

ADDITIONAL CHANGES PREVIOUSLY
PROPOSED BY LETTER
Serial No. 2210 Date 03/30/94

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN

LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be $\geq 1\% \Delta k/k$.

APPLICABILITY: MODES 1, 2*, 3^{##}, 4 and 5.

ACTION:

With the SHUTDOWN MARGIN $< 1\% \Delta k/k$, immediately initiate and continue boration at > 18 gpm of 7875 ppm boron or its equivalent, until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be $\geq 1\% \Delta k/k$:

- a. Within one hour after detection of an inoperable control rod(s) and at least once per 12 hours thereafter while the rod(s) is inoperable. If the inoperable control rod is immovable or untrippable, the above required SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable control rod(s).
- b. When in MODES 1 or 2[#], at least once per 12 hours, by verifying that regulating rod groups withdrawal is within the limits of Specification 3.1.3.6.
- c. When in MODE 2^{##} within 4 hours prior to achieving reactor criticality by verifying that the predicted critical control rod position is within the limits of Specification 3.1.3.6.
- d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading by consideration of the factors of e. below, with the regulating rod groups at the maximum insertion limit of Specification 3.1.3.6.

[#]With $K_{eff} \geq 1.0$.

^{##}With $K_{eff} < 1.0$.

* See Special Test Exception 3.10.4.

** See LCO 3.4.5, Steam Generators, for additional SHUTDOWN MARGIN requirements.

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SURVEILLANCE REQUIREMENTS (Continued)

e. When in MODES 3, 4 or 5, at least once per 24 hours by consideration of the following factors:

1. Reactor coolant system boron concentration,
2. Control rod position,
3. Reactor coolant system average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

4.1.1.1.2 The overall core reactivity balance shall be compared to predicted values to demonstrate agreement within $\pm 1\% \Delta k/k$ at least once per 31 Effective Full Power Days (EFPD). This comparison shall consider at least those factors stated in Specification 4.1.1.1.1.e, above. The predicted reactivity values shall be adjusted (normalized) to correspond to the actual core conditions prior to exceeding a fuel burnup of 60 Effective Full Power Days after each fuel loading.

BASES**INFORMATION ONLY**3/4.1.1 BORATION CONTROL3/4.1.1.1 SHUTDOWN MARGIN

A sufficient SHUTDOWN MARGIN ensures that 1) the reactor can be made subcritical from all operating conditions, 2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and 3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition. During Modes 1 and 2 the SHUTDOWN MARGIN is known to be within limits if all control rods are OPERABLE and withdrawn to or beyond the insertion limit.

SHUTDOWN MARGIN requirements vary throughout core life as a function of fuel depletion, RCS boron concentration and RCS T_{avg} . The most restrictive condition occurs at EOL, with T_{avg} at no load operating temperature. The SHUTDOWN MARGIN required is consistent with FSAR safety analysis assumptions.

3/4.1.1.2 BORON DILUTION

A minimum flow rate of at least 2800 gpm provides adequate mixing, prevents stratification and ensures that reactivity changes will be gradual through the Reactor Coolant System in the core during boron concentration reductions in the Reactor Coolant System. A flow rate of at least 2800 gpm will circulate an equivalent Reactor Coolant System volume of 12,110 cubic feet in approximately 30 minutes. The reactivity change rate associated with boron concentration reduction will be within the capability for operator recognition and control.

In MODE 5 or MODE 6, the RCS boron concentration is typically somewhat higher than the boron concentration required by Specification 3.1.1.1 (MODE 5) or Specification 3.9.1 (MODE 6), and could be higher than the boron concentration of normal sources of water addition. At reduced inventory conditions in the RCS, in order to reduce the possibility of vortexing, the flowrate through the decay heat system may be procedurally restricted to somewhat less than 2800 gpm. In this situation, if water with a boron concentration equal to or greater than the boron concentration associated with the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 (MODE 5), or the boron concentration corresponding to the more restrictive reactivity condition specified in Specification 3.9.1 (MODE 6), is added to the RCS, the RCS boron concentration is assured to remain above the minimum boron concentration associated with the Specification 3.1.1.1 or Specification 3.9.1 requirement, and a flowrate of less than 2800 gpm is not of concern.

3/4.1.1.3 MODERATOR TEMPERATURE COEFFICIENT

The limitations on moderator temperature coefficient (MTC) are provided to ensure that the assumptions used in the accident and transient analyses remain valid through each fuel cycle. The surveillance requirement for measurement of the MTC each fuel cycle are adequate to confirm the MTC value since this coefficient changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup. The confirmation that the measured MTC value is within its limit provides assurance that the coefficient will be maintained within acceptable values throughout each fuel cycle.

REACTOR COOLANT SYSTEM

STEAM GENERATORS

LIMITING CONDITION FOR OPERATION

~~3.4.5 Each steam generator shall be OPERABLE with a water level between 18 and 348 inches.~~

INSERT NEW T.S. 3.4.5
LIMITING CONDITION FOR
OPERATION, AS ATTACHED

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

ACTION:

- a. With one or more steam generators inoperable due to steam generator tube imperfections, restore the inoperable generator(s) to OPERABLE status prior to increasing T_{avg} above 200°F.
- b. With one or more steam generators inoperable due to the water level being outside the limits, be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the next 30 hours.

SURVEILLANCE REQUIREMENTS

4.4.5.0 Each steam generator shall be demonstrated OPERABLE by performance of the following augmented inservice inspection program and the requirements 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. The first sample inspection during each inservice inspection (subsequent to the baseline inspection) of each steam generator shall include:
 1. All tubes or tube sleeves that previously had detectable wall penetrations (> 20%) that have not been plugged or repaired by sleeving in the affected area.
 2. At least 50% of the tubes inspected shall be in those areas where experience has indicated potential problems.

New TS 3.4.5 Limiting Condition for Operation

3.4.5 Each Steam Generator shall be OPERABLE with a minimum water level of 18 inches and the maximum specified below as applicable:

MODES 1 and 2:

- a. The acceptable operating region of Figure 3.4-5.

MODE 3: *

- b. 50 inches Startup Range with the SFRCS Low Pressure Trip bypassed and one or both Main Feedwater Pump(s) capable of supplying Feedwater to any Steam Generator.

- c. 96 percent Operate Range with:

1. The SFRCS Low Pressure Trip active.

Or

2. The SFRCS Low Pressure Trip bypassed and both Main Feedwater Pumps incapable of supplying Feedwater to the Steam Generators.

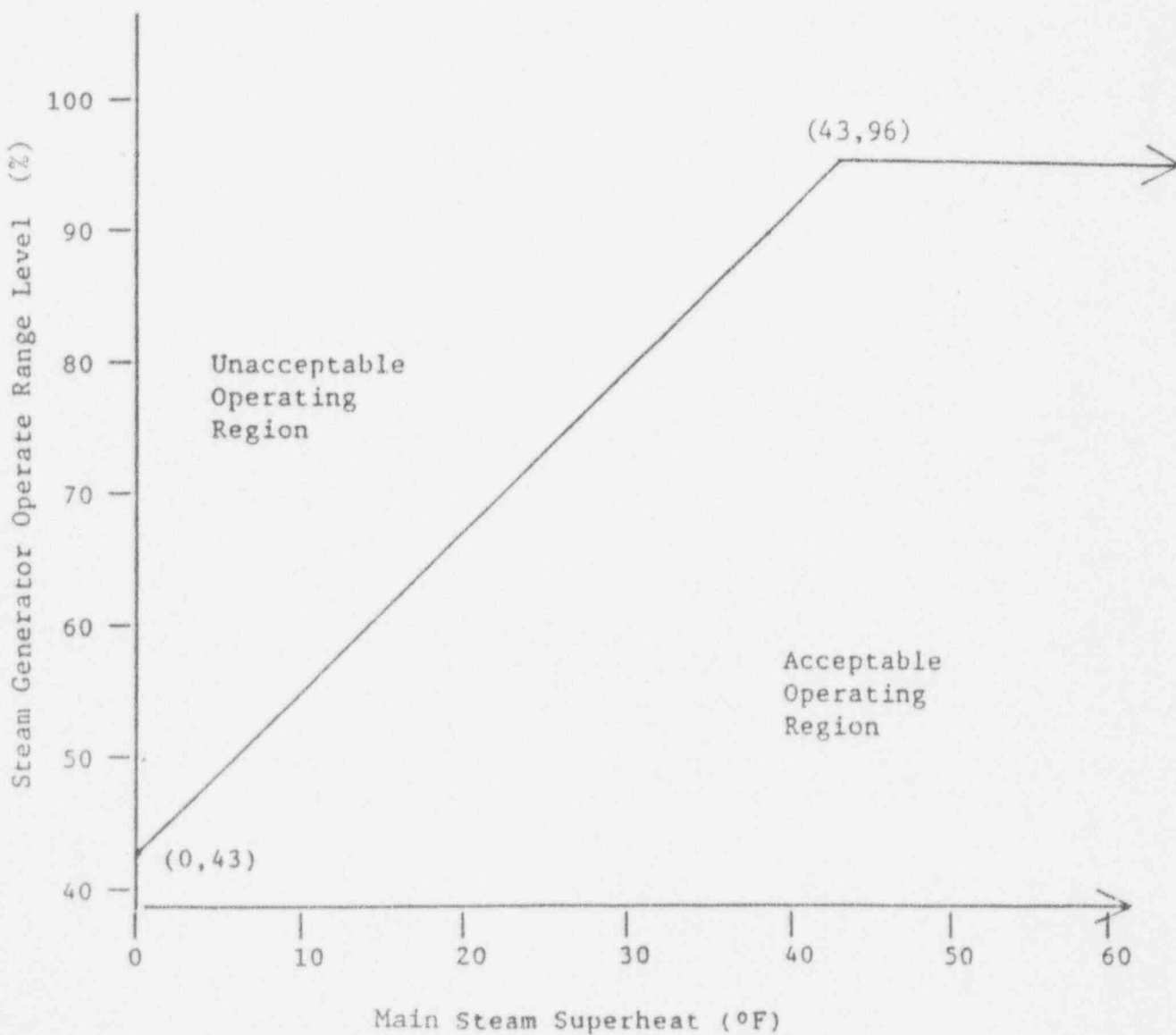
MODE 4:

- d. 625 inches Full Range Level

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

*Establish adequate SHUTDOWN MARGIN to ensure the reactor will stay subcritical during a MODE 3 Main Steam Line Break.

Figure 3.4-5
Maximum Allowable Steam Generator Level
in MODES 1 and 2



NEW Figure 3.4-5 TO BE INSERTED
AS NEW PAGE 3/4 4-6 a

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SURVEILLANCE REQUIREMENTS (Continued)

3. A tube inspection (pursuant to Specification 4.4.5.4.a.9) shall be performed on each selected tube. If any selected tube does not permit the passage of the eddy current probe for a tube inspection, this shall be recorded and an adjacent tube shall be selected and subjected to a tube inspection.
- b. Tubes in the following groups may be excluded from the first random sample if all tubes in a group in both steam generators are inspected. No credit will be taken for these tubes in meeting minimum sample size requirements.
 1. Group A-1: Tubes within one, two or three rows of the open inspection lane.
 2. Group A-2: Tubes having a drilled opening in the 15th support plate.
 3. Group A-3: Tubes included in the rectangle bounded by rows 62 and 90 and by tubes 58 and 76, excluding tubes included in Group A-1.*
- 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 less than a full 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.
 2. The inspections include those portions of the tubes where imperfections were previously found.

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

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

* Tubes in Group A-3 shall not be excluded after completion of the fifth refueling outage.

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SURVEILLANCE REQUIREMENTS (Continued)

- Notes:
- (1) In all inspections, previously degraded tubes must exhibit significant (> 10%) further wall penetrations to be included in the above percentage calculations.
 - (2) Where special inspections are performed pursuant to 4.4.5.2.b, defective or degraded tubes found as a result of the inspection shall be included in determining the Inspection Results Category for that special inspection but need not be included in determining the Inspection Results Category for the general steam generator inspection.

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

- a. The baseline inspection shall be performed to coincide with the first scheduled refueling outage but no later than April 30, 1980. Subsequent inservice inspections shall be performed at intervals of not less than 12 nor more than 24 calendar months after the previous inspection. If the results of two consecutive inspections for a given group* of tubes following service under all volatile treatment (AVT) conditions fall 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 for that group may be extended to a maximum of 40 months.
- b. If the results of the inservice inspection of a steam generator performed in accordance with Table 4.4-2 at 40 month intervals for a given group* of tubes fall in Category C-3, subsequent inservice inspections shall be performed at intervals of not less than 10 nor more than 20 calendar months after the previous inspection. The increase in inspection frequency shall apply until a subsequent inspection meets the conditions specified in 4.4.5.3a and the interval can be extended to 40 months.
- 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.

*A group of tubes means:

- (a) All tubes inspected pursuant to 4.4.5.2.b, or
- (b) All tubes in a steam generator less those inspected pursuant to 4.4.5.2.b.

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SURVEILLANCE REQUIREMENTS (Continued)

2. A seismic occurrence greater than the Operating Basis Earthquake.
 3. A loss-of-coolant accident requiring actuation of the engineered safeguards.
 4. A main steam line or feedwater line break.
- d. The provisions of Specification 4.0.2 are not applicable.

4.4.5.4 Acceptance Criteria

- a. As used in this Specification:

1. Tubing or Tube means that portion of the tube or tube sleeve which forms the primary system to secondary system boundary.
2. Imperfection means an exception to the dimensions, finish or contour of a tube from that required by fabrication drawings or specifications. Eddy-current testing indications below 20% of the nominal tube wall thickness, if detectable, may be considered as imperfections.
3. Degradation means a service-induced cracking, wastage, wear or general corrosion occurring on either inside or outside of a tube.
4. Degraded Tube means a tube containing imperfections \geq 20% of the nominal wall thickness caused by degradation that has not been repaired by sleeving in the affected area.
5. % Degradation means the percentage of the tube wall thickness affected or removed by degradation.
6. Defect means an imperfection of such severity that it exceeds the repair limit. A defective tube is a tube containing a defect that has not been repaired by sleeving in the affected area or a sleeved tube that has a defect in the sleeve.
7. 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 and is equal to 40% of the nominal tube wall thickness. The Babcock and Wilcox process described in Topical Report BAW-2120P will be used for sleeving.
8. 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 steam line or feedwater line break as specified in 4.4.5.3.c, above.
9. Tube Inspection means an inspection of the steam generator tube from the point of entry completely to the point of exit.

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SURVEILLANCE REQUIREMENTS (Continued)

10. 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 prior to initial POWER OPERATION using the equipment and techniques expected to be used during subsequent inservice inspections.

b. The steam generator shall be determined OPERABLE after completing the corresponding actions (plug or repair by sleeving in the affected areas all tubes exceeding the repair limit and all tubes containing through-wall cracks) required by Table 4.4-2.

4.4.5.5 Reports

a. Following each inservice inspection of steam generator tubes, the number of tubes plugged in each steam generator shall be reported to the Commission within 15 days.

b. The complete results of the steam generator tube inservice inspection shall be submitted on an annual basis in a report for the period in which this inspection was completed. This report shall include:

1. Number and extent of tubes inspected.

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

3. Identification of tubes plugged or sleeved.

c. Results of steam generator tube inspections which fall into Category C-3 and require notification of the Commission shall be reported 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.

4.4.5.6 The steam generator shall be demonstrated OPERABLE by verifying steam generator level to be within limits at least once per 12 hours.

4.4.5.7 When steam generator tube inspection is performed as per Section 4.4.5.2, an additional but totally separate inspection shall be performed on special interest peripheral tubes in the vicinity of the secured internal auxiliary feedwater header. This testing shall only be required on the steam generator selected for inspection, and the test shall require inspection only between

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SURVEILLANCE REQUIREMENTS (Continued)

the upper tube sheet and the 15th tube support plate. The tubes selected for inspection shall represent the entire circumference of the steam generator and shall total at least 150 peripheral tubes.

4.4.5.8 Visual inspections of the secured internal auxiliary feedwater header, header to shroud attachment welds, and the external header thermal sleeves shall be performed on each steam generator through the auxiliary feedwater injection penetrations.

These inspections shall be performed during the third and fourth refueling outages and at the ten-year ISI.

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TABLE 4.4-1
MINIMUM NUMBER OF STEAM GENERATORS TO BE
INSPECTED DURING INSERVICE INSPECTION

Preservice Inspection	No			Yes		
	Two	Three	Four	Two	Three	Four
No. of Steam Generators per Unit						
First Inservice Inspection		All		One	Two	Two
Second & Subsequent Inservice Inspections		One ¹		One ¹	One ²	One ³

Table Notation:

1. The inservice inspection may be limited to one steam generator on a rotating schedule encompassing 3 N % of the tubes (where N is the number of steam generators in the plant) 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 instructions described in 1 above.
3. Each of the other two steam generators not inspected during the first inservice inspections shall be inspected during the second and third inspections. The fourth and subsequent inspections shall follow the instructions described in 1 above.

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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. (1)	C-1	None	N/A	N/A	N/A	N/A
	C-2	Plug or repair by sleeving defective tubes and inspect additional 2S tubes in this S.G.	C-1	None	N/A	N/A
			C-2	Plug or repair by sleeving defective tubes and inspect additional 4S tubes in this S.G.	C-1	None
					C-2	Plug or repair by sleeving 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 by sleeving defective tubes and inspect 2S tubes in each other S.G. Report to the NRC prior to resumption of plant operation.	All other S.G.s are C-1	None	N/A	N/A
			Some S.G.s C-2 but no additional S.G. 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 by sleeving defective tubes. Report to the NRC prior to resumption of plant operation.	N/A	N/A

(1) $S = 3 \frac{N}{n} \%$ Where N is the number of steam generators in the unit, and n is the number of steam generators inspected during an inspection.

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Amendment No. 21, 171, 184
 Correction Ltr dated 5/17/94

REACTOR COOLANT SYSTEM**INFORMATION ONLY**BASES3/4.4.4 PRESSURIZER

A steam bubble in the pressurizer ensures that the RCS is not a hydraulically solid system and is capable of accommodating pressure surges during operation. The steam bubble also protects the pressurizer code safety valves and pilot operated relief valve against water relief.

The low level limit is based on providing enough water volume to prevent a reactor coolant system low pressure condition that would actuate the Reactor Protection System or the Safety Feature Actuation System. The high level limit is based on providing enough steam volume to prevent a pressurizer high level as a result of any transient.

The pilot operated relief valve and steam bubble function to relieve RCS pressure during all design transients. Operation of the pilot operated relief valve minimizes the undesirable opening of the spring-loaded pressurizer code safety valves.

3/4.4.5 STEAM GENERATORS

The Surveillance Requirements for inspection of the steam generator tubes ensure that the structural 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. 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. A process equivalent to the inspection method described in Topical Report BAW-2120P will be used for inservice inspection of steam generator tube sleeves. This inspection will provide assurance of RCS integrity.

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 chemistry 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 = 1 GPM). 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

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operation and by postulated accidents. Operating plants have demonstrated that primary-to-secondary leakage of 1 GPM can be detected by monitoring the secondary coolant. 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 in the affected areas.

Wastage-type defects are unlikely with proper chemistry treatment of the secondary coolant. However, even if a defect should develop in service, it will be found during scheduled inservice steam generator tube examinations. As described in Topical Report BAW-2120P, degradation as small as 20% through wall can be detected in all areas of a tube sleeve except for the roll expanded areas and the sleeve end, where the limit of detectability is 40% through wall. Tubes with imperfections exceeding the repair limit of 40% of the nominal wall thickness will be plugged or repaired by sleeving the affected areas. Davis-Besse will evaluate, and as appropriate implement, better testing methods which are developed and validated for commercial use so as to enable detection of degradation as small as 20% through wall without exception. Until such time as 20% penetration can be detected in the roll expanded areas and the sleeve end, inspection results will be compared to those obtained during the baseline sleeved tube inspection.

Whenever the results of any steam generator tubing inservice inspection fall into Category C-3, these results shall be reported to the Commission 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.

USAR

The steam generator water level limits are consistent with the initial assumptions in the FSAR. While in MODE 3, examples of Main Feedwater Pumps that are incapable of supplying feedwater to the Steam Generators are tripped pumps or a manual valve closed in the discharge flowpath. The reactivity requirements to ensure adequate SHUT DOWN MARGIN are provided in plant operating procedures.