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PG&E Letter DCL-01-095

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
License Amendment Request 01-03
Extension of Steam Generator Tube W* Alternate Repair Criteria for Indications in the Westinghouse Explosive Tube Expansion (WEXTEX) Region

Dear Commissioners and Staff:

In accordance with 10 CFR 50.90, enclosed is an application for amendment to Facility Operating License Nos. DPR-80 and DPR-82 for Units 1 and 2 of the Diablo Canyon Power Plant (DCPP) respectively. This License Amendment Request (LAR) will modify Technical Specification (TS) 5.5.9, "Steam Generator (SG) Tube Surveillance Program," to allow extension of SG tube W star (W*) alternate repair criteria (ARC) through Cycles 12 and 13. This extension will allow PG&E additional time to validate the W* leak rate model through performance of additional in-situ pressure testing of W* indications. PG&E believes that the current W* leak rate model is conservative based on the results of in-situ pressure testing of W* indications performed to date which did not identify leakage.

W* ARC allow axial primary water stress corrosion cracking indications in the Westinghouse explosive tube expansion (WEXTEX) region to remain in service if the indication is located below the bottom of the WEXTEX transition. Consistent with Westinghouse WCAP-14797, Revision 1, "Generic W* Tube Plugging Criteria for 51 Series Steam Generator Tubesheet Region WEXTEX Expansions," W* ARC accounts for the reinforcing effect that the tubesheet has on the external surface of the SG tube in the WEXTEX region for limiting SG tube burst and leakage. W* ARC reduces the need to plug SG tubes with indications in the WEXTEX region, and maintains structural and leakage integrity of tubes that are returned to service.

The current TS 5.5.9 allows implementation of W* ARC for Units 1 and 2 Cycles 10 and 11 only. Unit 1 Cycle 11 is projected to be complete in May 2002. Therefore, approval of this LAR is requested prior to May 2002 to allow continued implementation of this ARC during the DCPP Unit 1 eleventh refueling outage. PG&E requests that the license amendment be effective immediately, to be implemented within 30 days of issuance of an amendment.

A001

Sincerely,

David H. Oatley
Vice President Diablo Canyon Operations

cc: Edgar Bailey, DHS
Ellis W. Merschoff
David L. Proulx
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Diablo Distribution

Enclosures
KJS

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of PACIFIC GAS AND ELECTRIC COMPANY	Docket No. 50-275 Facility Operating License No. DPR-80
Diablo Canyon Power Plant Units 1 and 2	Docket No. 50-323 Facility Operating License No. DPR-82

<u>AFFIDAVIT</u>

David H. Oatley, of lawful age, first being duly sworn upon oath says that he is Vice President Diablo Canyon Operations of Pacific Gas and Electric Company; that he has executed LAR 01-03 on behalf of said company with full power and authority to do so; that he is familiar with the content thereof; and that the facts stated therein are true and correct to the best of his knowledge, information, and belief.

David H. Oatley
Vice President Diablo Canyon Operations

Subscribed and sworn to before me this 13th day of September, 2001.

Sandra Eatherly
Notary Public
County of San Luis Obispo
State of California

SANDRA EATHERLY
Commission # 1225422
Notary Public - California
San Luis Obispo County
My Comm. Expires Jul 18, 2003

EXTENSION OF STEAM GENERATOR TUBE W* ALTERNATE REPAIR CRITERIA FOR INDICATIONS IN THE WESTINGHOUSE EXPLOSIVE TUBE EXPANSION (WEXTEX) REGION

1.0 INTRODUCTION

This letter is a request to amend Operating License Nos. DPR-80 and DPR-82 for Units 1 and 2 of the Diablo Canyon Power Plant (DCPP) respectively.

The proposed changes will modify Technical Specification (TS) 5.5.9, "Steam Generator (SG) Tube Surveillance Program," to allow extension of SG tube W star (W*) alternate repair criteria (ARC) for DCPP Units 1 and 2 Cycles 12 and 13. The W* ARC allows axial primary water stress corrosion cracking (PWSCC) indications in the Westinghouse explosive tube expansion (WEXTEX) region to remain in service if the indication is located below the bottom of the WEXTEX transition. The current TS 5.5.9 allows implementation of W* ARC for Units 1 and 2 Cycles 10 and 11 only. Unit 1 Cycle 11 is projected to be completed in May 2002.

2.0 DESCRIPTION OF PROPOSED AMENDMENT

This license amendment request (LAR) extends the existing TS surveillance program and reporting requirements associated with W* ARC for SG tubing. The proposed TS change would extend the existing W* ARC to Cycles 12 and 13 as follows:

1. Revise note for TS 5.5.9.b.2.e, 5.5.9.d.1.f.2, and 5.5.9.d.1.k:

   Revise existing note "Applicable for Units 1 and 2, Cycles 10 and 11 only," to state "Applicable for Units 1 and 2, Cycles 10, 11, 12, and 13 only."

2. Revise note for TS 5.5.9.b.2.e

   Revise existing note "In-situ Testing will be performed in accordance with PG&E letter DCL 98-148 dated October 22, 1998," to state "In-situ Testing will be performed in accordance with PG&E letters DCL 98-148 dated October 22, 1998, and DCL 01-052 dated May 4, 2001, for Cycles 10 and 11 and letter DCL 01-095 dated September 13, 2001, for Cycles 12 and 13."

The proposed TS changes are noted on the markup TS pages provided in Enclosure 2. The proposed TS are provided in Enclosure 3. The markup and proposed TS pages include changes to pages 5.0-13 and 5.0-30. Changes to pages 5.0-13 and 5.0-30 have also been proposed as part of LAR 00-06 submitted in letter DCL-01-06, "Supplement 2 to License Amendment Request

00-06, 'Alternate Repair Criteria for Axial PWSCC at Dented Intersections in Steam Generator Tubing,'" dated February 20, 2001.

3.0 BACKGROUND

The NRC issued the W* ARC in license amendments 129 and 127 for DCPP Units 1 and 2 respectively. The ARC methodology in this proposed extension request is identical to that already approved by the NRC in the safety evaluation report for license amendments 129 and 127. This LAR only requests extension of the previously approved license amendments.

Extension of the ARC for Cycles 12 and 13 is intended to allow PG&E additional time to validate the W* leak rate model through performance of additional in-situ pressure testing of W* indications, as requested by the NRC. Only seven W* indications at DCPP have grown deep enough to justify in-situ testing to date, for a total of 12 industry WEXTEX leak tests, which is less than the 20 data points committed for leak rate model validation. PG&E's commitments for in-situ testing for Cycles 10 and 11 were originally provided to the NRC in letter DCL-98-148 dated October 22, 1998, and were recently supplemented by Unit 2 Cycle 11 commitments described in letter DCL-01-052 dated May 4, 2001. PG&E's in-situ testing commitments for Cycles 12 and 13 are described in this LAR. If no leaking W* indications are obtained after 20 in-situ tests (summed over all plants with WEXTEX expansions), in-situ testing would be terminated for W* indications and PG&E will request a permanent ARC.

4.0 REGULATORY REQUIREMENTS AND GUIDANCE

The SG tubes constitute more than half of the reactor coolant pressure boundary. Criterion 14 of the General Design Criteria (GDC) in Appendix A to Part 50 of Title 10 of the Code of Federal Regulations (CFR) states that the reactor coolant pressure boundary (RCPB) shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. Section 50.55a(c) specifies that components that are part of the RCPB must be designed and constructed to meet the requirements for Class I components in Section III of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. To ensure the continued integrity of the tubing at operating pressurized water reactor (PWR) facilities, 10 CFR 50.55a further requires that throughout the service life of a PWR facility, Class 1 components meet the requirements in Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components" of the ASME Code. This requirement includes the inspection and tube repair criteria of Section XI of the ASME Code. In addition, 10 CFR 50.55a(b)(2)(iii) states that if the TS Surveillance Requirements for SGs differ from those in Article IWB-2000 of Section XI of the ASME Code, the inservice inspection program is governed by the TS.

As part of the plant licensing basis, the consequences of postulated design basis accidents that assume degradation of the SG tubes resulting in primary coolant leakage to the secondary coolant side of the SGs are analyzed. Analyses of these accidents consider the primary-to-secondary leakage that may occur during these postulated accidents when demonstrating that radiological consequences do not exceed the 10 CFR Part 100 guidelines, or some fraction thereof, for offsite doses, nor GDC-19 for control room operator doses.

Section 5 of the plant TS requires periodic inservice inspections of the SG tubing and repair or removal from service all tubes exceeding the repair limit. In addition, the operational leakage limits are included in the TS to ensure that, should tube leakage develop, prompt action will be taken to avoid rupture of the leaking tubes. These requirements are intended to ensure that burst margins are maintained consistent with Appendices A and B to 10 CFR Part 50 and that the potential for leakage is maintained consistent with what has been analyzed as part of the plant licensing basis.

NRC Draft Regulatory Guide (RG) 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes," provides guidelines for determining the tube repair criteria and operational leakage limits that are specified in the TS. This RG provides specific criteria that should be considered in proposed SG tube alternate repair criteria.

5.0 TECHNICAL ANALYSIS

Twelve W* indications have been in-situ leak tested in the industry. Seven of these indications are from DCPP Unit 2 (DCPP 2) refueling outages, 9 in 1999 and 10 in 2001. One indication is from Sequoyah Unit 2 (SQN 2). Four indications are from Beaver Valley Unit 1 (BVPS 1). Data from SQN 2 and BVPS 1 was provided to PG&E by Tennessee Valley Authority and First Energy, respectively. The indications are listed in Table 1. No leakage was observed in any in-situ test. Most of the indications were located near the bottom of WEXTEX transition (BWT), such that the tubesheet provided minimal crevice restriction. The DCPP indications are located in tubes that had been deplugged, were tested to normal operating differential pressure (ΔP_{NO}), and were returned to service. W* indications in tubes that have never been plugged at DCPP have not grown deep enough to satisfy the requirements for leak testing.

The SQN 2 and BVPS 1 indications were measured below the top of the tubesheet (TTS) and were tested to three times normal operating differential pressure ($3\Delta P_{NO}$). The results of these tests indicated no leakage.

Table 1
Industry In-situ Test Results for Axial PWSCC in WEXTEX Region

Plant	Year	SG	Tube	Deplug Tube	Crack Distance Below BWT, (below TTS for SQN and BVPS), (Inch)	Peak Volt (Volt)	Crack Length (Inch)	Max Depth (%)	Approx Length > 80%, (Inch)	In-situ Test Required due to Exceeding Threshold Values	Test Pressure	Leak Rate
DCPP 2	1999	1	R3C59	Yes	0.51	5.6	0.27	100%	0.23	Yes	ΔP_{NO}	0
DCPP 2	1999	1	R7C62	Yes	0.59	4.2	0.35	80%	None	Yes	ΔP_{NO}	0
DCPP 2	1999	2	R31C25	Yes	0.98	4.0	0.24	70%	None	Yes	ΔP_{NO}	0
DCPP 2	2001	3	R7C52	Yes	0.56	3.4	0.43	94%	0.37	Yes	ΔP_{NO}	0
DCPP 2	2001	4	R3C5	Yes	0.55	1.5	0.83	100%	0.63	No	ΔP_{NO}	0
DCPP 2	2001	4	R2C29	Yes	3.52	4.5	0.91	100%	0.84	Yes	ΔP_{NO}	0
DCPP 2	2001	4	R2C29	Yes	1.83	0.9	0.34	100%	0.10	No	ΔP_{NO}	0
SQN 2	1997	4	R7C17	No	0.15	3.6	0.32	100%	0.02	Yes	$3\Delta P_{NO}$	0
BVPS 1	1997	A	R10C51	No	0.24	0.7	0.30	77%	None	No	$3\Delta P_{NO}$	0
BVPS 1	1997	A	R27C28	No	3.20	1.2	0.22	35%	None	No	$3\Delta P_{NO}$	0
BVPS 1	1997	B	R5C83	No	0.35	1.5	0.21	30%	None	No	$3\Delta P_{NO}$	0
BVPS 1	1997	C	R27C31	No	0.60	0.9	0.18	44%	None	No	$3\Delta P_{NO}$	0

To support validation of the W* leakage model, and consistent with prior commitments made in PG&E letter DCL-98-148, dated October 22, 1998, PG&E will continue to perform in-situ leak testing of W* indications that exceed the nondestructive examination (NDE) threshold values until 20 indications, summed over all plants with WEXTEX expansions, are tested. An additional eight indications are required to be tested in order to satisfy this commitment. As discussed above, none of the tested indications have resulted in leakage. If no leakage is observed after in-situ testing of eight additional indications, summed over all plants with WEXTEX expansions, in-situ testing would be terminated for W* indications and PG&E will request a permanent ARC. The ARC leakage model assumes all indications are through-wall and leak at a rate that is a function of the crack tip distance below the BWT. Thus, the model would be demonstrated to be conservative if no leakage is found for 20 in-situ tests.

As noted in Table 1, six indications that were in-situ tested did not actually require testing because their flaw voltages did not exceed the in-situ screening threshold value. Because W* leakage analysis methods require that a leak rate be assigned to all indications on the assumption that they are through-wall, these 6 indications support the conservatism in the W* ARC methods, and it is appropriate to include these data points in the committed data set of 20 indications.

W* in-situ leak tests are conducted at ΔP_{NO}. If the indication leaks, the test will be continued up to the steam line break (SLB) differential pressure, and the tube will be repaired. If leakage is not detected at ΔP_{NO}, the test would be terminated without extending the differential pressure to SLB conditions. Since it is intended to leave in-situ tested indications which do not leak in service, testing above ΔP_{NO} conditions could tear ligaments in the crack, and increase the likelihood of the indication leaking in the subsequent cycle. "Break through" of thin wall thickness ligaments for an indication inside the tubesheet, is not likely due to the tubesheet constraint. It can be reasonably assumed that an indication not leaking (i.e., not through-wall) at ΔP_{NO} conditions would not leak at SLB conditions.

The Cycles 12 and 13 sequential screening criteria and screen values are summarized below. These screening criteria are the same as the Cycles 10 and 11 criteria, except for two changes as previously described in PG&E letter DCL-01-052 dated May 4, 2001: (1) indications that were leak tested in a prior in-situ test and have less than a 25 percent Plus Point voltage increase from the last test are exempt from testing (step 1); and (2) separate screening values for critical voltage (V_{crit}) and threshold voltage (V_{thr}) are established for deplugged W* indications and nondeplugged W* indications (steps 2 and 3). These changes are proposed because the prior in-situ criteria did not address repeat testing nor testing of deplugged tubes.

- Step 1: Prior leak tested W* indications with maximum Plus Point voltages greater than or equal to 1.25 times the prior leak test voltage are carried to Step 2. The purpose of this step is to limit the number of repeat in-situ tests on the same W* indication.

- Step 2: Indications with maximum Plus Point voltages exceeding the critical voltage (V_{crit}) are leak tested independent of other parameters. V_{crit} equals 4.0 volts is used for nondeplugged indications and 6.0 volts for deplugged indications. Indications with maximum Plus Point voltages less than V_{crit} are carried to Step 3. The basis for V_{crit} of 4.0 volts for nondeplugged indications is unchanged and is described in letter DCL-98-148, dated October 22, 1998. The basis for establishing a higher V_{crit} of 6.0 volts for deplugged indications is that deplugged tubes commonly show voltage increases in the plugged tube condition that are expected due to changes in crack face conditions (i.e., oxidation or minor intergranular attack) rather than crack growth in length and depth. The higher V_{crit} voltage for deplugged tubes will permit the depth evaluation, which is less affected by the plugged tube conditions, to have more influence on the in-situ selection.

- Step 3: Indications with maximum Plus Point voltages exceeding V_{thr} are carried to the Step 4 depth evaluation. A minimum of the five largest voltage indications are carried to the depth evaluation if less than five indications exceed the voltage threshold. V_{thr} equals 2.5 volts is used for nondeplugged indications and 4.0 volts is used for deplugged indications. The basis for V_{thr} of 2.5 volts for nondeplugged indications is unchanged and is described in letter DCL-98-148. The basis for establishing a higher V_{thr} of 4.0 volts for deplugged indications is the same as described above, that is, deplugged tubes commonly show voltage increases in the plugged tube condition that are expected due to changes in crack face conditions rather than crack growth in length and depth. The 4.0 volt V_{thr} value for deplugged tubes is conservative because the maximum Plus Point voltage for active through-wall indications is about 4.5 volts.

- Step 4 (depth evaluation): Indications with maximum depths exceeding the maximum depth leakage threshold ($MD_{L\text{-}thr}$) over lengths greater than the deep crack length threshold ($L_{L\text{-}min}$) are leak tested. $MD_{L\text{-}thr}$ equals 80 percent and $L_{L\text{-}min}$ equals 0.1 inch are used. The bases for $MD_{L\text{-}thr}$ and $L_{L\text{-}min}$ are unchanged and are described in letter DCL-98-148.

Results of W* ARC Implementation in First Two Cycles of Implementation

W* ARC has been implemented during two refueling outages on each unit. The results of each inspection have been transmitted to the NRC in 90-day reports pursuant to the DCPP TS (DCL-99-076, dated June 18, 1999, DCL-00-008, dated January 20, 2000, DCL 01-010, dated February 5, 2001, and DCL-01-086, dated August 21, 2001). Ninety-day reporting will continue to be implemented during Cycles 12 and 13. The following summarizes the results of W* ARC implementation in Unit 1 refueling outage nine (1R9), Unit 1 refueling outage ten (1R10), Unit 2 refueling outage nine (2R9), and Unit 2 refueling outage ten (2R10).

One hundred percent of tubes in the hot leg WEXTEX region have been inspected in each outage from plus two to minus eight inches from the TTS. Cold leg inspections have not been required.

In Unit 1, 10 W* indications are currently in service in 9 W* tubes, 1 of which was deplugged in 1R9. Three new axial PWSCC indications required plugging because the upper crack tip (UCT) was located above the BWT, accounting for NDE uncertainty. The Unit 1 Cycle 10 SLB leak rate was calculated to be 0.07 gpm in the worst case SG. The projected Unit 1 Cycle 11 SLB leak rate is predicted to be 0.03 gallons per minute (gpm) in the worst case SG, much less than the limit of 12.8 gpm.

In Unit 2, 65 W* indications are currently in service in 58 W* tubes, 45 of which were deplugged in 2R9. Six new axial PWSCC indications have required plugging because the UCT was located above the BWT, accounting for NDE uncertainty. The Unit 2 Cycle 10 SLB W* leak rate was calculated to be 0.48 gpm in the worst case SG. The projected Unit 2 Cycle 11 SLB W* leak rate is predicted to be 0.66 gpm in the worst case SG, much less than the limit of 12.8 gpm.

No indications have been left in service that, in subsequent inspections, failed the W* ARC or had the UCT extend above the TTS (allowing for NDE uncertainty), thereby validating the slow growth rate of axial PWSCC.

The DCPP Units 1 and 2 WEXTEX region axial PWSCC growth rate at 603°F is 0.08 inch per effective full power year (EFPY) at 95 percent cumulative probability. The DCPP growth rate distribution is based on all DCPP Plus Point inspection data through 2001 (Unit 2 Cycle 10), consisting of 98 DCPP growth rate data points with consecutive Plus Point inspections. The DCPP growth rate distribution replaces the WCAP-14797, Revision 1, growth rate distribution because the DCPP growth distribution is much more robust. The WCAP-14797, Revision 1, growth rate is 0.25 inch per EFPY at 95 percent cumulative probability, reflecting an overly conservative estimate of growth rate with respect to actual observations at DCPP. The WCAP-14797, Revision 1, growth rate distribution has 39 data points with rotating pancake coil inspections, including eight DCPP data points. None of the 39 WCAP-14797, Revision 1, data points were generated from back-to-back Plus Point inspections; therefore, none are being retained in the DCPP growth rate distribution.

This DCPP growth distribution will be updated every outage with new DCPP data for W* ARC application. If the new growth data and deletion of the oldest cycle of growth data results in a minimum of 200 data points, the oldest cycle of growth data will be deleted.

In summary, the calculated SLB leak rate due to W* indications in service during Cycles 10 and 11 have been well below the allowable SLB analysis limit of 12.8 gpm. PG&E believes that the current W* leak rate model is conservative based on the results of in-situ pressure testing of W* indications performed to date which did not identify leakage. The calculated growth rate of W* indications at a cumulative probability of 95 percent has been low and is well below the value of 0.25 inch per EFPY previously estimated in WCAP-14797, Revision 1.

6.0 REGULATORY ANALYSIS

SG tube inspection and repair limits are specified in Section 5 of the DCPP TS. The current DCPP TS require that flawed tubes be repaired if the depths of the flaws are greater than or equal to 40 percent through-wall, unless the degradation is subject to voltage-based ARC or W* ARC. The TS repair limits ensure that tubes accepted for continued service will retain adequate structural and leakage integrity during normal operating, transient, and postulated accident conditions, consistent with GDC 14, 15, 30, 31, and 32 of 10 CFR 50, Appendix A. Structural integrity refers to maintaining adequate margins against gross failure, rupture, and collapse of the SG tubing. Leakage integrity refers to limiting primary to secondary leakage to within acceptable limits. The SG tube inspection and repair limits specified in Section 5 of the DCPP TS are based on

RG 1.121, which provides an acceptable method for meeting GDC 14,15, 31, and 32 by reducing the probability and consequences of a steam generator tube rupture (SGTR) accident.

For design basis events, the required structural margins of the SG tubes will be maintained by the presence of the tubesheet. Tube rupture is precluded for cracks in the WEXTEX region due to the constraint provided by the tubesheet. The W* length is the undegraded length of tube necessary to ensure structural integrity. The W* length, which includes consideration for NDE uncertainties and crack growth, provides the necessary resistive force to preclude loads which could result in tube pullout under normal operating and accident conditions. Therefore, RG 1.121 margins against burst are maintained for both normal and postulated accident conditions for the W* ARC.

At ΔP_{NO}, leakage from PWSCC in the W* length is limited by both the tube-to-tubesheet crevice and the limited crack opening permitted by the tubesheet constraint. Consequently, negligible normal operating leakage is expected from cracks within the tubesheet region. Primary-to-secondary leakage flow due to a postulated SGTR is not affected since the tubesheet enhances the tube integrity in the region of the WEXTEX expansion by precluding tube deformation beyond its initial expanded outside diameter. The resistance to both tube rupture and collapse is strengthened by the tubesheet in that region. SLB leakage is limited by leakage flow restrictions resulting from the crack and tube-to-tubesheet contact pressures that provide a restricted leakage path above the indications and also limit the degree of crack face opening compared to free span indications. The combined leakage for all such tubes, plus the combined leakage developed by any other ARC, is maintained below the allowable SLB leak rate limit (12.8 gpm) such that off-site doses are maintained less than the 10 CFR 100 guideline values. The W* criteria maintain the RG 1.121 margins against leakage for both normal and postulated accident conditions.

To support validation of the W* leakage model, PG&E will continue to perform in-situ leak testing of W* indications that exceed the NDE threshold values until 20 indications, summed over all plants with WEXTEX expansions, are tested. If no leaking W* indications are obtained after 20 in-situ tests, in-situ testing would be terminated for W* indications and DCPP will request a permanent ARC. The ARC leakage model assumes all indications are through-wall and leak at a rate that is a function of the crack tip distance below the BWT. Thus, the model would be demonstrated to be conservative if no leakage is found for 20 in-situ tests.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

7.0 NO SIGNIFICANT HAZARDS CONSIDERATION

PG&E has evaluated the no significant hazards considerations involved with the proposed amendment, focusing on the three standards set forth in 10 CFR 50.92(c):

> *"The commission may make a final determination, pursuant to the procedures in paragraph 50.91, that a proposed amendment to an operating license for a facility licensed under paragraph 50.21(b) or paragraph 50.22 or for a testing facility involves no significant hazards considerations, if operation of the facility in accordance with the proposed amendment would not:*
>
> *(1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or*
>
> *(2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or*
>
> *(3) Involve a significant reduction in a margin of safety."*

The following evaluation is provided for the no significant hazards considerations.

1. *Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?*

   Of the various accidents previously evaluated, the extension of the steam generator (SG) tube W star (W*) alternate repair criteria (ARC) through Cycles 12 and 13 only affects the steam generator tube rupture (SGTR) accident evaluation and the postulated steam line break (SLB) accident evaluation. Loss-of-coolant accident (LOCA) conditions cause a compressive axial load to act on the tube. Therefore, since the LOCA tends to force the tube into the tubesheet rather than pull it out, it is not a factor in this evaluation.

   For the SGTR accident, the required structural margins of the SG tubes will be maintained by the presence of the tubesheet. Tube rupture is precluded for cracks in the Westinghouse explosive tube expansion (WEXTEX) region due to the constraint provided by the tubesheet. Therefore, Regulatory Guide (RG) 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes," margins against burst are maintained for both normal and postulated accident conditions.

WCAP-14797, Revision 1, defines a length, W*, of degradation free expanded tubing that provides the necessary resistance to tube pullout due to the pressure induced forces (with applicable safety factors applied). The W* length supplies the necessary resistive force to preclude pullout loads under both normal operating and accident conditions. The contact pressure results from the WEXTEX expansion process, thermal expansion mismatch between the tube and tubesheet and from the differential pressure between the primary and secondary side. The proposed changes do not affect other systems, structures, components, or operational features. Therefore, the proposed change results in no significant increase in the probability of the occurrence of an SGTR or SLB accident.

The consequences of an SGTR accident are affected by the primary-to-secondary leakage flow during the accident. Primary-to-secondary leakage flow through a postulated broken tube is not affected by the proposed changes since the tubesheet enhances the tube integrity in the region of the WEXTEX expansion by precluding tube deformation beyond its initial expanded outside diameter. The resistance to both tube rupture and collapse is strengthened by the tubesheet in that region. At normal operating pressures, leakage from primary water stress corrosion cracking (PWSCC) in the W* length is limited by both the tube-to-tubesheet crevice and the limited crack opening permitted by the tubesheet constraint. No leakage has been observed in any in-situ test of W* indications identified to date. Consequently, negligible normal operating leakage is expected from cracks within the tubesheet region.

SLB leakage is limited by leakage flow restrictions resulting from the crack and tube-to-tubesheet contact pressures that provide a restricted leakage path above the indications and also limit the degree of crack face opening compared to free span indications. The total leakage, that is, the combined leakage for all such tubes, plus the combined leakage developed by any other ARC, are maintained below the maximum allowable SLB leak rate limit, such that off-site doses are maintained less than 10 CFR 100 guideline values.

Therefore, based on the above evaluation, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. *Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?*

   The proposed changes do not introduce any changes or mechanisms that create the possibility of a new or different kind of accident. Tube bundle integrity is expected to be maintained for all plant conditions upon continued implementation of the W* ARC.

   Axial indications left in service shall have the upper crack tip below the top of the tubesheet (TTS) by at least the value of the nondestructive examination (NDE) uncertainty and crack growth allowance, such that at the end of the subsequent operating cycle the entire crack remains below the tubesheet secondary face, thereby minimizing the potential for free span cracking and demonstrating that an acceptable level of risk is maintained for tubes returned to service under W* ARC. This repair criteria is in addition to ensuring that the upper crack tip is located below the bottom of the WEXTEX transition by at least the NDE measurement uncertainty. Condition monitoring will verify that all tubes returned to service under W* ARC remain below the TTS, including an allowance for NDE uncertainty.

   These changes do not introduce any new equipment or any change to existing equipment. No new effects on existing equipment are created nor are any new malfunctions introduced.

   Therefore, based on the above evaluation, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. *Does the change involve a significant reduction in a margin of safety?*

   The proposed changes maintain the required structural margins of the SG tubes for both normal and accident conditions. RG 1.121 is used as the basis in the development of the W* ARC for determining that SG tube integrity considerations are maintained within acceptable limits. RG 1.121 describes a method acceptable to the NRC staff for meeting General Design Criteria 14,15, 31, and 32 by reducing the probability and consequences of an SGTR. RG 1.121 concludes that by determining the limiting safe conditions of tube wall degradation beyond which tubes with unacceptable cracking, as established by inservice inspection, should be removed from service or repaired, the probability and consequences of a SGTR are reduced. This RG uses safety factors on loads for tube-burst that are consistent with the requirements of Section III of the ASME Code.

   For primarily axially oriented cracking located within the tubesheet, tube-burst is precluded due to the presence of the tubesheet. WCAP-14797, Revision 1, defines a length, W*, of degradation free expanded tubing that provides the necessary resistance to tube pullout due to the pressure induced forces (with applicable safety factors applied). Application of the W* ARC will preclude unacceptable primary-to-secondary leakage during all plant conditions. The methodology for determining leakage provides for large margins between calculated and actual leakage values in the W* ARC.

Plugging of the SG tubes reduces the reactor coolant flow margin for core cooling. Continued implementation of W* ARC will result in maintaining the margin of flow that may have otherwise been reduced by tube plugging.

Based on the above, it is concluded that the proposed changes do not result in a significant reduction of margin with respect to plant safety as defined in the Final Safety Analysis Report Update or Bases of the plant Technical Specifications.

Based on the above evaluation, PG&E concludes that the changes proposed by this License Amendment Request satisfy the no significant hazards consideration standards of 10 CFR 50.92(c), and accordingly a no significant hazards finding is justified.

8.0 ENVIRONMENTAL EVALUATION

PG&E has evaluated the proposed changes and determined the changes do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed changes meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), an environmental assessment of the proposed change is not required.

9.0 PRECEDENT

DCPP Units 1 and 2 currently have a W* ARC in TS 5.5.9 which is applicable for Cycles 10 and 11. The NRC issued the W* ARC license amendments (No. 129 for DPR-80 and No. 127 for DPR-82) to PG&E by letters dated February 19, 1999, and June 4, 1999. LAR 97-04 for the W* ARC was contained in PG&E letter DCL-97-038 dated March 10, 1997. PG&E letter DCL-97-038 also transmitted Westinghouse WCAP-14797, Revision 1 (Proprietary), and WCAP-14798, Revision 1 (Nonproprietary), which provide the technical basis for the W* ARC. An error correction to page A-12 of WCAP-14797, Revision 1, and WCAP-14798, revision 1 was provided in letter PG&E DCL-97-038, dated March 10, 1997. Responses to NRC requests for additional information on LAR 97-04 dated January 6, 1998, June 23, 1998, August 6, 1998, and January 29, 1999, were provided in PG&E letters DCL-98-039, dated March 13, 1998, DCL-98-119, dated August 28, 1998, DCL-98-148, dated October 22, 1998, and DCL-99-011, dated January 29, 1999, respectively. Supplementary TS pages for LAR 97-04 were provided in PG&E letter DCL-99-015, dated February 2, 1999. Revised in-situ testing screening values for 2R10 were provided in PG&E letter DCL-01-052 dated May 4, 2001.

10.0 REFERENCES

1. NRC letter to PG&E, "Issuance of Amendments for Diablo Canyon Nuclear Power Plant, Unit No. 1 (TAC No. M98283) and Unit No. 2 (TAC No. M98284)," dated February 19, 1999.
2. NRC letter to PG&E, "Correction to Amendment No. 129 to Facility Operating License No. DPR-80 (TAC No. M98283) and Amendment No. 127 to Facility Operating License No. DPR-82 (TAC No. M98284)," dated June 4, 1999.
3. PG&E letter to NRC, DCL-97-038, "License Amendment Request 97-04, Steam Generator Tube Alternate Repair Criteria for Indications in the Westinghouse Explosive Tube Expansion (WEXTEX) Region," dated March 10, 1997.
4. PG&E letter to NRC, DCL-97-095, "Transmittal of Errata Sheets for WCAP-14797 and WCAP-14798," dated March 10, 1997.
5. NRC letter to PG&E, "Request for Additional Information - Proposed W* Steam Generator Tube Repair Criteria (TAC Nos. M98283 and M98284)," dated January 6, 1998.
6. PG&E letter to NRC, DCL-98-039, "Response to Request for Additional Information, License Amendment Request 97-04," dated March 13, 1998.
7. NRC letter to PG&E, "Request for Additional Information - Proposed W* Steam Generator Tube Repair Criteria (TAC Nos. M98283 and M98284)," dated June 23, 1998.
8. PG&E letter to NRC, DCL-98-119, "Response to NRC Request for Additional Information, Dated June 23, 1998, Regarding Proposed W* Steam Generator Tube Repair Criteria," dated August 28, 1998.
9. NRC letter to PG&E, "Request for Additional Information Regarding Proposed W* Steam Generator Tube Alternate Repair Criteria for Diablo Canyon Power Plant, Units 1 and 2 (TAC Nos. M98283 and M98284)," dated August 6, 1998.
10. PG&E letter to NRC, DCL-98-148, "Response to NRC Request for Additional Information, Dated August 6, 1998, Regarding Proposed W* Steam Generator Tube Repair Criteria," dated October 22, 1998.
11. NRC letter to PG&E, "Request for Additional Information - Proposed W* Steam Generator Tube Repair Criteria (TAC Nos. M98283 and M98284)," dated January 29, 1999.

12. PG&E letter to NRC, DCL-99-011, "Response to NRC Request for Additional Information, Dated January 29, 1999, Regarding Proposed W* Steam Generator Tube Repair Criteria," dated January 29, 1999.
13. PG&E letter to NRC, DCL-99-015, "Submittal of Supplementary Technical Specification Page Regarding Proposed W* Steam Generator Tube Repair Criteria," dated February 2, 1999.
14. PG&E letter to NRC, DCL-01-052, "2R10 Threshold Screening Values for W* Insitu Leak Testing," dated May 4, 2001
15. WCAP-14797, Revision 1 (Proprietary), "Generic W* Tube Plugging Criteria for 51 Series Steam Generator Tubesheet Region WEXTEX Expansions," February 1997.
16. WCAP-14798, Revision 1 (Nonproprietary), "Generic W* Tube Plugging Criteria for 51 Series Steam Generator Tubesheet Region WEXTEX Expansions," February 1997.
17. PG&E letter to NRC, DCL-01-06, "Supplement 2 to License Amendment Request 00-06, "Alternate Repair Criteria for Axial PWSCC at Dented Intersections in Steam Generator Tubing," dated February 20, 2001.
18. PG&E letter to NRC, DCL-99-076, "Special Report 99-04 - 90 Day Report, Results of Steam Generator Alternate Repair Criteria for Diablo Canyon Power Plant Unit 1 Ninth Refueling Outage," dated June 8, 1999.
19. PG&E letter to NRC, DCL-00-008, "Special Report 00-01 - 90 Day Report, Results of Steam Generator Alternate Repair Criteria for Diablo Canyon Power Plant Unit 2 Ninth Refueling Outage," dated January 20, 2000.
20. PG&E letter to NRC, DCL-00-010, "Special Report 00-05 - Results of Steam Generator Alternate Repair Criteria for Diablo Canyon Power Plant Unit 1 Tenth Refueling Outage," dated February 5, 2001.
21. PG&E letter to NRC, DCL-01-086, "Special Report 01-04 - 90-Day Report, Results of Steam Generator Alternate Repair Criteria for Diablo Canyon Power Plant Unit 2 Tenth Refueling Outage," dated August 21, 2001.
22. Regulatory Guide 1.83, "Inservice Inspection of Pressurized Water Reactor Steam Generator Tubes," Revision 1.
23. Regulatory Guide 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes".

MARKED-UP TECHNICAL SPECIFICATIONS

Remove Page	Insert Page
5.0-10	5.0-10
5.0-13	5.0-13
5.0-17	5.0-17
5.0-30	5.0-30

5.5 Programs and Manuals (continued)

5.5.9 Steam Generator (SG) Tube Surveillance Program

SG tube integrity shall be demonstrated by performance of the following augmented inservice inspection program.

The provisions of SR 3.0.2 are applicable to the SG Tube Surveillance Program test frequencies.

a. SG Sample Selection and Inspection - SG tube integrity shall be determined during shutdown by selecting and inspecting at least the minimum number of SGs specified in Table 5.5.9-1.

b. SG Tube Sample Selection and Inspection - The SG tube minimum sample size, inspection result classification, and the corresponding action required shall be as specified in Table 5.5.9-2. The inservice inspection of SG tubes shall be performed at the frequencies specified in Specification 5.5.9.c and the inspected tubes shall be verified acceptable per the acceptance criteria of Specification 5.5.9.d. The tubes selected for each inservice inspection shall include at least 3% of the total number of tubes in all SGs; the tubes selected for these inspections shall be selected on a random basis except:

1. 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;

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

a) All nonplugged tubes that previously had detectable wall penetrations (greater than 20%),

b) Tubes in those areas where experience has indicated potential problems,

c) A tube inspection (pursuant to Specification 5.5.9.d.1.h) 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,

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

e) Tubes identified as W* tubes having a previously identified indication within the W* length shall be inspected using a rotating pancake coil (RPC) probe for the full length of the W* region during all future refueling outages. * **

(continued)

* Applicable for Units 1 and 2, Cycles 10, ~~and~~ 11, 12, and 13 only.

** In-Situ Testing will be performed in accordance with PG&E letters DCL 98-148 dated October 22, 1998, and DCL 01-052 dated May 4, 2001, for Cycles 10 and 11 and letter DCL 01-095 dated September 13, 2001, for Cycles 12 and 13.

No Changes

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Tube Surveillance Program (continued)

3. The tubes selected as the second and third samples (if required by Table 5.5.9-2) during each inservice inspection may be subjected to a partial tube inspection provided:

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

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

4. Implementation of the steam generator tube/tube support plate repair criteria requires a 100% bobbin coil inspection for hot-leg and cold-leg 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 intersection having ODSCC indications shall be based on the performance of at least a 20% random sampling of tubes inspected over their full length.

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

Category	Inspection Results
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 (greater than 10%) further wall penetrations to be included in the above percentage calculations.

c. Inspection Frequencies - The above required inservice inspections of SG tubes shall be performed at the following frequencies:

   1. The first inservice inspection shall be performed after 6 Effective Full Power Months but within 24 calendar months of initial criticality. Subsequent inservice inspections shall be performed at intervals of not less than 12 nor more than 24 calendar months after the previous inspection. If two consecutive inspections not including the preservice inspection, result in all inspection results falling into the C-1 category or if two consecutive inspections demonstrate that previously observed degradation has not continued and no additional degradation has occurred, the inspection interval may be extended to a maximum of once per 40 months;

(continued)

5.5.9 Steam Generator (SG) Tube Surveillance Program (continued)

2. If the results of the inservice inspection of a SG conducted in accordance with Table 5.5.9-2 at 40 month intervals fall in Category C-3, the inspection frequency shall be increased to at least once per 20 months. The increase in inspection frequency shall apply until the subsequent inspections satisfy the criteria of Specification 5.5.9.c.1. The interval may then be extended to a maximum of once per 40 months; and

3. Additional, unscheduled inservice inspections shall be performed on each SG in accordance with the first sample inspection specified in Table 5.5.9-2 during the shutdown subsequent to any of the following conditions:

   a) Reactor-to-secondary tube leaks (not including leaks originating from tube-to-tube sheet welds) in excess of the limits of Specification 3.4.13; or

   b) A seismic occurrence greater than the Double Design Earthquake, or

   c) A loss-of-coolant accident requiring actuation of the Engineered Safety Features, or

   d) A main steam line or feedwater line break.

d. Acceptance Criteria

1. As used in this Specification:

   a) 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;

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

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

   d) % Degradation means the percentage of the tube wall thickness affected or removed by degradation.

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

   f) 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.

      1) This definition does not apply to tube support plate intersections for which the voltage-based repair criteria are being applied. Refer to 5.5.9.d.1.j for the repair limit applicable to these intersections.

(continued)

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Tube Surveillance Program (continued)

2) 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 5.5.9.d.1.k. *

g) 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 5.5.9.c.3, above;

h) Tube Inspection means an inspection of the SG tube from the tube end (hot leg side) completely around the U-bend to the top support of the cold leg;

i) Preservice Inspection means an inspection of the full length of each tube in each SG 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;

j) 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:

(i) 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.

(ii) 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 5.5.9.d.1.j (iii) below.

(iii) 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, with 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.

(continued)

* Applicable for Units 1 and 2, Cycles 10, ~~and~~ 11, 12, and 13 only.

No Changes

5.5.9 Steam Generator (SG) Tube Surveillance Program (continued)

(iv) 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.

(v) If an unscheduled mid-cycle inspection is performed, the following mid-cycle repair limits apply instead of the limits identified in 5.5.9.d.1.j (i), 5.5.9.d.1.j (ii), and 5.5.9.d.1.j (iii). 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)

V_{SL} = 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 5.5.9.d.1.j (i), 5.5.9.d.1.j (ii), and 5.5.9.d.1.j (iii).

(continued)

5.5.9 Steam Generator (SG) Tube Surveillance Program (continued)

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.

k) (*) 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:

(i) 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.

(ii) W* Length is the distance to the tubesheet below the BWT that precludes tube pull out in the event of the 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.

(iii) 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.

(iv) 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 5.5.9d.1.k)(v).

(v) 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.

(continued)

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Tube Surveillance Program (continued)

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 top of tube sheet (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 RCP 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.

2. The SG tube integrity shall be determined after completing the corresponding actions (plug all tubes exceeding the plugging limit) required by Table 5.5.9-2.

e. Reports

The contents and frequency of reports concerning the SG tube surveillance program shall be in accordance with Specification 5.6.10.

(continued)

* Applicable for Units 1 and 2, Cycle 10, ~~and~~ 11, 12, and 13 only.

No Changes

5.6 Reporting Requirements (continued)

5.6.10 Steam Generator (SG) Tube Inspection Report

a. Within 15 days following the completion of each inservice inspection of SG tubes, the number of tubes plugged in each SG shall be reported to the Commission.

b. The complete results of the SG tube inservice inspection shall be submitted to the Commission in a report 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 SG tube inspections, which fall into Category C-3, shall be reported in a Special Report to the Commission 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 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 form 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.

(continued)

5.6 Reporting Requirements (continued)

5.6.10 Steam Generator (SG) Tube Inspection Report

e. (*) The results of the inspection of W* tubes shall be reported to the Commission pursuant to 10 CFR 50.4 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 10 CFR 50.4 within 90 days following return to service of the steam generators.

* Applicable for Units 1 and 2, Cycles 10, ~~and~~ 11, 12, and 13 only.

PROPOSED TECHNICAL SPECIFICATIONS PAGES

5.5 Programs and Manuals (continued)

5.5.9 Steam Generator (SG) Tube Surveillance Program

SG tube integrity shall be demonstrated by performance of the following augmented inservice inspection program.

The provisions of SR 3.0.2 are applicable to the SG Tube Surveillance Program test frequencies.

a. SG Sample Selection and Inspection - SG tube integrity shall be determined during shutdown by selecting and inspecting at least the minimum number of SGs specified in Table 5.5.9-1.

b. SG Tube Sample Selection and Inspection - The SG tube minimum sample size, inspection result classification, and the corresponding action required shall be as specified in Table 5.5.9-2. The inservice inspection of SG tubes shall be performed at the frequencies specified in Specification 5.5.9.c and the inspected tubes shall be verified acceptable per the acceptance criteria of Specification 5.5.9.d. The tubes selected for each inservice inspection shall include at least 3% of the total number of tubes in all SGs; the tubes selected for these inspections shall be selected on a random basis except:

   1. 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;

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

      a) All nonplugged tubes that previously had detectable wall penetrations (greater than 20%),

      b) Tubes in those areas where experience has indicated potential problems,

      c) A tube inspection (pursuant to Specification 5.5.9.d.1.h) 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,

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

      e) Tubes identified as W* tubes having a previously identified indication within the W* length shall be inspected using a rotating pancake coil (RPC) probe for the full length of the W* region during all future refueling outages. * **

(continued)

* Applicable for Units 1 and 2, Cycles 10, 11, 12, and 13 only.

** In-Situ Testing will be performed in accordance with PG&E letters DCL 98-148 dated October 22, 1998, and DCL 01-052 dated May 4, 2001, for Cycles 10 and 11 and letter DCL 01-095 dated September 13, 2001, for Cycles 12 and 13.

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Tube Surveillance Program (continued)

2) 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 5.5.9.d.1.k. *

g) 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 5.5.9.c.3, above;

h) Tube Inspection means an inspection of the SG tube from the tube end (hot leg side) completely around the U-bend to the top support of the cold leg;

i) Preservice Inspection means an inspection of the full length of each tube in each SG 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;

j) 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:

(i) 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.

(ii) 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 5.5.9.d.1.j (iii) below.

(iii) 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, with 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.

(continued)

* Applicable for Units 1 and 2, Cycles 10, 11, 12, and 13 only.

(continued)

* Applicable for Units 1 and 2, Cycles 10, 11, 12, and 13 only.

5.6 Reporting Requirements (continued)

5.6.10 Steam Generator (SG) Tube Inspection Report

e. (*) The results of the inspection of W* tubes shall be reported to the Commission pursuant to 10 CFR 50.4 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 10 CFR 50.4 within 90 days following return to service of the steam generators.

* Applicable for Units 1 and 2, Cycles 10, 11, 12, and 13 only.