MARKED-UP TECHNICAL SPECIFCATIONS

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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

4.4.5.0 Each steam generator shall be demonstrated OPERABLE by performance of the following augmented inservice inspection program and the requirement of Specification 4.0.5.

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. The tubes selected for each inservice inspection shall include at least 3% 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% 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:

   1) All nonplugged tubes that previously had detectable wall penetrations (greater than 20%).

* Amendment Nos. XXX and XXX applicable for Units 1 and 2, Cycles 10 and 11, only.

Unit 1 - Amendment No. XXX
Unit 2 - Amendment No. XXX

e. If an unscheduled mid-cycle inspection is performed, the following mid-cycle repair limits apply instead of the limits identified in 4.4.5.4a.10)a, 4.4.5.4a.10)b, and 4.4.5.4a.10)c. The mid-cycle repair limits are determined from the following equations:

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

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

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)

VSL = structural limit voltage

Gr = average growth rate per cycle length

NDE = 95% cumulative probability allowance for nondestructive examination uncertainty (i.e., a value of 20% has been approved by the NRC)

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

NOTE 1: The lower voltage repair limit is 2.0 volts for 7/8 inch diameter tubing at DCPP Units 1 and 2.

NOTE 2: The upper voltage repair limit is calculated according to the methodology in Generic Letter 95-05 as supplemented.

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

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11) W* Plugging Limit is used for disposition of an alloy 600 steam generator tube for continued service that is experiencing predominately axially oriented inside diameter stress corrosion cracking confined within the tubesheet, below the bottom of the WEXTEX transition (BWT). As used in this specification:

a. Bottom of WEXTEX Transition (BWT) is the highest point of contact between the tube and tubesheet at, or below the top-of-tubesheet as determined by eddy current testing.

b. W* Length is the distance to the tubesheet below the BWT that precludes tube pull out in the event of a complete circumferential separation of the tube below the W* length. The W* length is conservatively set at: 1) an undegraded hot leg tube length of 5.2 inches for Zone A tubes and 7.0 inches for Zone B tubes, and 2) an undegraded cold leg tube length of 5.5 inches for Zone A tubes and 7.5 inches for Zone B tubes. Information provided in WCAP-14797, Revision 1, defines the boundaries of Zone A and Zone B.

c. Flexible W* Length is the W* length adjusted for any cracks found within the W* region. The Flexible W* Length is the total RPC-inspected length as measured downward from the BWT, and includes NDE uncertainties and crack lengths within W* as adjusted for growth.

d. W* Tube is a tube with equal to or greater than 40% degradation within or below the W* length that is left in service, and degraded within the limits specified in Specification 4.4.5.4a.11)e.

e. Within the tubesheet, the plugging (repair) limit is based on maintaining steam generator serviceability as described below:

1. For tubes to which the W* criteria are applied, the length of non-degraded tube below BWT shall be greater than or equal to the W* length plus NDE uncertainties and crack growth for the operating cycle.

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2. Axial cracks in tubes returned to service using W* shall have the upper crack tip below the BWT by at least the NDE measurement uncertainty, and below the TTS by at least the NDE measurement uncertainty and crack growth allowance, such that at the end of the subsequent operating cycle the entire crack remains below the tubesheet secondary face.

3. Resolvable, single axial indications (multiple indications must return to the null point between individual cracks) within the flexible W* length can be left in service. Alternate RPC coils or an ultrasonic test (UT) inspection can be used to demonstrate return to null point between multiple axial indications or the absence of circumferential involvement between axial indications.

4. Tubes with inclined axial indications less than 2.0 inches long (including the crack growth allowance) having inclination angles relative to the tube axis of < 45 degrees minus the NDE uncertainty, ΔNDE_{CA}, on the measurement of the crack angle can be left in service. Tubes with two or more parallel (overlapping elevation), inclined axial cracks shall be plugged or repaired. For application of the 2.0 inch limit, an inclined indication is an axial crack that is visually inclined on the RPC C-scan, such that an angular measurement is required, and the measured angle exceeds the measurement uncertainty of ΔNDE_{CA}.

5. Circumferential, volumetric, and axial indications with inclination angles greater than (45 degrees - ΔNDE_{CA}) within the flexible W* length shall be plugged or repaired.

6. Any type of combination of the tube degradation below the W* length is acceptable.

STEAM GENERATORS (Continued)

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 chemistry limits found to result in negligible corrosion of the steam generator tubes. If the secondary coolant chemistry is not maintained within these 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 Reactor Coolant System and the Secondary Coolant System (primary-to-secondary leakage = 150 gallons per day per steam generator). 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. DCPP has demonstrated that primary-to-secondary leakage of 150 gallons per day per steam generator can readily be detected during power operation. Leakage in excess of this limit will require plant shutdown and an unscheduled inspection, during which the leaking tubes will be located and plugged.

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The voltage-based repair limits of SR 4.4.5.4a.10) 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 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 significant cracks extending outside the thickness of the support plate. Refer to GL 95-05 for additional description of the degradation morphology.

Implementation of SR 4.4.5.4a.10) 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 flaw 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:

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

where V_{GR} represents the allowance for flaw 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.

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Operating experience of tubes with through-wall cracking in the transition region of European plants and in-situ pressure testing of a domestic plant with primary water stress corrosion cracking in the roll transitions suggests that leakage at operating conditions from W* tubes would not be expected.

The W* criteria incorporate the guidance provided in Revision 1 of WCAP-14797, "Generic W* Tube Plugging Criteria for 51 Series Steam Generator Tubesheet Region WEXTEX Expansions." W* length is the distance into the tubesheet below the bottom of the WEXTEX transition (BWT) that precludes tube pullout in the event of a complete circumferential separation of the tube below the W* length.

For tubes to which the W* criteria are applied, indications of degradation in excess of 40% through-wall can remain in service without a loss of functionality or structural and leakage integrity. Tubes to which W* is applied can experience through-wall degradation up to the limits defined in Revision 1 of WCAP-14797 without increasing the probability of a tube rupture or large leakage event. The guidance of Regulatory Guide 1.121, issued for comment in August 1976, is used to assess the limits of acceptable tube degradation within W*. A potential exists for W* tubes to allow primary-to-secondary leakage during a postulated steam line break. Information is provided in Revision 1 of WCAP-14797 that is used to calculate the expected leakage at steam line break conditions for W* tubes. Tube degradation of any extent below the W* length, including a complete circumferential separation of the tube, is acceptable and does not require repair.

Axial cracks in tubes returned to service using the W* criteria must remain below the secondary tubesheet face at the end of the subsequent operating cycle. This performance criteria is demonstrated by operational assessment and condition monitoring.

The combined calculated leak rate from all alternate repair criteria must be less than the maximum allowable SLB leak rate limit in any one steam generator in order to maintain off-site doses to within 10 CFR 100 guideline values during a postulated steam line break event.

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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

4.4.5.0 Each steam generator shall be demonstrated OPERABLE by performance of the following augmented inservice inspection program and the requirement of Specification 4.0.5.

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. The tubes selected for each inservice inspection shall include at least 3% 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% 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:

   1) All nonplugged tubes that previously had detectable wall penetrations (greater than 20%).

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

* Amendment Nos. XXX and XXX applicable for Units 1 and 2, Cycles 10 and 11, only.

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 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;

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

3) Degraded Tube means a tube containing imperfections greater than or equal to 20% of the nominal wall thickness caused by degradation;

4) % Degradation means the percentage of the tube wall thickness affected or removed by degradation;

5) Defect means an imperfection of such severity that it exceeds the plugging limit. A tube containing a defect is defective;

6) Plugging Limit means the imperfection depth at or beyond which the tube shall be removed from service and is equal to 40% of the nominal tube wall thickness.

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

b) This definition does not apply to the portion of the tube within the tubesheet below the W* length. Acceptable tube wall degradation within the W* length shall be defined as in Specification 4.4.5.4a.11).

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 a Double Design Earthquake, a loss-of-coolant accident, or a steam line or feedwater line break as specified in 4.4.5.3c., 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 of the cold leg;

9) Preservice Inspection means an inspection of the full length of each tube in each steam generator performed by eddy current techniques prior to service to establish a baseline condition of the tubing. This inspection shall be performed after the field hydrostatic test and prior to initial POWER OPERATION using the equipment and techniques expected to be used during subsequent inservice inspections.

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 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 the lower voltage repair limit (Note 1), 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 the lower voltage repair limit (Note 1), will be repaired or plugged, except as noted in 4.4.5.4a.10)c below.

c. Steam generator tubes, with indication of potential degradation attributed to outside diameter stress corrosion cracking within the bounds of the tube support plate with a bobbin voltage greater than the lower voltage repair limit (Note 1) but less than or equal to the upper voltage repair limit (Note 2), may remain in service if a rotating pancake coil inspection does not detect degradation. Steam generator tubes, within indications of outside diameter stress corrosion cracking degradation with a bobbin voltage greater than the upper voltage repair limit (Note 2) will be plugged or repaired.

d. Certain intersections as identified in Westinghouse letter to PG&E dated September 3, 1992, "Deformation of Steam Generator Tubes Following a Postulated LOCA and SSE Event," will be excluded from application of the voltage-based repair criteria as it is determined that these intersections may collapse or deform following a postulated LOCA + SSE event.

e. If an unscheduled mid-cycle inspection is performed, the following mid-cycle repair limits apply instead of the limits identified in 4.4.5.4a.10)a, 4.4.5.4a.10)b, and 4.4.5.4a.10)c. The mid-cycle repair limits are determined from the following equations:

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

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

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)

VSL = structural limit voltage

Gr = average growth rate per cycle length

NDE = 95% cumulative probability allowance for nondestructive examination uncertainty (i.e., a value of 20% has been approved by the NRC)

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

NOTE 1: The lower voltage repair limit is 2.0 volts for 7/8 inch diameter tubing at DCPP Units 1 and 2.

NOTE 2: The upper voltage repair limit is calculated according to the methodology in Generic Letter 95-05 as supplemented.

11) W* Plugging Limit is used for disposition of an alloy 600 steam generator tube for continued service that is experiencing predominately axially oriented inside diameter stress corrosion cracking confined within the tubesheet, below the bottom of the WEXTEX transition (BWT). As used in this specification:

a. Bottom of WEXTEX Transition (BWT) is the highest point of contact between the tube and tubesheet at, or below the top-of-tubesheet as determined by eddy current testing.

b. W* Length is the distance to the tubesheet below the BWT that precludes tube pull out in the event of a complete circumferential separation of the tube below the W* length. The W* length is conservatively set at: 1) an undegraded hot leg tube length of 5.2 inches for Zone A tubes and 7.0 inches for Zone B tubes, and 2) an undegraded cold leg tube length of 5.5 inches for Zone A tubes and 7.5 inches for Zone B tubes. Information provided in WCAP-14797 defines the boundaries of Zone A and Zone B.

c. Flexible W* Length is the W* length adjusted for any cracks found within the W* region. The Flexible W* Length is the total RPC-inspected length as measured downward from the BWT, and includes NDE uncertainties and crack lengths within W* as adjusted for growth.

d. W* Tube is a tube with equal to or greater than 40% degradation within or below the W* length that is left in service, and degraded within the limits specified in Specification 4.4.5.4a.11)e.

e. Within the tubesheet, the plugging (repair) limit is based on maintaining steam generator serviceability as described below:

1. For tubes to which the W* criteria are applied, the length of non-degraded tube below BWT shall be greater than or equal to the W* length plus NDE uncertainties and crack growth for the operating cycle.

2. Axial cracks in tubes returned to service using W* shall have the upper crack tip below the BWT by at least the NDE measurement uncertainty, and below the TTS by at least the NDE measurement uncertainty and crack growth allowance, such that at the end of the subsequent operating cycle the entire crack remains below the tubesheet secondary face.

3. Resolvable, single axial indications (multiple indications must return to the null point between individual cracks) within the flexible W* length can be left in service. Alternate RPC coils or an ultrasonic test (UT) inspection can be used to demonstrate return to null point between multiple axial indications or the absence of circumferential involvement between axial indications.

4. Tubes with inclined axial indications less than 2.0 inches long (including the crack growth allowance) having inclination angles relative to the tube axis of <45 degress minus the NDE uncertainty, ΔNDE_{CA}, on the measurement of the crack angle can be left in service. Tubes with two or more parallel (overlapping elevation), inclined axial cracks shall be plugged or repaired. For application of the 2.0 inch limit, an inclined indication is an axial crack that is visually inclined on the RPC C-scan, such that an angular measurement is required, and the measured angle exceeds the measurement uncertainty of ΔNDE_{CA}.

5. Circumferential, volumetric, and axial indications with inclination angles greater than (45 degress - ΔNDE_{CA}) within the flexible W* length shall be plugged or repaired.

6. Any type of combination of the tube degradation below the W* length is acceptable.

b. The steam generator shall be determined OPERABLE after completing the corresponding actions (plug all tubes exceeding the plugging limits) 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 in each steam generator shall be reported to the Commission in a Special Report pursuant to Specification 6.9.2.

b. The complete results of the steam generator tube inservice inspection shall be submitted to the Commission in a Special Report pursuant to Specification 6.9.2 within 12 months following completion of the inspection. This Special Report shall include:

1) Number and extent of tubes inspected,

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

3) Identification of tubes plugged.

c. Results of steam generator tube inspections, which fall into Category C-3, shall be reported in a Special Report to the Commission pursuant to Specification 6.9.2 within 30 days and prior to resumption of plant operation. This report shall provide a description of investigations conducted to determine 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 NRC prior to returning the steam generators to service 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, reduced by estimated leakage by all other alternate repair criteria, exceeds the leak limit determined from the licensing basis dose calculation for the postulated main steamline break for the next operating cycle.

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 NRC and provide an assessment of the safety significance of the occurrence.

e. The results of the inspection of W* tubes shall be reported to the Commission pursuant to Specification 6.9.2 within 90 days following return to service of the steam generators. This report shall include:

1) Identification of W* tubes.

2) W* inspection distance measured with respect to the BWT or the top of the tubesheet, whichever is lower.

3) Elevation and length of axial indications within the flexible W* distance and the angle of inclination of clearly skewed axial cracks (if applicable).

4) The total steam line break leakage for the limiting steam generator per WCAP-14797.

f. The aggregate calculated steam line break leakage from application of all alternate repair criteria shall be reported to the Commission pursuant to Specification 6.9.2 within 90 days following return to service of the steam generators.

STEAM GENERATORS (Continued)

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 chemistry limits found to result in negligible corrosion of the steam generator tubes. If the secondary coolant chemistry is not maintained within these 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 Reactor Coolant System and the Secondary Coolant System (primary-to-secondary leakage = 150 gallons per day per steam generator). 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. DCPP has demonstrated that primary-to-secondary leakage of 150 gallons per day per steam generator can readily be detected during power operation. Leakage in excess of this limit will require plant shutdown and an unscheduled inspection, during which the leaking tubes will be located and plugged.

Operating experience of tubes with throughwall cracking in the transition region of European plants and in-situ pressure testing of a domestic plant with primary water stress corrosion cracking in the roll transitions suggests that leakage at operating conditions from W* tubes would not be expected.

The W* criteria incorporate the guidance provided in Revision 1 of WCAP-14797, "Generic W* Tube Plugging Criteria for 51 Series Steam Generator Tubesheet Region WEXTEX Expansions." W* length is the distance into the tubesheet below the bottom of the WEXTEX transition (BWT) that precludes tube pullout in the event of a complete circumferential separation of the tube below the W* length.

For tubes to which the W* criteria are applied, indications of degradation in excess of 40% throughwall can remain in service without a loss of functionality or structural and leakage integrity. Tubes to which W* is applied can experience throughwall degradation up to the limits defined in Revision 1 of WCAP-14797 without increasing the probability of a tube rupture or large leakage event. The guidance of Regulatory Guide 1.121, issued for comment in August 1976, is used to assess the limits of acceptable tube degradation within W*. A potential exists for W* tubes to allow primary-to-secondary leakage during a postulated steam line break. Information is provided in Revision 1 of WCAP-14797 that is used to calculate the expected leakage at steam line break conditions for W* tubes. Tube degradation of any extent below the W* length, including a complete circumferential separation of the tube, is acceptable and does not require repair.

Axial cracks in tubes returned to service using the W* criteria must remain below the secondary tubesheet face at the end of the subsequent operating cycle. This performance criteria is demonstrated by operational assessment and condition monitoring.

STEAM GENERATORS (Continued)

The combined calculated leak rate from all alternate repair criteria must be less than the maximum allowable SLB leak rate limit in any one steam generator in order to maintain off-site doses to within 10 CFR 100 guideline values during a postulated steam line break event.

The voltage-based repair limits of SR 4.4.5.4a.10) 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 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 significant cracks extending outside the thickness of the support plate. Refer to GL 95-05 for additional description of the degradation morphology.

Implementation of SR 4.4.5.4a.10) 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 flaw 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:

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

where V_{GR} represents the allowance for flaw 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.

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

STEAM GENERATORS (Continued)

SR 4.4.5.5d 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 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 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.

Wastage-type defects are unlikely with proper chemistry treatment of the secondary coolant. However, even if a wastage defect should develop in service, it will be found during scheduled inservice steam generator tube examinations. Plugging will be required for all tubes with imperfections exceeding the plugging limit defined in Surveillance Requirement 4.4.5.4a. Steam generator tube inspections of operating plants have demonstrated the capability to reliably detect degradation that has penetrated 20% of the original tube wall thickness.

Whenever the results of any steam generator tubing inservice inspection fall into Category C-3, these results will be reported to the Commission as a Special Report pursuant to Specification 6.9.2 within 30 days and 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.

3/4.4.6 REACTOR COOLANT SYSTEM LEAKAGE

3/4.4.6.1 LEAKAGE DETECTION SYSTEMS

The RCS Leakage Detection Systems required by this specification are provided to monitor and detect leakage from the reactor coolant pressure boundary. These Detection Systems are functionally consistent with the recommendations of Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems," May 1973.