

REACTOR COOLANT SYSTEM

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^g 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:

TROJAN-UNIT 1

3/4 4-6

Amendment No. 61

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REACTOR COOLANT SYSTEM

SURVEILLANCE REQUIREMENTS (Continued)

1. All ~~nonplugged~~^{tube} tubes that previously had detectable¹ wall penetrations (>20%) that have not been plugged nor sleeved in the affected area, and all tubes that previously had detectable sleeve wall penetrations that have not been plugged.
2. Tubes in those areas where experience has indicated potential problems.
3. A tube inspection (pursuant to Specification 4.4.5.4.a.8) 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.
- c. In addition to the 3% sample, all tubes with defects below the F* distance which have not been plugged shall be inspected in the tube sheet region.
- d. 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.
 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.

Note: In all inspections, previously degraded tubes must exhibit significant (>10%) further wall penetrations to be included in the above percentage calculations.

REACTOR COOLANT SYSTEM

SURVEILLANCE REQUIREMENTS (Continued)

4.4.5.4 Acceptance Criteria

a. As used in the Specification:

1. Imperfection means an ^{or tube sleeve} 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 ^{or tube sleeve}.
3. Degraded Tube means a tube containing imperfections $\geq 20\%$ of the nominal ^{Tube or Tube sleeve} wall thickness caused by degradation.
4. % Degradation means the percentage of the tube ^{or tube sleeve} wall thickness affected or removed by degradation.
5. Defect means an imperfection of such severity that it exceeds the ~~plugging~~ ^{Repair} limit. A tube containing a defect that has ~~is defective~~ ^{defective Tube is a} not been repaired by sleeving or a sleeved tube that has a defect in the sleeve.
6. Plugging Limit means the imperfection depth at or beyond which the tube shall be removed from service because it may become unserviceable prior to the next inspection, ~~and is equal to (40)% of the nominal tube wall thickness.~~ This definition does not apply to the area of the tube sheet region below the F* distance, provided the tube has no indications of cracking within the F* distance. The repair limit imperfection depths are specified in percentage of nominal wall thickness as follows:
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 steam line 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 of the cold leg.

- a) Original Tube Wall 40 %
- b) Babcock & Wilcox sleeve Wall* 40 %
- c) Bechtel/KWU sleeve Wall* 35 %

* The following sleeve designs have been found acceptable by the NRC staff:

1. Babcock & Wilcox Kinetic Welded sleeves (BAW-2094P, Revision 1)
2. Bechtel/KWU Welded Sleeves (BKAT-01-P, Revision 1; EBR-TRJ-01-P)

TROJAN-UNIT 1

3/4 4-9

Amendment No. 87, 1/33

August 7, 1987-e

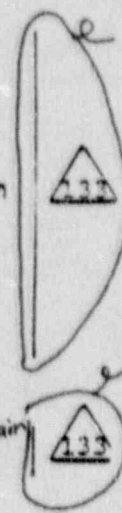
by plugging or repaired by sleeving in the affected area.



REACTOR COOLANT SYSTEM

SURVEILLANCE REQUIREMENTS (Continued)

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 Roll Expansion is that portion of a tube which has been increased in diameter by a rolling process such that no crevice exists between the outside diameter of the tube and the tube sheet.
11. F* Distance is the minimum length of the roll expanded portion of the tube which cannot contain any indications of cracking in order to ensure the tube does not pull out of the tube sheet. The F* distance is 1.4 inches and is measured from the top of the roll expansion of the tube down toward the bottom of the tube sheet. *F* is not applicable if a sleeve has been installed in the roll expanded portion of the tube.*
- b. The steam generator shall be determined OPERABLE after completing the corresponding actions (plug all tubes exceeding the plugging-repair limit) required by Table 4.4-2. *or sleeve in the affected areas*



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. *or sleeved*
- b. The complete results of the steam generator tube inservice inspection shall be reported on an annual basis for the period in which the 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 shall be reviewed for reportability pursuant to Specification 6.6.1. If the results are deemed reportable, such report must be submitted to the Commission prior to the resumption of plant operation.

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 sleeve} defective tubes and inspect additional 2S tubes in this S. G.	C-1	None ^{or sleeve}	N/A	N/A
			C-2	Plug defective tubes and inspect additional 4S tubes in this S. G.	C-1	None ^{or sleeve}
					C-2	Plug defective tubes
					<u>IC-3</u>	Perform action for C-3 result of first sample
	C-3	Inspect all tubes in this S. G., plug ^{or sleeve} defective tubes and inspect 2S tubes in each other S. G. Report to NRC pursuant to specification 4.4.5.5.c.	C-3	Perform action for C-3 result of first sample	N/A	N/A
			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 ^{or sleeve}	Inspect all tubes in each S.G. and plug defective tubes. Report to NRC pursuant to specification 4.4.5.5.c.	N/A	N/A

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



REACTOR COOLANT SYSTEM

BASES

The power operated relief valves (PORVs) operate to relieve RCS pressure below the setting of the pressurizer code safety valves. These relief valves have remotely operated block valves to provide a positive shutoff capability should isolation of a relief valve be necessary.

3/4.4.4 PRESSURIZER

The requirement that 150 kw of pressurizer heaters and their associated controls be capable of being supplied electrical power from an emergency bus provides assurance that these heaters can be energized during a loss of offsite power condition to maintain natural circulation at HOT STANDBY. A minimum of 7 of the 23 kw heaters meets this requirement.

3/4.4.5 STEAM GENERATORS

One OPERABLE steam generator 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 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 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 or tube sleeve 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

Degraded steam generator tubes may be repaired by the installation of sleeves which span the section of degraded steam generator tubing. A steam generator tube with a sleeve installed meets the structural requirements of tubes which are not degraded. Descriptions of sleeve designs shall be submitted to the NRC for review and approval prior to their use in the repair of degraded steam generator tubes.

REACTOR COOLANT SYSTEM

BASES

3/4.4.5 STEAM GENERATORS CONTINUED

system and the secondary coolant system (primary-to-secondary leakage = 500 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. Operating plants have demonstrated that primary-to-secondary leakage of 500 gallons per day per steam generator can readily be detected by radiation monitors of steam generator blowdown. 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 sleeved in the affected areas

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 will be required of all tubes with imperfections exceeding the plugging limit which, by the definition of Specification 4.4.5.4.a, is 40% of the tube nominal wall thickness. Tubes with defects below the F^o distance do not have to be plugged or repaired as long as there are no indications of cracking in the F^o distance. The F^o distance is 1.4 inches and includes a safety factor of 3 and a 0.5-inch eddy current measurement uncertainty. Steam generator tube inspections of operating plants have demonstrated the capability to reliably detect wastage-type degradation that has penetrated 20% of the original tube wall thickness.

or sleeving in the affected area



Whenever the results of any steam generator tubing inservice inspection fall into Category C-3, these results will be promptly reported to the Commission pursuant to Specification 6.9.1 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 consistent with the recommendations of Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems", May 1970.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

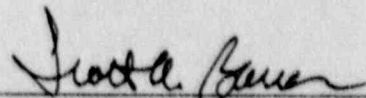
In the Matter of)
)
PORTLAND GENERAL ELECTRIC COMPANY,) Docket 50-344
THE CITY OF EUGENE, OREGON, AND) Operating License NPF-1
PACIFIC POWER & LIGHT COMPANY)
)
(TROJAN NUCLEAR PLANT))

CERTIFICATE OF SERVICE

I hereby certify that copies of License Change Application 187, Revision 1 to the Operating License for Trojan Nuclear Plant, dated April 16, 1990, have been served on the following by hand delivery or by deposit in the United States mail, first class, this 16th day of April 1990:

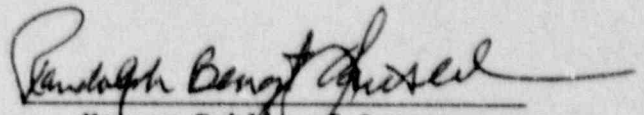
State of Oregon
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Salem OR 97310

Mr. Michael J. Sykes
Chairman of County Commissioners
Columbia County Courthouse
St. Helens OR 97051



S. A. Bauer, Manager
Nuclear Regulation Branch
Nuclear Safety & Regulation

Subscribed and sworn to before me this 16th day of April 1990.


Notary Public of Oregon

My Commission Expires:

March 22, 1994

