 3.0 inches below the top of the tubesheet, whichever is greater. Tubes with service-induced degradation identified in this region shall be repaired or removed from service upon detection.

3.0 This definition does not apply to service-induced degradation identified in unsleeved tubes greater than the F* distance and also greater than 3.0 inches below the top of the tubesheet. Tubes with service-induced degradation identified in this region are acceptable for continued operation.

4.0 This definition does not apply to service-induced degradation identified within 3.0 inches below the lower end of a sleeve installed in the tubesheet region. Tubes with service-induced degradation identified in this region shall be removed from service upon detection.

5.0 This definition does not apply to service-induced degradation identified greater than 3.0 inches below the lower end of a sleeve installed in the tubesheet region. Tubes with service-induced degradation identified in this region are acceptable for continued operation.

b) ABB Combustion Engineering TIG welded sleeve wall 32%

c) Westinghouse laser welded sleeve wall 25%

7. 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 steamline or feedwater line break as specified in 4.4.5.3.c, above.

8. Tube Inspection means an inspection of the steam generator tube from the point of entry (hot-leg side) completely around the U-bend to the top support ~~to the cold-leg~~ of the cold-leg. Within the tubesheet this includes only the portion of the tube within the F* distance or within 3.0 inches below the top of the tubesheet, whichever is greater, unless tube sleeves are installed. When a tube sleeve is installed, the inspection extends to a distance of 3.0 inches below the lower end of the sleeve. The tube-to-tubesheet weld is excluded from this inspection requirement.

SURVEILLANCE REQUIREMENTS (Continued)

9. Tube Repair refers to sleeving which is used to maintain a tube in-service or return a tube to service. This includes the removal of plugs that were installed as a corrective or preventive measure. The following sleeve designs have been found acceptable:

   a) ABB Combustion Engineering TIG welded sleeves, CEN-629-P, Revision 02 and CEN-629-P Addendum 1.

   b) Westinghouse laser welded sleeves, WCAP-13483, Revision 1.

10. Tube Support Plate Plugging Limit is used for the disposition of an alloy 600 steam generator tube for continued service that is experiencing predominantly axially oriented outside diameter stress corrosion cracking confined within the thickness of the tube support plates. At tube support plate intersections, the plugging (repair) limit is based on maintaining steam generator tube serviceability as described below:

   a) Steam generator tubes, whose degradation is attributed to outside diameter stress corrosion cracking within the bounds of the tube support plate with bobbin voltages less than or equal to 2.0 volts will be allowed to remain in service.

   b) Steam generator tubes, whose degradation is attributed to outside diameter stress corrosion cracking within the bounds of the tube support plate with a bobbin voltage greater than 2.0 volts will be repaired or plugged, except as noted in 4.4.5.4.a.10.c below.

SURVEILLANCE REQUIREMENTS (Continued)

c) Steam generator tubes, with indications of potential degradation attributed to outside diameter stress corrosion cracking within the bounds of the tube support plate with a bobbin voltage greater than 2.0 volts but less than or equal to the upper voltage repair limit[1] may remain in service if a rotating pancake coil or acceptable alternative inspection does not detect degradation. Steam generator tubes, with indications of outside diameter stress corrosion cracking degradation with a bobbin voltage greater than the upper voltage repair limit[1] will be plugged or repaired.

d) If an unscheduled mid-cycle inspection is performed, the following mid-cycle repair limits apply instead of the limits identified in 4.4.5.4.a.10.a, 4.4.5.4.a.10.b, and 4.4.5.4.a.10.c.

The mid-cycle repair limits are determined from the following equations:

$$V_{MURL} = \frac{V_{SL}}{1.0 + NDE + Gr\left(\frac{CL - \Delta t}{CL}\right)}$$

$$V_{MLRL} = V_{MURL} - (V_{URL} - V_{LRL})\left(\frac{CL - \Delta t}{CL}\right)$$

(1) The upper voltage repair limit is calculated according to the methodology in Generic Letter 95-05 as supplemented.

SURVEILLANCE REQUIREMENTS (Continued)

where:

V_{URL}	=	upper voltage repair limit
V_{LRL}	=	lower voltage repair limit
V_{MURL}	=	mid-cycle upper voltage repair limit based on time into cycle
V_{MLRL}	=	mid-cycle lower voltage repair limit based on V_{MURL} and time into cycle
Δt	=	length of time since last scheduled inspection during which V_{URL} and V_{LRL} were implemented
CL	=	cycle length (the time between two scheduled steam generator inspections)
V_{SL}	=	structural limit voltage
Gr	=	average growth rate per cycle length
NDE	=	95-percent cumulative probability allowance for nondestructive examination uncertainty (i.e., a value of 20-percent has been approved by NRC)[2]

Implementation of these mid-cycle repair limits should follow the same approach as in TS 4.4.5.4.a.10.a, 4.4.5.4.a.10.b, and 4.4.5.4.a.10.c.

(2) The NDE is the value provided by the NRC in GL 95-05 as supplemented.

11. a) Bottom of the Roll Transition (BRT) - Defined as the highest point of contact between the tube and tubesheet, at or below the top of the tubesheet, as determined by eddy current testing.

    b) F* Distance - Defined as the non-degraded distance from the top of the tubesheet to the bottom of the F* length including the distance from the top of the tubesheet to the bottom of the roll transition and Non-Destructive Examination (NDE) uncertainties (i.e., F* distance = F* length + distance to BRT + NDE uncertainties).

    c) F* Length - Defined as the length of non-degraded expanded tubing below the bottom of the roll transition (BRT) or top of tubesheet, whichever is lower, that must be demonstrated to be non-degraded in order for the tube to maintain structural and leakage integrity. For the hot leg, the F* length is 1.97 inches which represents the most conservative hot leg length as defined in WCAP-16385, Revision 1. This F* length is developed from the limiting set of input parameters based on faulted conditions.

b. The steam generator shall be determined OPERABLE after completing the corresponding actions (plug or repair all tubes exceeding the plugging or repair limit) required by Table 4.4-2.

4.4.5.5 Reports

a. Within 15 days following the completion of each inservice inspection of steam generator tubes, the number of tubes plugged or repaired in each steam generator shall be submitted in a Special Report in accordance with 10 CFR 50.4.

b. The complete results of the steam generator tube and sleeve inservice inspection shall be submitted in a Special Report in accordance with 10 CFR 50.4 within 12 months following the completion of the inspection. This Special Report shall include:

1. Number and extent of tubes and sleeves inspected.

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

3. Identification of tubes plugged or repaired.

c. Results of steam generator tube inspections which fall into Category C-3 shall be reported to the Commission pursuant to Specification 6.6 prior to resumption of plant operation. The written report shall provide a description of investigations conducted to determine the cause of the tube degradation and corrective measures taken to prevent recurrence.

d. For implementation of the voltage-based repair criteria to tube support plate intersections, notify the Commission prior to returning the steam generators to service (MODE 4) should any of the following conditions arise:

1. If estimated leakage based on the projected end-of-cycle (or if not practical, using the actual measured end-of-cycle) voltage distribution exceeds the leak limit (determined from the licensing basis dose calculation for the postulated main steamline break) for the next operating cycle.

SURVEILLANCE REQUIREMENTS (Continued)

2. If circumferential crack-like indications are detected at the tube support plate intersections.

3. If indications are identified that extend beyond the confines of the tube support plate.

4. If indications are identified at the tube support plate elevations that are attributable to primary water stress corrosion cracking.

5. If the calculated conditional burst probability based on the projected end-of-cycle (or if not practical, using the actual measured end-of-cycle) voltage distribution exceeds 1×10^{-2}, notify the Commission and provide an assessment of the safety significance of the occurrence.

e. Notify the Commission prior to returning the steam generators to service (MODE 4) after an outage in which steam generator inspections are performed, if the preliminary estimated total projected end-of-cycle accident-induced leakage from all sources exceeds the leak limit (determined from the licensing basis dose calculation for the postulated main steamline break) for the next operating cycle.

f. With respect to tubes where the F* inspection methodology is applied, report the following information to the NRC within 90 days after achieving Mode 4 following the outage in which the F* inspection methodology was applied:

1. Number of total indications, location of each indication, orientation of each indication, severity of each indication, and whether the indications initiated from the inside or outside surface.

2. The cumulative number of indications detected in the tubesheet region as a function of elevation within the tubesheet.

3. The projected end-of-cycle accident-induced leakage from tubesheet indications.

TABLE 4.4-1

MINIMUM NUMBER OF STEAM GENERATORS TO BE INSPECTED DURING INSERVICE INSPECTION

Preservice Inspection	No	Yes
No. of Steam Generators per Unit	Three	Three
First Inservice Inspection	All	Two
Second & Subsequent Inservice Inspections	One[1]	One[2]

Table Notation

1. The inservice inspection may be limited to one steam generator on a rotating schedule encompassing 9% of the tubes if the results of the first or previous inspections indicate that all steam generators are performing in a like manner. Note that under some circumstances, the operating conditions in one or more steam generators may be found to be more severe than those in other steam generators. Under such circumstances the sample sequence shall be modified to inspect the most severe conditions.

2. The other steam generator not inspected during the first inservice inspection shall be inspected. The third and subsequent inspections should follow the instruction described in 1 above.

TABLE 4.4-2
STEAM GENERATOR 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 S.G.	C-1	None	N/A	N/A	N/A	N/A
	C-2	Plug or repair defective tubes and inspect additional 2S tubes in this S.G.	C-1	None	N/A	N/A
			C-2	Plug or repair defective tubes and inspect additional 4S tubes in this S.G.	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 S.G., plug or repair defective tubes and inspect 2S tubes in each other S.G. Notification to NRC pursuant to Specification 6.6.	All other S.G.s are C-1	None	N/A	N/A
			Some S.G.s C-2 but no additional S.G.s are C-3	Perform action for C-2 result of second sample	N/A	N/A
			Additional S.G. is C-3	Inspect all tubes in each S.G. and plug or repair defective tubes. Notification to NRC pursuant to Specification 6.6.	N/A	N/A

$S = \frac{9}{n}\%$ Where n is the number of steam generators inspected during an inspection.

Attachment B

Beaver Valley Power Station, Unit No. 2
License Amendment Request No. 183

Proposed Technical Specification Bases Changes

Technical Specification Bases changes are provided for information only.

The following are the affected pages:

B 3/4 4-2*

B 3/4 4-3

B 3/4 4-3a

B 3/4 4-3b

* No changes are proposed for this page. It is provided for readability only.

3/4.4.2 (This Specification number is not used.)

3/4.4.3 SAFETY VALVES

The pressurizer code safety valves operate to prevent the RCS from being pressurized above its Safety Limit of 2735 psig. Each safety valve is designed to relieve 345,000 lbs. per hour of saturated steam at the valve set point.

During shutdown conditions (MODE 4 with any RCS cold leg temperature below the enable temperature specified in 3.4.9.3) RCS overpressure protection is provided by the Overpressure Protection Systems addressed in Specification 3.4.9.3.

During operation, all pressurizer code safety valves must be OPERABLE to prevent the RCS from being pressurized above its safety limit of 2735 psig. The combined relief capacity of all of these valves is greater than the maximum surge rate resulting from a complete loss of load assuming no reactor trip until the first Reactor Protective System trip set point is reached (i.e., no credit is taken for a direct reactor trip on the loss of load) and also assuming no operation of the power operated relief valves or steam dump valves.

Demonstration of the safety valves' lift settings will occur only during shutdown and will be performed in accordance with the provisions of Section XI of the ASME Boiler and Pressure Code.

Safety valves similar to the pressurizer code safety valves were tested under an Electric Power Research Institute (EPRI) program to determine if the valves would operate stably under feedwater line break accident conditions. The test results indicated the need for inspection and maintenance of the safety valves to determine the potential damage that may have occurred after a safety valve has lifted and either discharged the loop seal or discharged water through the valve. Additional action statements require safety valve inspection to determine the extent of the corrective actions required to ensure the valves will be capable of performing their intended function in the future.

3/4.4.4 PRESSURIZER

The requirement that 150 kw of pressurizer heaters and their associated controls and emergency bus provides assurance that these heaters can be energized during a loss of offsite power condition to maintain natural circulation at HOT STANDBY.

3/4.4.5 STEAM GENERATORS

One OPERABLE steam generator in a non-isolated reactor coolant loop provides sufficient heat removal capability to remove decay heat after a reactor shutdown. The requirement for two OPERABLE steam generators, combined with other requirements of the Limiting Conditions for Operation ensures adequate

3/4.4.5 STEAM GENERATORS (Continued)

decay heat removal capabilities for RCS temperatures greater than 350°F if one steam generator becomes inoperable due to single failure considerations. Below 350°F, decay heat is removed by the RHR system.

The Surveillance Requirements for inspection of the steam generator tubes ensure that the structural and leakage integrity of this portion of the RCS will be maintained. The program for inservice inspection of steam generator tubes is based on a modification of Regulatory Guide 1.83, Revision 1. However, WCAP-16385, Revision 1, "F* Tube Plugging Criterion for Tubes with Degradation in the Tubesheet Roll Expansion Region of the Beaver Valley Unit 2 Steam Generators," provides the basis for excluding that portion of the tube within the tubesheet and the tube-to-tubesheet weld, that does not contribute to structural and leakage integrity, from periodic nondestructive examination requirements. Inservice inspection of steam generator tubing is essential in order to maintain surveillance of the conditions of the tubes in the event that there is evidence of mechanical damage or progressive degradation due to design, manufacturing errors, or inservice conditions that lead to corrosion. Inservice inspection of steam generator tubing also provides a means of characterizing the nature and cause of any tube degradation so that corrective measures can be taken.

The plant is expected to be operated in a manner such that the secondary coolant will be maintained within those parameter limits found to result in negligible corrosion of the steam generator tubes. If the secondary coolant chemistry is not maintained within these parameter limits, localized corrosion may likely result in stress corrosion cracking. The extent of cracking during plant operation would be limited by the limitation of steam generator tube leakage between the Primary Coolant System and the Secondary Coolant System (primary-to-secondary LEAKAGE = 150 gallons per day per steam generator). Axial cracks having a primary-to-secondary LEAKAGE less than this limit during operation will have an adequate margin of safety to withstand the loads imposed during normal operation and by postulated accidents. Operating plants have demonstrated that primary-to-secondary LEAKAGE of 150 gallons per day per steam generator can readily be detected. LEAKAGE in excess of this limit will require plant shutdown and an unscheduled inspection, during which the leaking tubes will be located and plugged or repaired by sleeving. The technical bases for sleeving are described in the approved vendor reports listed in Surveillance Requirement 4.4.5.4.a.9.

Wastage-type defects are unlikely with the all volatile treatment (AVT) of secondary coolant. However, even if a defect of similar type should develop in service, it will be found during scheduled inservice steam generator tube examinations. Plugging or repair will be required of all tubes with imperfections exceeding the plugging or repair limit. Degraded steam generator tubes may be repaired by the installation of sleeves which span the degraded tube section. A steam generator tube with a sleeve installed meets the structural

3/4.4.5 STEAM GENERATORS (Continued)

requirements of tubes which are not degraded, therefore, the sleeve is considered a part of the tube. The surveillance requirements identify those sleeving methodologies approved for use. The number of tubes plugged is limited by the minimum required RCS flow (TS 3.2.5.c). However, since increased tube plugging levels cause hot leg temperatures to rise, thereby increasing susceptibility to degradation, it is desirable to maintain the number of plugged tubes less than this limit. Therefore, tube plugging levels will be managed with the intention of keeping the planned average tube plugging to less than 8% under uprated conditions through the use of NRC approved repair methods and possible tube deplugging and repair.

If an installed sleeve is found to have through wall penetration greater than or equal to the plugging limit, the tube must be plugged. The plugging limit for the sleeve is derived from R. G. 1.121 analysis which utilizes a 20 percent allowance for eddy current uncertainty in determining the depth of tube wall penetration and additional degradation growth. Steam generator tube inspections of operating plants have demonstrated the capability to reliably detect degradation that has penetrated 20 percent of the original tube wall thickness.

The voltage-based repair limits of these surveillance requirements (SR) implement the guidance in GL 95-05 and are applicable only to Westinghouse-designed steam generators (SGs) with outside diameter stress corrosion cracking (ODSCC) located at the tube-to-tube support plate intersections. The guidance in GL 95-05 will not be applied to the tube-to-flow distribution baffle plate intersections. The voltage-based repair limits are not applicable to other forms of SG tube degradation nor are they applicable to ODSCC that occurs at other locations within the SG. Additionally, the repair criteria apply only to indications where the degradation mechanism is dominantly axial ODSCC with no NDE detectable cracks extending outside the thickness of the support plate. Refer to GL 95-05 for additional description of the degradation morphology.

Implementation of these SRs requires a derivation of the voltage structural limit from the burst versus voltage empirical correlation and then the subsequent derivation of the voltage repair limit from the structural limit (which is then implemented by this surveillance).

The voltage structural limit is the voltage from the burst pressure/bobbin voltage correlation, at the 95-percent prediction interval curve reduced to account for the lower 95/95-percent tolerance bound for tubing material properties at 650°F (i.e., the 95-percent LTL curve). The voltage structural limit must be adjusted downward to account for potential degradation growth during an

operating interval and to account for NDE uncertainty. The upper voltage repair limit; V_{URL}, is determined from the structural voltage limit by applying the following equation:

$$V_{URL} = V_{SL} - V_{Gr} - V_{NDE}$$

3/4.4.5 STEAM GENERATORS (Continued)

where V_{Gr} represents the allowance for degradation growth between inspections and V_{NDE} represents the allowance for potential sources of error in the measurement of the bobbin coil voltage. Further discussion of the assumptions necessary to determine the voltage repair limit are discussed in GL 95-05.

Safety analyses were performed pursuant to Generic Letter 95-05 to determine the maximum MSLB-induced primary-to-secondary leak rate that could occur without offsite doses exceeding a small fraction of 10 CFR 100 (concurrent iodine spike), 10 CFR 100 (pre-accident iodine spike), and without control room doses exceeding GDC-19. The current value of the maximum MSLB-induced leak rate and a summary of the analyses are provided in Section 15.1.5 of the UFSAR.

The mid-cycle equation in SR 4.4.5.4.a.10.d should only be used during unplanned inspections in which eddy current data is acquired for indications at the tube support plates.

SR 4.4.5.5 implements several reporting requirements recommended by GL 95-05 for situations which the NRC wants to be notified prior to returning the SGs to service. For the purposes of this reporting requirement, leakage and conditional burst probability can be calculated based on the as-found voltage distribution rather than the projected end-of-cycle (EOC) voltage distribution (refer to GL 95-05 for more information) when it is not practical to complete these calculations using the projected EOC voltage distributions prior to returning the SGs to service. Note that if leakage and conditional burst probability were calculated using the measured EOC voltage distribution for the purposes of addressing the GL section 6.a.1 and 6.a.3 reporting criteria, then the results of the projected EOC voltage distribution should be provided per the GL section 6.b (c) criteria.

The F* criteria incorporate the guidance provided in WCAP-16385, Revision 1, "F* Tube Plugging Criterion for Tubes with Degradation in the Tubesheet Roll Expansion Region of the Beaver Valley Unit 2 Steam Generators". F* length is the undegraded length of tubing into the tubesheet below the bottom of the roll transition (BRT) that precludes tube pullout in the event of a complete circumferential separation of the tube below the F* length. F* distance is the undegraded distance from the top of the tubesheet to the bottom of the F* length including the distance from the top of the tubesheet to the BRT and non-destructive examination (NDE) measurement uncertainties. Tubes with service-induced degradation identified within the F* distance or within 3.0 inches below the top of the tubesheet, whichever is greater, shall be repaired or removed from service upon detection. Service induced degradation below this region in the tubesheet would be acceptable for continued operation.

Since 3.0 inches of undegraded tube length within the tubesheet is adequate to ensure structural and leak integrity, tubes with sleeves installed in the tubesheet region need only be inspected down to 3.0 inches below the lower end of the sleeve. Service induced degradation above this point would result in removing the tube from service. Below this point, such degradation would be acceptable for continued operation.

Tubes to which the F* inspection methodology is applied can experience through-wall degradation below the F* distance up to the limits defined in WCAP-16385, Revision 1 without increasing the probability of a tube rupture or large leakage event. Tube degradation of any type or extent below F* distance, including a complete circumferential separation of the tube, is acceptable. As applied at Beaver Valley Unit 2, the F* methodology is used to define the required tube inspection depth into the hot leg tubesheet, and is not used to permit degradation in the F* distance to remain in service.

Based on the Farley WCAP-11306 which states that postulated leakage below the F* distance can be neglected, additional leakage (normal and accident-induced) from implementation of the F* methodology is not anticipated at BVPS-2. However, postulated accident induced leakage from F* implementation shall be combined with the postulated end-of-cycle accident-induced leakage from all other sources (e.g. voltage based alternate repair criteria). If the preliminary estimated total end-of-cycle accident-induced leakage from all sources exceeds the leakage limit, the NRC staff shall be notified prior to restart (Mode 4). The combined calculated leak rate from all alternate repair criteria must be less than the maximum allowable steam line break leak rate limit in any one steam generator in order to maintain doses within 10 CFR 100 guideline values and within GDC-19 values during a postulated steam line break event.

Whenever the results of any steam generator tubing inservice inspection fall into Category C-3, these results will be reported to the Commission pursuant to Specification 6.6 prior to resumption of plant operation. Such cases will be considered by the Commission on a case-by-case basis and may result in a requirement for analysis, laboratory examinations, tests, additional eddy-current inspection, and revision of the Technical Specifications, if necessary.

Attachment C

Summary of Changes to Proposed Technical Specifications and Bases
License Amendment Request 183 – Revised Steam Generator Inspection Scope

Technical Specification	Page	Change Description
SR 4.4.5.2.e – Tube sampling requirement related to F*	3/4 4-12	1. Replaces reference to a specific inspection probe with a generic reference 2. Clarifies wording describing scope of tubes inspected and locations inspected when F* methodology is applied
SR 4.4.5.4.a.6 a) – Plugging or repair limit definition exceptions	3/4 4-14a	1. Clarifies that plugging or repair limit exceptions 2.0 and 3.0 apply to unsleeved tubes only 2. Clarifies plugging or repair limit exception 2.0 regarding degradation locations that would require plugging or repair regardless of magnitude 3. Clarifies plugging or repair limit exception 3.0 regarding degradation locations that would not require plugging or repair regardless of magnitude 4. Adds plugging or repair limit exception 4.0 regarding degradation locations in sleeved tubes that would require plugging or repair regardless of magnitude 5. Adds plugging or repair limit exceptions 5.0 regarding degradation locations in sleeved tubes that would not require plugging or repair regardless of magnitude
SR 4.4.5.4.a.8 - Tube inspection definition	3/4 4-14a	1. Clarifies wording describing locations inspected when F* methodology is applied 2. Revises wording to describe locations in sleeved tubes that are subject to inspection when F* methodology is applied
SR 4.4.5.5	3/4 4-14f	1. Adds reporting requirements e and f regarding inspection results and projected end-of-cycle leakage when F* is applied
Bases 3/4.4.5	B 3/4 4-3a	1. Added discussion of intent to maintain normal plugging levels below 8 percent
Bases 3/4.4.5	B 3/4 4-3b	1. Clarifies wording regarding degradation locations that would require plugging or repair regardless of magnitude 2. Adds discussion of application of F* to sleeved tubes 3. Adds discussion of projected accident induced leakage due to F* implementation and the need for reporting