1.1 Definitions (continued)

$\bar{E}$ -AVERAGE DISINTEGRATION ENERGY	$\bar{E}$ shall be the average (weighted in proportion to the concentration of each radionuclide in the reactor coolant at the time of sampling) of the sum of the average beta and gamma energies per disintegration (in MeV) for isotopes, other than iodines, with half lives > 15 minutes, making up at least 95% of the total noniodine activity in the coolant.
LEAKAGE	LEAKAGE from the Reactor Coolant System (RCS) shall be:

a. Identified LEAKAGE

1. LEAKAGE, such as that from pump seals or valve packing (except reactor coolant pump (RCP) seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank;

2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be pressure boundary LEAKAGE; or

3. RCS LEAKAGE through a steam generator to the Secondary System (primary to secondary LEAKAGE);

b. Unidentified LEAKAGE

All LEAKAGE (except RCP seal water injection or leakoff) that is not identified LEAKAGE;

c. Pressure Boundary LEAKAGE

LEAKAGE (except primary to secondary LEAKAGE) through a nonisolable fault in an RCS component body, pipe wall, or vessel wall.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. RCS identified LEAKAGE not within limit for reasons other than pressure boundary LEAKAGE or primary to secondary LEAKAGE.	C.1 Be in MODE 3. AND C.2.1 Reduce LEAKAGE to within limits. OR C.2.2 Be in MODE 5.	6 hours 14 hours 44 hours
D. Pressure boundary LEAKAGE exists. OR Primary to secondary LEAKAGE not within limit.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.4.14.1	----------NOTES---------- 1. Not required to be performed until 12 hours after establishment of steady state operation. 2. Not applicable to primary to secondary LEAKAGE. ---------- Verify RCS operational LEAKAGE within limits by performance of RCS water inventory balance.	24 hours
SR 3.4.14.2	----------NOTE---------- Not required to be performed until 12 hours after establishment of steady state operation. ---------- Verify primary to secondary LEAKAGE is $\leq$ 150 gallons per day through any one SG.	72 hours

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.19 Steam Generator (SG) Tube Integrity

LCO 3.4.19 SG tube integrity shall be maintained.

AND

All SG 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 SG tube.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more SG 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 SG inspection. AND	7 days
	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 SG tube inspection

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met. OR SG tube integrity not maintained.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.19.1	Verify SG tube integrity in accordance with the Steam Generator Program.	In accordance with the Steam Generator Program
SR 3.4.19.2	Verify that each inspected SG tube that satisfies the tube repair criteria is plugged or repaired in accordance with the Steam Generator Program.	Prior to entering MODE 4 following an SG tube inspection

5.5 Programs and Manuals (continued)

5.5.8 Steam Generator (SG) Program

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

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

1. Structural integrity performance criterion: All in-service 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, except for flaws addressed through application of the alternate repair criteria discussed in Specification 5.5.8.c.2(c), 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.

5.5.8 Steam Generator (SG) Program (continued)

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. For Unit 2, when alternate repair criteria discussed in Specification 5.5.8.c.2(c) are applied to axially oriented outside diameter stress corrosion cracking indications at the tube support plate locations, the probability that one or more of these indications in an SG will burst under postulated main steam line break conditions shall be less than 1E-02.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. For Unit 1, leakage is not to exceed 1 gpm per SG. For Unit 2, leakage from all sources, excluding the leakage attributed to the degradation associated with implementation of the voltage-based repair criteria discussed in Specification 5.5.8.c.2(c), is not to exceed 1 gpm per SG.

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.14, "RCS Operational LEAKAGE."

c. Provisions for SG tube repair criteria:

1. Unit 1 steam generator 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.

2 Unit 2 steam generator tubes found by inservice inspection to contain flaws shall be dispositioned as follows:

5.5 Programs and Manuals

5.5.8 Steam Generator (SG) Program (continued)

(a) Depth Based Criteria:

(1) Tubes found by inservice inspection containing a flaw in a non-sleeved region with a depth equal to or exceeding 50% of the nominal tube wall thickness shall be plugged or repaired except if permitted to remain in service through application of the alternate tube repair criteria discussed in Specification 5.5.8.c.2(b) or in Specification 5.5.8.c.2(c). If significant general tube thinning occurs, this criterion is reduced to 40% wall penetration.

(2) Tubes found by inservice inspection containing a flaw in the pressure boundary region of any sleeve exceeding 25% of the nominal sleeve wall thickness shall be plugged.

(3) Tubes with a flaw in a sleeve to tube joint that occurs in the original tube wall of the joint shall be plugged.

(b) The following F* or EF* Alternate Repair Criteria may be applied to the hot-leg of the tubesheet as an alternative to the depth based criteria in Specification 5.5.8.c.2(a)(1):

(1) F* Criterion: If the bottom of the uppermost hardroll transition in the tubesheet is below the midplane of the tubesheet, then all flaws located below 1.07 inches from the bottom of this uppermost hardroll transition (not including eddy current uncertainty) may be allowed to remain in service provided the tube does not contain any flaws within this 1.07-inch span (not including eddy current uncertainty). This 1.07-inch span (increased for measurement uncertainty) is referred to as the F* region. If flaws are contained within the F* region, the tube shall be plugged or repaired.

5.5.8 Steam Generator (SG) Program (continued)

(2) EF* Criterion: If the bottom of the uppermost hardroll transition in the tubesheet is above the midplane of the tubesheet but at least 2.0 inches below the top of the secondary face of the tubesheet, then all flaws located below 1.67 inches from the bottom of the uppermost hardroll transition (not including eddy current uncertainty) may be allowed to remain in service provided the tube does not contain any flaws within this 1.67-inch span (not including eddy current uncertainty). This 1.67-inch span (increased for measurement uncertainty) is referred to as the EF* region. If flaws are contained within the EF* region, the tube shall be plugged or repaired.

(c) The following Alternate Tube Support Plate Voltage-Based Repair Criteria may be applied as an alternative to the depth based criteria in Specification 5.5.8.c.2(a)(1): For regions of the tube affected by predominately axially oriented outside diameter stress corrosion cracking confined within the thickness of tube support plates the plugging or repair limit is as follows:

(1) If the bobbin voltage associated with the indication is less than or equal to 2.0 Volts, the indication is allowed to remain in service.

(2) If the bobbin voltage associated with the indication is greater than 2.0 Volts, the tube shall be plugged or repaired unless the voltage is less than or equal to the upper voltage repair limit (calculated according to the methodology in GL 95-05 as supplemented) and a rotating pancake coil (or comparable examination technique) does not detect a flaw. In this latter case, the indication may remain in service.

5.5.8 Steam Generator (SG) Program (continued)

3 If an unscheduled mid-cycle inspection is performed, the following mid-cycle repair limits apply instead of the limits in Specifications 5.5.8.c.2(c)(1) and 5.5.8.c.2(c)(2) above. The mid-cycle repair limits are determined from the following equations:

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

$$V_{MLRL} = V_{MURL} - (V_{URL} - 2.0)\left(\frac{CL - \Delta t}{CL}\right)$$

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

5.5.8 Steam Generator (SG) Program (continued)

CL = cycle length (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 the NRC)

Implementation of these mid-cycle repair limits should follow the same approach as described in Specifications 5.5.8.c.2(c)(1) and 5.5.8.c.2(c)(2) above.

Note: The upper voltage repair limit is calculated according to the methodology in GL 95-05 as supplemented.

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet, and that may satisfy the applicable tube repair criteria. In tubes repaired by sleeving, the portion of the original tube wall between the sleeve's joints is not an area requiring re-inspection. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, d.3 and d.4 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the

5.5.8 Steam Generator (SG) Program (continued)

next SG 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 SG during the first refueling outage following SG replacement.

2. For Unit 1 SGs, inspect 100% of the tubes at sequential periods of 144, 108, 72, and, thereafter, 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the SGs. In addition, inspect 50% of the tubes by the refueling outage nearest the midpoint of the period and the remaining 50% by the refueling outage nearest the end of the period. No SG shall operate for more than 72 effective full power months or three refueling outages (whichever is less) without being inspected.

3. For Unit 2 SGs, inspect 100% of the tubes at sequential periods of 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the SGs. No SG shall operate more than 24 effective full power months or one refueling outage (whichever is less) without being inspected.

   (a) During each Unit 2 SG inspection (every 24 effective full power months (EFPM) or one refueling outage (whichever is less)), all tubes within that SG which have had the F* or EF* criteria applied will be inspected in the F* and EF* regions of the roll expanded region. The region of these tubes below the F* and EF* regions do not need to be inspected, unless there is a sleeve (or portion of a sleeve) that extends below the F* or EF* region.

5.5.8 Steam Generator (SG) Program (continued)

(b) Implementation of the SG tube alternate repair criteria discussed in Specification 5.5.8.c.2(c) 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.

(c) SG tube indications left in service as a result of application of the alternate repair criteria discussed in Specification 5.5.8.c.2(c) shall be inspected by bobbin coil probe every 24 EFPM or one refueling outage (whichever is less).

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

e. Provisions for monitoring operational primary to secondary LEAKAGE.

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

1. There are no approved SG tube repair methods for the Unit 1 SGs.

5.5.8 Steam Generator (SG) Program (continued)

2. For Unit 2, the following are approved repair methods:

   (a) Alloy 690 tungsten inert gas welded sleeves in accordance with CEN-629-P, Revision 03-P, "Repair of Westinghouse Series 44 and 51 Steam Generator Tubes Using Leak Tight Sleeves".

   (b) Hardroll expanding non-sleeved portions of tubes in the tubesheet in order to apply the F* and EF* criteria.

5.5 Programs and Manuals (continued)

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5.6 Reporting Requirements

5.6.6 Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR) (continued)

b. The analytical methods used to determine the RCS pressure and temperature limits and Cold Overpressure Mitigation System setpoints shall be those previously reviewed and approved by the NRC, specifically those described in the following document:

WCAP-14040-NP-A, Revision 2, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves" (includes any exemption granted by NRC to ASME Code Case N-514).

c. The PTLR shall be provided to the NRC upon issuance for each reactor vessel fluence period and for any revision or supplement thereto. Changes to the curves, setpoints, or parameters in the PTLR resulting from new or additional analysis of beltline material properties shall be submitted to the NRC prior to issuance of an updated PTLR.

5.6.7 Steam Generator Tube Inspection Report

a. A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with the Specification 5.5.8, Steam Generator (SG) Program. The report shall include:

1. The scope of inspections performed on each SG,

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,

5.6 Reporting Requirements

5.6.7 Steam Generator Tube Inspection Report (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 SG,

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

10. The results of inspections performed under Specification 5.5.8.d.3 for all tubes that have flaws below the F* or EF* distance, and were not plugged. The report shall include: a) identification of F* and EF* tubes; and b) location and extent of degradation.

b. For implementation of the alternate repair criteria discussed in Specification 5.5.8.c.2(c), notify the NRC staff prior to returning the steam generators to service should any of the following conditions arise:

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

2. If indications are identified that extend beyond the confines of the tube support plate, or

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

5.6 Reporting Requirements (continued)

5.6.8 EM Report

When a report is required by Condition C or I of LCO 3.3.3, "Event Monitoring (EM) 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.