Pacific Gas and Electric Company

Gregory M. Rueger
Senior Vice President–
Generation and
Chief Nuclear Officer

US Mail:
Mail Code B32
Pacific Gas and Electric Company
PO Box 770000
San Francisco, CA 94177-0001

Overnight Mail:
Mail Code B32
Pacific Gas and Electric Company
77 Beale Street, 32nd Floor
San Francisco, CA 94105-1814

415.973.4684
Fax: 415.973.2313

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PG&E Letter DCL-00-094

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
License Amendment Request 00-06
Alternate Repair Criteria for Axial PWSCC at Dented Intersections in Steam Generator Tubing

Dear Commissioners and Staff:

Enclosed is an application for amendment to Facility Operating License Nos. DPR-80 and DPR-82 pursuant to 10 CFR 50.90. This license amendment request (LAR) proposes technical specification (TS) changes to incorporate an alternate repair criteria (ARC) for axial primary water stress corrosion cracking (PWSCC) at dented tube support plate intersections.

A description of the proposed TS change and basis for the change are provided in Enclosure 1. The proposed TS change is noted on the marked-up copy of the improved TS (ITS) page provided in Enclosure 2. The proposed ITS is provided in Enclosure 3.

PG&E's LAR is similar to the license amendment (LA) issued to Tennessee Valley Authority (TVA) for Sequoyah Nuclear Plant Units 1 and 2 dated March 8, 2000. The NRC has approved the ARC methodology in WCAP-15128 Revision 2, "Depth-Based SG Tube Repair Criteria for Axial PWSCC at Dented TSP Intersections." PG&E's LAR is based on the methodology in WCAP-15128 Revision 3. PG&E will submit Revision 3 to the NRC by June 30, 2000, following required changes as documented in TVA letter to the NRC dated March 2, 2000.

Enclosure 1 identifies differences from TVA's license amendment, provides the basis for a permanent license amendment, and provides an assessment of circumferential indications and mixed mode indications as requested by the NRC in a phone call with PG&E on April 21, 2000.

A001

PG&E desires to implement this ARC during the Diablo Canyon Power Plant Unit 1 10th refueling outage (1R10), currently scheduled to begin on October 8, 2000. Since the LA is not needed until after ITS is effective, the current TS pages are not included. PG&E requests that the LA be effective immediately, to be implemented within 30 days of issuance of an amendment.

Sincerely,

Gregory M. Rueger

cc: Edgar Bailey, DHS
Steven D. Bloom
Ellis W. Merschoff
David L. Proulx
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

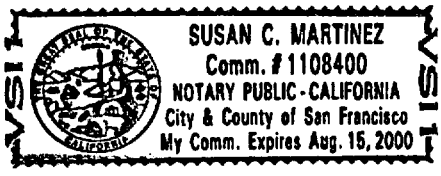
AFFIDAVIT

Gregory M. Rueger, of lawful age, first being duly sworn upon oath says that he is Senior Vice President - Generation of Pacific Gas and Electric Company; that he has executed LAR 00-06 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.

Gregory M. Rueger
Senior Vice President
Generation

Subscribed and sworn to before me this 19th day of June, 2000

Notary Public
County of San Francisco
State of California



ADDITION OF TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENTS TO ESTABLISH ALTERNATE REPAIR CRITERIA FOR AXIAL PWSCC AT DENTED TUBE SUPPORT PLATE INTERSECTIONS

A. DESCRIPTION OF AMENDMENT REQUEST

This license amendment request (LAR) adds new surveillance and reporting requirements to the technical specifications (TS) associated with steam generator (SG) tube inspection and repair. The new requirements establish alternate repair criteria (ARC) for axial primary water stress corrosion cracking (PWSCC) at dented tube support plate (TSP) intersections.

The proposed TS changes are as follows:

1. Add TS 5.5.9.b.5:

   "Inspection of dented tube support plate intersections will be performed in accordance with WCAP-15128 Revision 3."

2. Add TS 5.5.9.d.1.f.3:

   "This definition does not apply to axial PWSCC indications, or portions thereof, which are located within the thickness of dented tube support plates which exhibit a maximum depth greater than or equal to 40 percent of the initial tube wall thickness. Refer to WCAP-15128 Revision 3 for repair limits applicable to these intersections. Certain wedge region intersections and 7th tube support plate intersections as identified in the analysis attached to PG&E letter DCL-99-165, dated December 23, 1999, are excluded from application of axial PWSCC depth-based repair criteria."

3. Add TS 5.6.10.g:

   "For implementation of the depth-based repair criteria for axial PWSCC at dented TSPs, the results of the condition monitoring and operational assessments will be reported to the NRC within 120 days following completion of the inspection. The report will include tabulations of indications found in the inspection, tabulations of tubes repaired and left in service under the ARC, and growth rate distributions for indications found in the inspection as well as the growth distributions used to establish the tube repair limits. Any corrective actions found necessary in the event that condition monitoring requirements are not met will be identified in the report."

The proposed TS change is noted on the marked-up copy of the improved TS (ITS) page provided in Enclosure 2. The proposed ITS is provided in Enclosure 3.

PG&E's LAR is similar to the license amendment (LA) issued to Tennessee Valley Authority (TVA) for Sequoyah Nuclear Plant (SQN) Units 1 and 2 dated March 8, 2000. The NRC has approved the ARC methodology in WCAP-15128 Revision 2, "Depth-Based SG Tube Repair Criteria for Axial PWSCC at Dented TSP Intersections." PG&E's LAR is based on the methodology in WCAP-15128 Revision 3. PG&E will submit Revision 3 to the NRC by June 30, 2000, following required changes as documented in TVA letter to the NRC dated March 2, 2000.

PG&E's LAR differs from TVA's license amendment in the following areas, and are further discussed in the Safety Evaluation of this LAR:

- The NRC limited the ARC for two cycles of operation at SQN Units 1 and 2. Instead of a two cycle amendment, PG&E requests a permanent TS amendment.

- PG&E requests approval of changes to ITS. Because ITS does not have a Bases section for the steam generator program, the Safety Evaluation is expanded to include the bases for the ARC limits.

- PG&E requests approval of ARC exclusion zones.

- For detection of axial PWSCC in less than or equal to 2 volt dented intersections, PG&E requests approval to have the option to use either Plus Point coil or bobbin coil.

- PG&E requests approval to Plus Point inspect 100 percent of the critical area and buffer zone of each SG each outage, rather than inspect 100 percent of greater than 2 volt dents up to the highest TSP for which PWSCC has been detected in the prior and current outage.

- For axial outside diameter stress corrosion cracking (ODSCC) not detectable by bobbin at dented intersections, PG&E requests approval to revise existing criteria for determining initial Plus Point inspection scope and expansion of dented intersections.

- PG&E has provided an assessment of circumferential flaws and mixed mode flaws, as requested by the NRC in a phone call with PG&E on April 21, 2000. If circumferential cracking in less than or equal to 2 volt dents is detected in

the future and 100 percent Plus Point exams of less than or equal to 2 volt dents have not been performed up to the affected TSP elevation, PG&E requests approval to assess the need for potential expansion of Plus Point inspections consistent with the EPRI SG Examination Guidelines.

- The tube removal requirements for ARC application delineated in WCAP-15128 have already been satisfied for Diablo Canyon Power Plant (DCPP) Units 1 and 2, via tube removals performed in 1995 during the Unit 1 seventh refueling outage (1R7). Additional tube removals are not required.

B. BACKGROUND

The SG tubes constitute more than half of the reactor coolant pressure boundary (RCPB). Design of the RCPB for structural and leakage integrity is a requirement under 10 CFR 50, Appendix A. Specific requirements governing the maintenance of SG tube integrity are in DCPP TS, Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code), and Regulatory Guide (RG) 1.83. These include requirements for periodic inservice inspection of the tubing, flaw acceptance criteria (i.e., repair limits for plugging), and primary-to-secondary leakage limits. These requirements, coupled with the broad scope of plant operational and maintenance programs, have formed the basis for assuring adequate SG tube integrity.

SG tube plugging limits are specified in the DCPP TS. The current DCPP TS require that flawed tubes be removed from service by plugging if the depths of the flaws are greater than or equal to 40 percent through-wall, unless the degradation is subject to voltage-based repair criteria or W* repair criteria. 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 General Design Criteria (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 steam generator tubing. Leakage integrity refers to limiting primary-to-secondary leakage to within acceptable limits.

The traditional strategy for achieving the objectives of the GDC related to SG tube integrity has been to establish a minimum wall thickness requirement in accordance with the structural criteria of RG 1.121. Development of minimum wall thickness requirements to satisfy RG 1.121 was governed by analyses for uniform thinning of the tube wall in the axial and circumferential directions. The assumption of uniform thinning results in development of a repair limit that is conservative for flaw types occurring in the field. The resultant 40 percent

depth-based repair limit incorporated into the DCPP TS is conservative for highly localized flaws such as axial PWSCC that occurs at dented TSPs.

Examination of crack morphology for PWSCC at dented intersections has been found to show one or two microcracks well aligned with only a few uncorroded ligaments and little or no other inside diameter axial cracking at the intersection. This relatively simple morphology is conducive to obtaining good accuracy in nondestructive examination (NDE) sizing of these indications.

PG&E currently performs NDE measurements of axial PWSCC at dented TSPs in accordance with validated Plus Point rotating coil sizing techniques. If the measured maximum depth of the indication is less than 40 percent, the tube is left in service. If the measured maximum depth of the indication is greater than or equal to 40 percent, the tube is plugged.

Under the proposed ARC in this LAR, if the measured maximum depth of the indication is greater than or equal to 40 percent within the confines of the TSP, the tube may be allowed to remain in service using the methodology of WCAP-15128 Revision 3.

C. JUSTIFICATION

The proposed TS changes are necessary to avoid the need for repairing or plugging SG tubes that contain axial PWSCC indications that are greater than or equal to 40 percent deep within dented TSP intersections, but still have adequate structural and leakage integrity for additional service. The proposed change would preserve and restore reactor coolant flow margins through the SGs that are assumed in the loss of coolant accident (LOCA) analysis, and reduce the probability of unnecessary SG replacement. In addition, the proposed change would reduce the radiation exposure incurred by personnel involved in tube plugging and repair operations, and reduce the man-hours and potential impact to critical path time during refueling outages.

D. SAFETY EVALUATION

The purpose of SG tube repair limits is to provide reasonable assurance that tubes accepted for continued service without plugging and repair will exhibit adequate structural and leakage integrity with appropriate allowance for error or variability and for defect growth prior to the next inservice inspection.

The SG tube repair limits for axial PWSCC in this proposed TS amendment represents a SG tube ARC for greater than or equal to 40 percent deep axial PWSCC indications which are located within the thickness of the dented tube

support plates. These repair bases are not applicable to other types of localized tube wall degradation located at tube-to-tube support plate intersections.

The ARC is based on the use of crack depth profiles (crack length, average depth, maximum depth) obtained from Plus Point analyses. Based on the analysis of crack profiles and the accuracy that can be demonstrated for sizing PWSCC indications in the TSP region, the proposed change will preserve structural and leakage integrity of SG tubes.

Indications with measured maximum depths of less than 40 percent through-wall are left in service in accordance with the limits of the existing TS. For each indication greater than or equal to 40 percent through-wall, this ARC requires Monte Carlo analysis techniques to perform condition monitoring (to determine the as-found condition) and operational assessment (to determine the need for tube repair). The results of the condition monitoring and operational assessments will be reported to the NRC within 120 days following completion of the inspection.

In the analysis of a SG tube rupture event, a bounding primary-to-secondary leakage rate equal to the operational leakage limits in the TS, plus the leak rate associated with the double ended rupture of a single tube, is assumed. For other design basis accidents such as a main steam line break, main feed line break, control rod ejection, and locked reactor coolant pump motor, the tubes are assumed to retain their structural integrity and exhibit primary-to-secondary leakage within the limits assumed in the current licensing basis accident analyses. Steam line break accident leakage rates from the proposed PWSCC ARC are combined with post-accident leakage rates from other approved ARC (i.e., voltage-based ARC and W* ARC). The combined postulated accident leakage rates due to ARC will not exceed the limits assumed in the current licensing basis accident analyses, currently 12.8 gpm (at room temperature) for a faulted SG.

The 40 percent maximum depth repair limit for free span indications provides a very low likelihood of free span leakage under design basis or severe accident conditions. Leakage from indications inside the TSP is limited by the constraint of the TSP even under severe accident conditions, and leakage behavior in a severe accident would be similar to that found acceptable by the NRC under approved ARC for axial ODSCC at TSP intersections.

The following summarizes the ARC repair limits and bases, exclusions to application of the ARC, and inspection requirements.

Freespan Indication Repair Limit

The tube will be repaired if the crack depth outside the dented TSP is greater than or equal to 40 percent maximum depth, the current TS repair limit. This LAR proposes no change to this limit for free span indications.

Crack Length Limit for Greater Than or Equal to 40 percent Maximum Depth Indications

The crack length limit for greater than or equal to 40 percent maximum depth indications is defined as 0.375 inch from the centerline of the TSP. This limit defines the edges of the TSP thickness of 0.75 inch for Model 51 SGs. It is acceptable for the crack to extend to both edges of the TSP as long as the maximum depth of the crack outside the TSP is less than 40 percent maximum depth and the requirements for end of cycle (EOC) conditions are acceptable.

Operational Assessment Repair Bases

If the indication satisfies the above maximum depth and length requirements, the repair bases is then obtained by projecting the crack profile to the end of the next operating cycle and determining the burst pressure and leakage for the projected profile using Monte Carlo analysis techniques described in WCAP-15128 Revision 3. The burst pressure and leakage is compared to the requirements in WCAP-15128 Revision 3. Separate analyses are required for the total crack length and the length outside the TSP due to differences in requirements. If the projected EOC requirements are satisfied, the tube will be left in service. If projected EOC requirements are not satisfied, the tube will be repaired.

Exclusions to ARC: Wedge Region and Seventh TSP Bending Region

Certain wedge region intersections and seventh tube support plate intersections, as identified in the analysis attached to PG&E letter DCL-99-165, dated December 23, 1999, will be excluded from application of depth-based repair criteria at dented TSPs. The excluded intersections are the same as those excluded from voltage-based repair criteria at TSPs.

As discussed in PG&E letter DCL-99-165, in addressing the combined loading effects of a LOCA and safe shutdown earthquake (SSE) on the SGs, the potential exists for yielding of the TSP in the vicinity of the wedge groups, accompanied by deformation of tubes and a subsequent postulated in-leakage. Tube deformation could lead to opening of pre-existing tight through wall cracks, resulting in secondary to primary in-leakage following the event. Secondary to

primary in-leakage is a potential concern because, although not quantified, in-leakage could have an adverse affect on Final Safety Analysis Report (FSAR) results. Thus, any tubes that are defined to be potentially susceptible to significant deformation under LOCA plus SSE loads are excluded from application of ARC. 243 tubes per SG are susceptible to deformation and excluded from ARC, as identified in PG&E letter DCL-99-165.

PG&E letter DCL-99-165 also discusses a tube stress analysis for feed line break (FLB) / steam line break (SLB) plus SSE loading. 914 tubes per SG are excluded from application of ARC due to high bending stresses at the seventh TSP, because FLB/SLB plus SSE loading cause the stresses in certain tubes to exceed the maximum imposed bending stress for existing test data (equal to approximately the lower tolerance limit yield stress). These tubes are located in rows 11 to 15 and 36 to 46.

Tubes in the wedge region and seventh TSP exclusion zones are inspected by bobbin coil every outage. If degradation is identified by the bobbin coil at an exclusion zone tube, then the tube intersection is inspected by Plus Point. If Plus Point confirms a crack-like indication at the intersection, then the tube will be excluded from ARC and plugged.

Exclusions to ARC: Missing TSP Ligaments

The PWSCC ARC will not apply to intersections which contain a cracked or missing TSP ligament, as detected by bobbin and confirmed by Plus Point or pancake coil. A complete discussion of PG&E's program for detection of cracked or missing ligaments is described in PG&E letter DCL-98-046 dated March 27, 1998, in response to NRC Generic Letter 97-06. In DCL-98-046, PG&E committed to exclude voltage-based repair criteria to intersections which contain a missing TSP ligament as measured by eddy current techniques, because only a missing ligament (not a cracked ligament) could permit a burst under normal operating conditions. For consistency of application, voltage-based ARC and PWSCC ARC will not be applied at intersections containing either a cracked or missing ligament.

Inspection Requirements

To support ARC for axial PWSCC at dented TSP intersections, inspection requirements are identified in WCAP-15128 Revision 3 for the extent of inspection and NDE data analysis.

The bobbin coil probe is applied for sizing of dent voltages and for detection of axial PWSCC indications at TSP intersections with less than or equal to 2 volt

dents. This 2 volt dent limit is based on the range of dents available for NDE qualification and may be lower than an acceptable upper limit for bobbin detection. The Plus Point probe is applied for detection and sizing of axial PWSCC indications at intersections with any size dent, and for confirmation of axial PWSCC indications detected by bobbin.

The NRC has approved the following inspection requirements for PWSCC ARC:

1. Bobbin coil inspection of all TSP intersections.

2. Plus Point coil inspection of all bobbin coil indications at dented TSP intersections.

3. Plus Point coil inspection of all prior PWSCC indications left in service.

4. On a SG basis, Plus Point coil inspection of all TSP intersections having greater than 2 volt dents up to the highest TSP for which PWSCC has been detected in the prior and current inspection and 20 percent of greater than 2 volt dents at the next highest TSP.

As discussed below, PG&E has several clarifications and requests for NRC approval regarding bobbin inspections, Plus Point inspections of bobbin indications and dented intersections, and treatment of axial outside stress corrosion cracking (ODSCC) not detected by bobbin.

Bobbin Inspections

PG&E letter DCL-99-122 dated September 21, 1999 submitted the results of a 10 CFR 50.59 evaluation which demonstrated that the use of an EPRI qualified bobbin technique for detection of axial PWSCC in less than or equal to 2 volt dented intersections does not constitute an unreviewed safety question. PG&E has not implemented the bobbin technique. The evaluation was submitted in anticipation that the technique could be applied in 2R9 (Fall 1999 outage). The assessment was based on a conservative deterministic assessment relying on bobbin probability of detection (POD) curves contained in Revision 0 and Revision 1 of WCAP-15128. Since that time, the WCAP has been revised to eliminate the use of deterministic assessments and bobbin POD curves. Therefore, the submittal is for information only. PG&E will not implement the bobbin technique until its use is approved by the NRC as part of PWSCC ARC.

In the past, rather than crediting the bobbin coil for detection of axial PWSCC in less than or equal to 2 volt dents, PG&E has been using Plus Point for inspection of less than or equal to 2 volt dents to detect axial PWSCC. The

requirement to use Plus Point to inspect less than or equal to 2 volt dents was established in prior commitments to the NRC (reference PG&E letter DCL-98-011), before validation of the bobbin technique was completed. To provide inspection flexibility, PG&E requests approval to have the option to use either the bobbin coil or Plus Point coil for detection of PWSCC in less than or equal to 2 volt dented intersections. For both bobbin and Plus Point, PG&E will apply a POD of 0.6 in the leakage operational assessment, unless POD improvements are proposed by PG&E and accepted by the NRC.

Plus Point Inspection of Bobbin Indications

PG&E will perform Plus Point coil inspection of all bobbin coil indications at dented TSP intersections. This does not reflect a change in inspection methodology from prior inspections, because PG&E has always performed rotating coil inspections of all bobbin coil indications at dented TSP intersections. PG&E has previously committed to Plus Point inspect all dented TSP intersections containing bobbin coil indications that are subject to voltage-based ARC.

Plus Point Inspection of Dented TSP Intersections

The dent population is based on greater than 2 volt dents identified and sized by bobbin in the prior outage inspection. Rather than inspect 100 percent of greater than 2 volt dents up to the highest TSP for which PWSCC has been detected in the prior and current outage, PG&E will inspect 100 percent of the critical area and buffer zone of each SG each outage. The critical area and buffer zone will be defined as follows. Consistent with the EPRI Steam Generator Examination Guidelines, the critical area is the TSP region(s) which, on the basis of inspection results, engineering evaluation, and related experience, is defined by the type of degradation (PWSCC or circumferential degradation), the cause of the degradation (denting at TSP intersections), and the boundary of the degradation (function of temperature and results of previous inspections). The buffer zone is the next highest TSP, and its population is equal to 20 percent of the dented intersections at that TSP. Technical justification for defining the critical area and buffer zone for the completed inspection and next inspection will be reported to the NRC in the 120 day ARC report.

PG&E will employ a more restrictive inspection criteria for greater than 5 volt dents, in accordance with commitments made to the NRC in support of voltage-based ARC (reference PG&E letters DCL-98-011 and DCL-98-020, and NRC letter dated March 12, 1998). In Unit 2, PG&E will inspect 100 percent of greater than 5 volt dents. In Unit 1, PG&E will inspect 100 percent of greater

than 5 volt dents up to the highest TSP elevation where PWSCC, circumferential cracking, or axial ODSCC not detected by bobbin (i.e., AONDB) at greater than 5 volt dents have been previously detected in that SG. In addition, at least 20 percent of greater than 5 volt dents at each hot leg TSP will be inspected in each SG (and a minimum of 50 greater than 5 volt dents at each hot leg TSP, or 100 percent inspection if there are less than 50 greater than 5 volt dents at a hot leg TSP).

Axial ODSCC not Detected by Bobbin (AONDB)

PG&E is also currently committed to evaluate AONDB at less than 5 volt dented intersections. If AONDB is detected at a less than 5 volt dented intersection, PG&E is currently required to evaluate expansion of the Plus Point dent inspection program to include 100 percent of less than 5 dents up to and including the affected TSP elevation, plus 20 percent at the next highest TSP elevation. In addition, the initial scope of the next refueling outage inspection must include the same criteria. If AONDB at less than 5 volt dents is detected in the future, PG&E requests revision of this commitment, as described below.

Existing AONDB commitments were established in prior correspondence to the NRC when voltage-based ARC was being licensed for use at DCPP Units 1 and 2. At that time, there was no industry accepted practice for disposition of AONDB indications. Since then, an industry practice has been established as documented in Addendum 3 to EPRI Report NP-7480-L, "Steam Generator Tubing ODSCC at Tube Support Plates for Alternate Repair Limits, Database Update 1999," November 1999. Section 8.1.3 of Addendum 3 defines a process for assigning an inferred bobbin voltage to AONDB indications using a plant-specific correlation of bobbin voltage to RPC voltage, and states that "the RPC voltage corresponding to 2 volts bobbin voltage at the upper, one-sided 95 percent confidence bound on the mean can be used to define tube repair requirements as well as the threshold to determine the need for expansion of the augmented RPC inspection of dented intersections and mixed residual signals." To be consistent with industry practice, PG&E proposes that the threshold be established as the lower voltage repair limit (LRL) for axial ODSCC, currently 2 volts for 7/8 inch tubing. Therefore, if the inferred bobbin voltage is less than the LRL and the dent voltage is less than 5 volts, the tube will be left in service, no expansion is required, and the initial scope of the next inspection is not affected. However, if the inferred bobbin voltage is greater than or equal to the LRL, the tube will be plugged and Plus Point expansions will be evaluated consistent with EPRI SG Examination Guidelines.

As described in NEI letter to the NRC dated September 22, 1999, determination of bobbin voltages for AONDB indications at less than or equal to 5 volt dents

does not require NRC approval. For application to greater than 5 volt dents, the NEI letter requested NRC review and approval by September 5, 2000, to permit use in Fall 2000 ARC assessments. Therefore, if the NRC approves the application to greater than 5 volt dents, PG&E requests revision of greater than 5 volt dent AONDB commitments in a manner consistent with less than 5 volt dent AONDB.

Circumferential Flaws and Mixed Mode Flaws

PG&E recognizes that detection of circumferential indications at dented TSPs (either PWSCC or ODSCC) using the bobbin coil is not qualified per EPRI Appendix H. However, based on extensive inspection results at DCPP Units 1 and 2, it is not expected that a large number of circumferential indications will occur in less than or equal to 2 volt dented intersections. PG&E has used Plus Point to inspect less than or equal to 2 volt dented intersections in the critical areas for the last five refueling outages, and no circumferential indications have been detected at less than or equal to 2 volt dented intersections.
46 circumferential indications have been detected by Plus Point and plugged in DCPP Units 1 and 2, and all are located in greater than 2 volt dented intersections. The majority of the indications are located in greater than 5 volt dented intersections, while four are located in less than 5 volt dented intersections (3.1, 3.0, 2.8, and 2.4 volts). 41 of the circumferential flaws are PWSCC, and 5 are ODSCC. In all cases, the indications are confined to the TSP thickness and are short and shallow such that they did not violate condition monitoring structural and leakage limits. One shallow PWSCC circumferential indication was pulled in the seventh refueling outage of Unit 1 (1R7) and destructively examined, such that Plus Point detection thresholds of approximately 27 degrees and 50 percent maximum depth were established.

If circumferential cracking in less than or equal to 2 volt dents is detected in the future and 100 percent Plus Point exams of less than or equal to 2 volt dents have not been performed up to the affected TSP elevation, PG&E will assess the need for potential expansion of Plus Point inspections consistent with the EPRI SG Examination Guidelines. In the affected SG, PG&E would define the critical area for circumferential cracking as a function of the smallest dent size that has known circumferential cracking. For example, if circumferential cracking is identified at a 1.5 volt dented intersection at TSP 1H, PG&E would define the critical area as all dents greater than or equal to 1.5 volts at 1H in the affected SG, and would ensure that 100 percent of that critical area is inspected by Plus Point. In this example, PG&E would define the buffer zone as 20 percent of greater than or equal to 1.5 volt dents at 2H, and would ensure that 100 percent of the buffer zone is inspected by Plus Point.

PG&E also recognizes the potential for mixed mode cracking in less than or equal to 2 volt dents. To date, there have been no occurrence of intersections containing axial and circumferential ODSCC indications (i.e., ODSCC mixed mode). Axial and circumferential PWSCC indications (i.e., PWSCC mixed mode) have been detected in four intersections. In all cases, ligaments have been detected such that the flaws do not intersect and, therefore, did not require further assessment as a mixed mode flaw. Ligament sizes of these four PWSCC mixed mode flaws are listed in the table below.

SG	Row	Column	TSP	Outage	Dent Volt	Circumferential Ligament (degree)	Axial Ligament (inch)
22	14	12	1H	2R7	2.39	8	0.11
12	21	33	3H	1R9	3	none	0.12
22	22	46	1H	2R9	6.13	3	0.38
22	12	25	1H	2R7	24.06	57 and 69*	0.23 and 0.20*

* two axial flaws and one circumferential flaw

In accordance with the EPRI In Situ Pressure Test Guidelines, for nonintersecting mixed mode flaws, each component may be assessed independently of each other for burst and leakage integrity. The flaw lengths and depths of the axial and circumferential components have been small such that structural and leakage integrity margins were satisfied.

Based on DCPP results to date and typical flaw geometries at dented intersections, it is unlikely that intersecting mixed mode indications will occur. However, should intersecting mixed mode flaws be detected in the future, PG&E will follow the EPRI In Situ Guidelines to disposition the leakage and burst potential. The guidelines provide critical lengths and depths of axial and circumferential components that represent threshold values for leakage and burst testing. If a mixed mode flaw exceeds these thresholds, the flaw would be assessed using analytical methods to predict burst pressures and leak rates under accident conditions. For conservatism, nonintersecting indications detected in the seventh refueling outage of Unit 2 (2R7) were treated as intersecting mixed mode flaws, and Westinghouse performed an analysis to determine that there was sufficient burst margin at end of cycle.

All intersections containing circumferential indications and mixed mode indications are plugged and evaluated for stabilization. Several intersections containing circumferential indications have been stabilized.

Because no intersecting mixed mode indications have been identified to date, operational assessments have not accounted for mixed mode indications. PG&E has routinely performed Plus Point inspections of 100 percent of dented intersections (no lower dent voltage cutoff) in the critical area of each SG and,

therefore, operational assessments have not been required to assess uninspected tubes. As described above, if circumferential indications are detected in less than or equal to 2 volt dents, PG&E will ensure that 100 percent of the critical area is inspected by Plus Point. Therefore, operational assessments will not need to account for uninspected tubes.

Tube Pull Requirements

The tube removal requirements for ARC application delineated in WCAP-15128, Revision 2 have already been satisfied for DCPP Units 1 and 2. PG&E removed four intersections containing axial PWSCC indications from DCPP Unit 1 in 1995 during 1R7, and destructive examinations were performed. These intersections are included in the data set used in the NDE qualification. PG&E removed an additional intersection containing axial PWSCC from DCPP Unit 1 in 1999, during the Unit 1 ninth refueling outage (1R9), and destructive examination was performed. All five intersections are representative of the types of indications to which the ARC will be applied. Additional tube removals are not required at DCPP Units 1 and 2 to support application of the ARC at either unit.

Assessment for Permanent Amendment

The NRC limited the ARC for two cycles of operation at SQN Units 1 and 2. Instead of a two cycle amendment, PG&E requests a permanent TS amendment. The NRC's safety evaluation related to SQN's amendment indicated that a subsequent request for a permanent TS change should provide the following information:

1. *NRC safety evaluation: WCAP-15128, Revision 2, should be revised to incorporate the clarifications and commitments made in TVA's letter dated March 2, 2000.*

   PG&E response: WCAP-15128 Revision 3 will incorporate the clarifications and commitments made in TVA's letter dated March 2, 2000. Revision 3 will be submitted to the NRC by June 30, 2000, and is incorporated into the DCPP TS by reference in proposed improved TS (ITS) 5.5.9.d.1.f.3.

2. *NRC safety evaluation: Consider incorporating refinements into the operational assessment methodology to permit consideration of a more complete amount of the growth rate data from the most recent operating cycle.*

   PG&E response: To the extent practical without delaying SG close out, PG&E will consider all growth rate data from the most recent operating cycle

when performing operational assessments for determining the need for tube repair. As discussed in TVA letter dated March 2, 2000, incorporating all recent growth data into the operational assessment to determine the need for tube repair could result in a significant time and cost penalty. For example, because SGs are typically closed out in series, close out could be delayed in one SG while waiting for inspections to be completed in another SG to gather additional growth rate data.

Following the 1999 inspections at DCPP Units 1 and 2, there are 91 DCPP-specific growth data points. The DCPP-specific 95 percent growth rates per effective full power year (EFPY) are 0.05 inch, 12.2 percent maximum depth, and 10.4 percent average depth. These values remain less than the industry 95 percent growth rates. DCPP is required to use the industry growth rate distribution until a sufficient number of DCPP-specific data points are obtained. In the near term, it is unlikely that new growth data obtained during DCPP inspections will increase the upper 95 percentile of the industry growth rate cumulative distribution.

3. *NRC safety evaluation: Assess the performance of the operational assessment methodologies for predicting end of cycle (EOC) flaw distributions as a function of flaw size. Assess differences between predicted and actual flaw size distributions in terms of their impact on predicted burst pressures for the most limiting tube and total SG accident leak rate.*

   PG&E response: PG&E will assess the performance of the operational assessment methodologies for predicting EOC flaw distributions as a function of flaw size. Differences between predicted and actual flaw size distributions will be assessed in terms of their impact on predicted burst pressures for the most limiting tube and total SG accident leak rate. These assessments will be initiated following the second cycle of ARC application on either unit. Results of the assessments, and corrective actions if needed, will be documented in the 120 day ARC submittal.

4. *NRC safety evaluation: Assess the early experience with the number and size of indications previously detected and left in service versus the number and size of indications of PWSCC indications not previously detected and the need for accounting for the appearance of such new indications in the operational assessment burst evaluation.*

   PG&E response: PG&E will assess the number and size of indications previously detected and left in service versus the number and size of new PWSCC indications and the need for accounting for the appearance of such

new indications in the operational assessment burst evaluation. Results of the assessments, and corrective actions if needed, will be documented in the 120 day ARC submittal.

5. *NRC safety evaluation: Consider developing refinements into the overall accident leakage model such that the leak test regression calibration of the deterministic model includes a calibration of the model to predict pop-through of crack ligaments. In addition, refinements to the breakthrough model should be incorporated to ensure that all potential pop-through ligaments are identified (within the limits of reasonable refinement of the model) and that all significant ligaments are included in the leakage assessment.*

   PG&E response: PG&E plans to develop refinements into the overall accident leakage model and breakthrough model, as suggested by the NRC. PG&E also plans to develop and propose a revision of the probability of detection (POD) factor of 0.6. Refinements to leakage models and POD cannot be performed in time to support issuance of Revision 3 of WCAP-15128. Therefore, these refinements will be incorporated in Revision 4 of WCAP-15128, expected to be submitted to NRC by August 2000. If these refinements are acceptable to the NRC, PG&E will then propose a revision of this LAR to reference Revision 4 of WCAP-15128 instead of Revision 3.

E. NO SIGNIFICANT HAZARDS EVALUATION

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?*

   Examination of crack morphology for primary water stress corrosion cracking (PWSCC) at dented intersections has been found to show one or two microcracks well aligned with only a few uncorroded ligaments and little or no other inside diameter axial cracking at the intersection. This relatively simple morphology is conducive to obtaining good accuracy in nondestructive examination (NDE) sizing of these indications. Accordingly, alternate repair criteria (ARC) is established based on crack length and average and maximum depth within the thickness of the tube support plate (TSP).

   The application of the ARC requires a Monte Carlo condition monitoring assessment to determine the as-found condition of the tubing. The condition monitoring analysis described in WCAP-15128 Revision 3 is consistent with NRC Generic Letter 95-05 requirements.

   The application of the ARC requires a Monte Carlo operational assessment to determine the need for tube repair. The repair bases are obtained by projecting the crack profile to the end of the next operating cycle and determining the burst pressure and leakage for the projected profile using Monte Carlo analysis techniques described in WCAP-15128 Revision 3. The burst pressure and leakage is compared to the requirements in WCAP-15128 Revision 3. Separate analyses are required for the total crack length and the length outside the TSP due to differences in requirements. If the projected end of cycle (EOC) requirements are satisfied, the tube will be left in service.

   A steam generator (SG) tube rupture event is one of a number of design basis accidents that are analyzed as part of a plant's licensing basis. A single or multiple tube rupture event would not be expected in a SG in which the ARC has been applied. The ARC requires repair of any indication having a maximum crack depth greater than or equal to 40 percent outside the TSP, thus limiting the potential length of a deep crack outside the TSP at EOC conditions and providing margin against burst and leakage for free span indications.

   For other design basis accidents such as a main steam line break, main feed line break, control rod ejection, and locked reactor coolant pump motor, the tubes are assumed to retain their structural integrity.

Therefore, 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?*

Implementation of the proposed SG tube ARC does not introduce any significant changes to the plant design basis. A single or multiple tube rupture event would not be expected in a SG in which the ARC has been applied. Both condition monitoring and operational assessments are completed as part of the implementation of ARC to determine that structural and leakage margin exists prior to returning SGs to service following inspections. If the condition monitoring requirements are not satisfied for burst or leakage, the causal factors for EOC indications exceeding the expected values will be evaluated. The methodology and application of this ARC will continue to ensure that tube integrity is maintained during all plant conditions consistent with the requirements of Regulatory Guide (RG) 1.121 and Revision 1 of RG 1.83. Therefore, a permanent ARC is justified.

In the analysis of a SG tube rupture event, a bounding primary-to-secondary leakage rate equal to the operational leakage limits in the Technical Specifications (TS), plus the leak rate associated with the double ended rupture of a single tube, is assumed. For other design basis accidents, the tubes are assumed to retain their structural integrity and exhibit primary-to-secondary leakage within the limits assumed in the current licensing basis accident analyses. Steam line break leakage rates from the proposed PWSCC ARC are combined with leakage rates from other approved ARC (i.e., voltage-based ARC and W* ARC). The combined leakage rates will not exceed the limits assumed in the current licensing basis accident analyses.

The 40 percent maximum depth repair limit for free span indications provides a very low likelihood of free span leakage under design basis or severe accident conditions. Leakage from indications inside the TSP is limited by the constraint of the TSP even under severe accident conditions, and leakage behavior in a severe accident would be similar to that found acceptable by the NRC under approved ARC for axial outside diameter stress corrosion cracking (ODSCC) at TSP intersections. Therefore, even under severe accident conditions, it is concluded that application of the proposed ARC for PWSCC at dented TSP locations results in a negligible difference in risk of a tube rupture or large leakage event, when compared to current 40 percent repair limits or previously approved ARC.

DCPP continues to implement a maximum operating condition leak rate limit of 150 gallons per day per SG to preclude the potential for excessive leakage during all plant conditions.

The possibility of a new or different kind of accident from any previously evaluated is not created because SG tube integrity is maintained by inservice inspection, condition monitoring, operational assessment, tube repair, and primary-to-secondary leakage monitoring.

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

Tube repair limits provide reasonable assurance that tubes accepted for continued service without plugging or repair will exhibit adequate tube structural and leakage integrity during subsequent plant operation. The implementation of the proposed ARC is demonstrated to maintain SG tube integrity consistent with the criteria of draft NRC Regulatory Guide 1.121. The guidelines of RG 1.121 describe a method acceptable to the NRC staff for meeting General Design Criteria (GDC) 2, 4, 14, 15, 31, and 32 by ensuring the probability or the consequences of SG tube rupture remain within acceptable limits. This is accomplished by determining the limiting conditions of degradation of SG tubing, for which tubes with unacceptable cracking should be removed from service.

Upon implementation of the proposed ARC, even under the worst-case conditions, the occurrence of PWSCC at the tube support plate elevations is not expected to lead to a SG tube rupture event during normal or faulted plant conditions. The ARC involves a computational assessment to be completed for each indication left in service ensuring that performance criteria for tube integrity and leak tightness are met until the next scheduled outage. Therefore, a permanent ARC is justified.

As discussed below, certain tubes are excluded from application of ARC. Existing tube integrity requirements apply to these tubes, and the margin of safety is not reduced.

In addressing the combined loading effects of a loss-of-coolant (LOCA) and safe shutdown earthquake (SSE) on the SGs (as required by GDC 2), the potential exists for yielding of the TSP in the vicinity of the wedge groups, accompanied by deformation of tubes and a subsequent postulated in-leakage. Tube deformation could lead to opening of pre-existing tight through wall cracks, resulting in secondary to primary in-leakage following the event, which could have an adverse affect on the Final Safety Analysis Report (FSAR) results. Based on a DCPP analysis of LOCA and SSE,

SG tubes located in wedge region exclusion zones are susceptible to deformation, and are excluded from application of ARC.

A DCPP tube stress analysis for feed line break (FLB)/steam line break (SLB) plus SSE loading determined that high bending stresses occur in certain SG tubes at the seventh TSP, because the stresses exceed the maximum imposed bending stress for existing test data (equal to approximately the lower tolerance limit yield stress). These tubes are located in rows 11 to 15 and 36 to 46, and are excluded from application of ARC.

Tube intersections that contain TSP ligament cracking are also excluded from application of ARC.

Based on the above, it is concluded that the proposed license amendment request does not result in a significant reduction in margin with respect to the plant safety analyses as defined in the FSAR or TS.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

F. NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

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

G. 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.

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5. Inspection of dented tube support plate intersections will be performed in accordance with WCAP-15128, Revision 3.

INSERT B

3) This definition does not apply to axial PWSCC indications, or portions thereof, which are located within the thickness of dented tube support plates which exhibit a maximum depth greater than or equal to 40 percent of the initial tube wall thickness. Refer to WCAP-15128 Revision 3 for repair limits applicable to these intersections. Certain wedge region intersections and 7th tube support plate intersections as identified in the analysis attached to PG&E letter DCL-99-165, dated December 23, 1999, are excluded from application of axial PWSCC depth-based repair criteria.

INSERT C

g. For implementation of the depth-based repair criteria for axial PWSCC at dented TSPs, the results of the condition monitoring and operational assessments will be reported to the NRC within 120 days following completion of the inspection. The report will include tabulations of indications found in the inspection, tabulations of tubes repaired and left in service under the ARC, and growth rate distributions for indications found in the inspection as well as the growth distributions used to establish the tube repair limits. Any corrective actions found necessary in the event that condition monitoring requirements are not met will be identified in the report.

PROPOSED IMPROVED TECHNICAL SPECIFICATIONS PAGES

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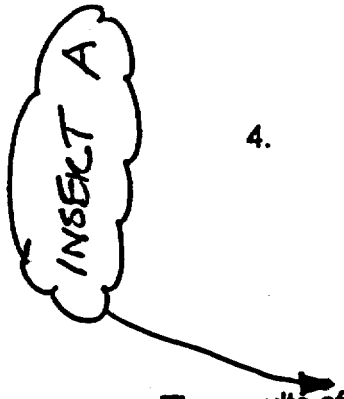
5.5 Programs and Manuals

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 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. *

INSERT B

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 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.

INSERT C

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 only.

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5. Inspection of dented tube support plate intersections will be performed in accordance with WCAP-15128, Revision 3.

INSERT B

3) This definition does not apply to axial PWSCC indications, or portions thereof, which are located within the thickness of dented tube support plates which exhibit a maximum depth greater than or equal to 40 percent of the initial tube wall thickness. Refer to WCAP-15128 Revision 3 for repair limits applicable to these intersections. Certain wedge region intersections and 7th tube support plate intersections as identified in the analysis attached to PG&E letter DCL-99-165, dated December 23, 1999, are excluded from application of axial PWSCC depth-based repair criteria.

INSERT C

g. For implementation of the depth-based repair criteria for axial PWSCC at dented TSPs, the results of the condition monitoring and operational assessments will be reported to the NRC within 120 days following completion of the inspection. The report will include tabulations of indications found in the inspection, tabulations of tubes repaired and left in service under the ARC, and growth rate distributions for indications found in the inspection as well as the growth distributions used to establish the tube repair limits. Any corrective actions found necessary in the event that condition monitoring requirements are not met will be identified in the report.

PROPOSED IMPROVED TECHNICAL SPECIFICATIONS PAGES

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.

5. Inspection of dented tube support plate intersections will be performed in accordance with WCAP-15128, Revision 3.

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 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. *

3) This definition does not apply to axial PWSCC indications, or portions thereof, which are located within the thickness of dented tube support plates which exhibit a maximum depth greater than or equal to 40 percent of the initial tube wall thickness. Refer to WCAP-15128 Revision 3 for repair limits applicable to these intersections. Certain wedge region intersections and 7th tube support plate intersections as identified in the analysis attached to PG&E letter DCL-99-165, dated December 23, 1999, are excluded from application of axial PWSCC depth-based repair criteria.

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.

(continued)

5.5 Programs and Manuals

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

(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 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.

g. For implementation of the depth-based repair criteria for axial PWSCC at dented TSPs, the results of the condition monitoring and operational assessments will be reported to the NRC within 120 days following completion of the inspection. The report will include tabulations of indications found in the inspection, tabulations of tubes repaired and left in service under the ARC, and growth rate distributions for indications found in the inspection as well as the growth distributions used to establish the tube repair limits. Any corrective actions found necessary in the event that condition monitoring requirements are not met will be identified in the report.

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