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PG&E Letter DCL-03-174

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
License Amendment Request 03-16
Revised Wedge Region Exclusion Zones for Steam Generator Tube Alternate Repair Criteria

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) proposes new steam generator (SG) wedge region exclusion zones for outside diameter stress corrosion cracking (ODSCC) alternate repair criteria (ARC) at tube support plate (TSP) intersections and for primary water stress corrosion cracking (PWSCC) ARC at dented TSP intersections.

Wedge region exclusion zones are tube locations ineligible for the application of ARC because loss of coolant accident (LOCA) plus safe shutdown earthquake (SSE) loads could potentially result in permanent tube deformation. Wedge regions are made up of tubes located adjacent to wedges, which provide support for the TSPs.

The wedge region exclusion zones currently approved for the ODSCC ARC (in License Amendments (LAs) 124 and 122 to Facility Operating License Nos. DPR-80 and DPR-82 for Units 1 and 2 of DCPP respectively) and for PWSCC ARC (in LA 152 to Facility Operating License Nos. DPR-80 and DPR-82 for Units 1 and 2 of DCPP respectively) are referenced in Technical Specification (TS) 5.5.9, and are based on a LOCA plus SSE loads analysis performed in 1992. The new wedge region exclusion zones are based on new analyses of LOCA plus SSE loads completed in 2003 using plant-specific accident loads.

The new wedge region exclusion zone results in a reduction in the number of tubes excluded from the ARC, when compared to the prior wedge region exclusion zone approved by the NRC, and is therefore less restrictive.

A001

Enclosure 1 contains a description of the proposed change, results of the supporting technical analyses, and the no significant hazards consideration determination. Enclosures 2 and 3 contain marked-up and retyped (clean) TS pages, respectively.

PG&E has determined that this LAR does not involve a significant hazard consideration as determined per 10 CFR 50.92. Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of this amendment.

The changes proposed in this LAR are not required to address an immediate safety concern. However, PG&E requests that the NRC assign a higher priority for review and approval of this LAR so that the change can be implemented in the next Unit 1 refueling outage (1R12) planned in March 2004. By implementing the revised wedge region exclusion zone alternate repair criteria requested in this LAR, the number of SG tubes that might be unnecessarily plugged in the next Units 1 and 2 refueling outages will be reduced. This will preserve the reactor coolant system flow margin and will reduce the occupational radiation exposure that would otherwise be incurred by plant workers involved in tube plugging operations.

PG&E also requests that the LAs be made effective upon issuance, to be implemented within 60 days from the date of issuance.

If you have any questions or require additional information, please contact Stan Ketelsen at (805) 545-4720.

Sincerely,

David H. Oatley
Vice President and General Manager – Diablo Canyon

why1/4279
Enclosures

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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

David H. Oatley, of lawful age, first being duly sworn upon oath says that he is Vice President and General Manager – Diablo Canyon of Pacific Gas and Electric Company; that he has executed license amendment request LAR 03-16 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 and General Manager – Diablo Canyon

Subscribed and sworn to before me this 19th day of December, 2003.

Notary Public
County of San Luis Obispo
State of California

CHUCK MACKEY
Commission # 1397547
Notary Public - California
San Luis Obispo County
My Comm. Expires Feb 1, 2007

EVALUATION

1.0 DESCRIPTION

This letter is a request to amend Facility Operating Licenses DPR-80 for Unit 1 and DPR-82 for Unit 2 of the Diablo Canyon Power Plant (DCPP).

In 2003, Westinghouse completed a revised loss-of-coolant accident (LOCA) plus safe shutdown earthquake (SSE) load analysis for DCPP Units 1 and 2 to identify the numbers and the locations of the steam generator (SG) tubes which must be excluded from the voltage-based outside diameter stress corrosion cracking (ODSCC) alternate repair criteria (ARC) at tube support plate (TSP) intersections and primary water stress corrosion cracking (PWSCC) ARC at dented TSP intersections. The revised analysis incorporates DCPP-specific LOCA and seismic loads that were not available when the 1992 analysis was performed, and considers varying tube support conditions that bound potential support conditions that may exist in the DCPP SG tube bundle. This revised analysis reduces the number of tubes that are potentially susceptible to deformation and in-leakage, from 468 tubes (1992 analysis) to 262 tubes (2003 analysis) per SG. As a result, fewer tubes are excluded from ARC application.

2.0 PROPOSED CHANGE

The proposed amendment would revise the SG TSP intersections that are excluded from application of SG tube voltage-based ODSCC ARC at TSPs and PWSCC ARC at TSPs.

For ODSCC ARC, the proposed change revises the current Technical Specification (TS) 5.5.9.d.1.j (iv) to reference this license amendment request (LAR) for certain intersections that will be excluded from application of the voltage-based repair criteria.

For PWSCC ARC, there is no corresponding TS that specifies the wedge region exclusion zone. Therefore, there is no TS change required.

The proposed TS changes are noted on the marked-up TS page provided in Enclosure 2. The proposed retyped TS page is provided in Enclosure 3.

3.0 BACKGROUND

The NRC approved implementation of voltage-based ODSCC ARC at DCPP Units 1 and 2 in License Amendment (LA) Nos. 124 and 122, "Issuance of Amendments for Diablo Canyon Nuclear Power Plant, Unit No. 1 (TAC No. M97254) and Unit No. 2 (TAC No. M97255)," dated March 12, 1998. The NRC approved implementation of PWSCC ARC at DCPP Units 1 and 2 in LA 152, "Alternate Repair Criteria For Axial Primary Water Stress Corrosion Cracking at Dented Intersections in Steam Generator Tubing," dated May 1, 2002. In both of these ARC, certain intersections located in wedge regions are excluded from application of ARC since they could potentially deform following a postulated LOCA plus SSE loads event. The wedge regions are made up of tubes located adjacent to the wedges, which provide support for the TSPs. Tubes that have pre-existing through-wall cracks that are left in service under ARC, and that may deform under a postulated LOCA plus SSE loads event, may result in secondary-to-primary in-leakage following the event. Therefore, tubes that have crack-like indications in the wedge region exclusion zone are excluded from ARC.

The wedge region exclusion zones currently approved for ODSCC ARC and PWSCC ARC are based on a LOCA plus SSE loads analysis performed by Westinghouse in 1992. The description of the 1992 LOCA plus SSE loads analysis and identification of the tube intersections to be excluded from ODSCC ARC was submitted to the NRC in LAR 97-03, "Voltage Based Alternate Steam Generator Tube Repair Limit for Outside Diameter Stress Corrosion Cracking at Tube Support Plate Intersections," dated February 26, 1997. The LOCA plus SSE loads analysis and ODSCC ARC was approved by the NRC in LA Nos. 124 and 122, with TS 5.5.9.d.1.j (iv) referencing the 1992 Westinghouse letter that identified the tube intersections excluded from ODSCC ARC.

In Supplement 3 to LAR 00-06, "Alternate Repair Criteria for Axial PWSCC at Dented Intersections in Steam Generator Tubing," dated November 13, 2001, PG&E submitted a request for ARC for axial PWSCC at dented TSP intersections. The PWSCC ARC applied the same wedge region exclusion zone approved by the NRC in LAs 124 and 122. The NRC approved the PWSCC ARC in LA 152. There are no TS related to the tube intersections excluded from PWSCC ARC.

Westinghouse has rerun the 1992 LOCA plus SSE loads analysis using DCPP-specific LOCA and seismic loads which were not available in 1992. Varying tube support conditions that bound potential support conditions that may exist in the DCPP tube bundle were used. In determining the number of potentially affected tubes, enveloping loads from both the seismic and LOCA analyses are used.

The revised analysis reduces the number of tubes that are potentially susceptible to deformation and in-leakage, from 468 tubes (1992 analysis) to 262 tubes (2003 analysis) per SG. Tables 2 through 5 identify the updated tube locations susceptible to deformation.

PG&E previously submitted a request for a revised wedge region exclusion zone for ODSCC ARC in LAR 99-02, submitted in PG&E Letter DCL-99-165, "Exclusion Zones for Alternate Repair Criteria," dated December 23, 1999. This request was withdrawn by PG&E Letter DCL-01-046, "Withdrawal of License Amendment Request 99-02, Exclusion Zones for Alternate Repair Criteria," dated April 27, 2001, because PG&E was evaluating SG chemical cleaning and believed that the supporting analyses could impact the defined exclusion zones. Westinghouse has recently completed the revised LOCA plus SSE loads analyses in support of chemical cleaning, and the resulting wedge region exclusion zones are slightly changed from that listed in LAR 99-02.

PG&E's goal is to ensure SG integrity until the SGs are replaced. The need to replace SGs results from the loss of reactor coolant system flow margin due to SG tube plugging. Over the operating life of the SGs, application of the overly conservative 1992 wedge region exclusion zone would result in unnecessarily plugging SG tubes containing TS allowable cracking at TSP intersections that are not susceptible to collapse and in-leakage following a LOCA plus SSE loads event. Plugging these tubes would unnecessarily reduce SG heat removal capability on both accident conditions and normal operations. The proposed amendment would preserve the reactor coolant system flow margin and reduce the occupational radiation exposure that would otherwise be incurred by plant workers involved in tube plugging operations.

4.0 TECHNICAL ANALYSIS

In addressing the combined loading effects of a LOCA and SSE event on the SGs, as required by General Design Criterion 2 of 10 CFR 50, Appendix A, the potential exists for yielding of the TSP in the vicinity of the wedge groups, accompanied by deformation of SG 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 effect on the Final Safety Analysis Report Update (FSARU) safety analysis results. Thus, any tubes that are predicted to deform under LOCA plus SSE loads are excluded from application of ARC.

The revised LOCA plus SSE loads analysis, completed by Westinghouse in 2003, incorporates DCPP-specific LOCA and seismic loads and considers varying tube support conditions that bound potential support conditions that may exist in the DCPP tube bundle (both pre and post chemical cleaning). The bounding analysis considers two tube-to-TSP interface conditions. The first support condition assumes that the TSP intersections are packed with magnetite material such that the tubes are essentially fixed in the TSP intersections. The second support condition assumes the crevices are full of magnetite but the tubes are free to rotate (pinned) inside the TSPs. In determining the number of potentially affected tubes, enveloping loads from both the seismic and LOCA analyses are used.

Chemical cleaning is planned for the next refueling outage of each unit (1R12 and 2R12) in 2004. The revised wedge region exclusion zones are applicable to the SG bundle in the current pre-cleaned condition as well as the post-cleaned condition because the varying tube support conditions assumed in the analysis bound potential support conditions that may exist in the DCPP tube bundle in both the pre and post-cleaned condition.

4.1 LOCA Loads

LOCA loads are developed as a result of transient flow and pressure fluctuations following a postulated primary coolant system pipe break. Based on the prior qualification of DCPP Units 1 and 2 for leak-before-break requirements for the primary piping, the limiting LOCA event is the residual heat removal (RHR) line break. As a result of a LOCA, the SG U-tubes are subjected to three distinct types of loading mechanisms:

- Primary fluid rarefaction wave loads,
- SG shaking loads due to the coolant loop motion, and
- External hydrostatic pressure loads as the primary side blows down to atmospheric pressure.

The first two loading mechanisms occur simultaneously during the course of a LOCA and result predominantly in bending stresses in the SG tube U-bends at the top TSP. The third loading mechanism (resulting in the maximum secondary-to-primary pressure differential) does not result in any net load on the TSP that would affect plate deformation, and is not considered in this evaluation.

With regard to LOCA shaking loads, for large (primary) pipe break events that are assumed to occur immediately adjacent to the primary piping inlet or outlet, the pipe break event results in shaking of the overall SG. However, as noted above, under the leak-before-break conditions, the limiting pipe break event considered in this analysis is the RHR line break. Since this limiting pipe break event is remote to the SG and of a much-reduced pipe size than the main reactor coolant loop piping, the potential for shaking loads being introduced to the SG is significantly reduced. Even for large pipe break events, the plate loads resulting from shaking of the SG are small compared to the rarefaction wave loads. Due to the remoteness of the limiting pipe break from the SG and reduced size of the pipe failure, it is judged that LOCA shaking loads for this pipe break event will not result in any significant plate loads. As such, no further consideration is given to the LOCA shaking conditions for this analysis.

The LOCA rarefaction wave initiates at the postulated break location and travels around the tube U-bends. A differential pressure is created across the two legs of the tubes, which causes an in-plane horizontal motion of the U-bend. The integrated response of the tube bundle to the individual tube loads results in significant lateral loads on the tube support plates.

The pressure-time history input to the structural analysis is obtained from a transient thermal-hydraulic analysis using the MULTIFLEX computer code. A break opening time of 1.0 msec to full flow area, simulating an instantaneous double-ended rupture is assumed to obtain conservative hydraulic loads. The fluid-structure interaction effect due to the flexibility of the divider plate between the inlet and outlet plenums of the primary chamber is included in the analysis. Pressure-time histories are calculated for three tube radii, identified as the minimum, average, and maximum radius tubes.

For the rarefaction wave induced loadings, the predominant motion of the U-bends is in the plane of the U-bend. Thus, the antivibration bars do not couple the individual tube motions. Also, only the U-bend region is subjected to high bending stresses. Therefore, the structural analysis is performed using single tube models limited to the U-bend region. For the LOCA case where the tubes are assumed free to rotate inside the TSP, the finite element model extends down to the TSP 6 (the TSP below the top TSP). In performing the dynamic analysis, the mass inertia of the tube is input as effective material density and includes the weight of the tube, weight of the primary fluid inside the tube, and the hydrodynamic mass effects of the secondary fluid.

The results of the dynamic time history analysis show that the three tube geometries develop maximum plate loads at different times in the transient. However, for conservatism, it is assumed that the peak forces occur simultaneously. This results in a conservative load on the TSP. In order to calculate an overall load for the bundle, loads are approximated for the other tube rows by linearly interpolating the loads for the three tubes analyzed. This is judged to be an acceptable approximation due to the conservatism inherent in assuming that the peak loads for all of the tubes occur simultaneously. The same approximation was used in the 1992 analysis.

4.2 Seismic Loads

SSE loads are developed as a result of the motion of the ground during an earthquake. Plant-specific response spectra for DCPP Units 1 and 2 are used to obtain the loads and stresses in the tube bundle internals. A nonlinear time-history analysis is used to account for the effects of radial gaps between the secondary shell and the TSP. SSE is used in a generic sense to represent the seismic event categorized as a faulted event. For DCPP, the limiting faulted seismic event is the double design earthquake (DDE). The DDE stresses in the tubes are greater than the Hosgri-induced stresses, which are from the postulated earthquake event originated from the Hosgri fault discovered 5km from the Diablo Canyon site in 1971. In calculating the affected tubes, plate loads from an analysis of the DDE event are used.

The seismic excitation defined for the SGs is in the form of acceleration response spectra at the SG supports. In order to perform the nonlinear time history analysis, the response spectra are converted into acceleration time history input. Acceleration time-histories for the nonlinear analysis are synthesized from reference motions, using a frequency suppression/raising technique.

The seismic analysis is performed using the ANSYS computer program. The mathematical model consists of three-dimensional lumped mass, beam, and pipe elements as well as general matrix input to provide a plant-specific representation of the SG and reactor coolant piping stiffnesses. Two equivalent beams are used to simulate the straight leg region on both the hot-leg side and cold-leg side of the tube bundle. The U-bend region, however, is modeled as five equivalent tubes of different bend radii, each equivalent tube representing a group of SG tubes. In addition, a single tube representing the outermost tube row is also modeled. The values of the equivalent U-bend radii are determined based on how various groups of tubes contact the anti-vibration bars during the out-of-plane motion of the tube bundle. Continuity between the straight leg and U-bend tubes, as well as between the U-bend tubes themselves, is accomplished through appropriate nodal couplings.

4.3 Combined LOCA plus SSE Loads

In calculating a combined TSP load, the LOCA and SSE loads are combined using the square root of the sum of the squares. For the Model 51 SGs used at DCPP, 6 wedge groups located every 60 degrees around the plate circumference transmit these loadings into the SG shell/wrapper structure and form localized areas of high stress within the TSP (i.e., the wedge regions). The distribution of load among wedge groups is approximated as a cosine function among those groups reacting the load, which corresponds to half the wedge groups. Except for the bottom TSP, the wedge groups for each of the TSPs are located at the same angular location as for the top TSP. Thus, if TSP deformation occurs at the lower plates, the same tubes are affected as for the top TSP. For the top TSP, however, the wedge groups have a 10 inch width, compared to a 6 inch width for the other plates. This larger wedge group width distributes the load over a larger portion of the plate, resulting in less plate and tube deformation for a given load level. For the bottom TSP, the wedge group width is 6 inches, and the wedge groups are rotated 36 degrees relative to the other TSPs. The distribution of load among the various wedge groups for the LOCA load results in a maximum wedge load of 0.634 of the total LOCA plate load. For seismic loads, which can have a random orientation, the maximum wedge load is 0.667 of the total SSE plate load.

4.4 Identification of Potentially Susceptible Tubes

Combining the above inputs for loads, number of deformed tubes as a function of load, and load factors, calculations were performed to determine the number of deformed tubes for each plate and wedge location.

The number and location of the tubes that are predicted to deform under combined LOCA and SSE loads, and thus susceptible to in-leakage, is based on results of plate crush tests for Series 51 SGs. The tests were performed on prototypic TSP samples with tubes present in the tube holes. Although the test samples incorporated nominal clearances (gaps) between the tubes and the plate, the tests are considered applicable to both nominal (unpacked) tube support conditions and packed support conditions for the following reasons. In comparing the in-plane stiffness characteristics of plates with nominal gaps and plates with packed intersections, the plates with packed intersections are found to be 2.5 times as stiff as the plates with nominal gaps. Due to the significantly higher stiffness of the plate with packed intersections, it is judged that the test results are conservative relative to plate deformation (i.e., the hole rather than the tube) for the plate with packed intersections.

An overall summary of the number of potentially affected tubes is provided in Table 1. Based on the plate crush tests, a maximum of 120 tubes (3.5 percent) will deform. However, to conservatively accommodate for uncertainties in the analysis, more tubes at each affected wedge group, for a total of 262 tubes, are assumed to deform and will be excluded from ARC. The conservatism is added since issues like misalignment of holes and other local anomalies could cause a slightly different set of tubes to be deformed than indicated in the plate crush tests. As such, it is not possible to identify exactly the tubes that might be limiting at each wedge group.

Tabular summaries of the 262 tubes that are potentially susceptible to deformation and subsequent in-leakage are summarized in Tables 2 and 3 for DCPP SGs 1-1, 1-3, 2-2, and 2-4 (left-hand units), and in Tables 4 and 5 for DCPP SGs 1-2, 1-4, 2-1, and 2-3 (right-hand units). The left-hand units are defined to be those SGs where the primary fluid flows from the reactor to the steam generator to the pump and back to the reactor vessel in a counter-clockwise direction. Conversely, for the right-hand units, the flow is in the clockwise direction.

The number of tubes in the exclusion zone has been reduced compared to the previously licensed 1992 exclusion zone. For the 1992 analysis, in the absence of DCPP-specific seismic and LOCA TSP forces, plate deformation was conservatively assumed to result in 7.5 percent reactor coolant system flow area reduction. Assuming that all of the wedge areas would be affected equally, this resulted in about 42 tubes at each of 6 wedge locations being affected (252 tubes per SG). This number was then increased to a total of 468 tubes per SG to account for uncertainties in the analysis.

Application of a smaller wedge region exclusion zone will allow more degraded tubes to remain in service under ARC. ARC limits that have been previously approved by the NRC, including margins against burst and leakage following a steam line break, will be applied to tubes outside the exclusion zone.

4.5 Enhanced Inspection Practices

Enhanced eddy current inspection requirements have been established at DCPP Units 1 and 2 at wedge region exclusion zones to reduce the potential for leaving through-wall indications in service that could potentially cause secondary to primary in-leakage following a LOCA plus SSE loads event. Tubes in the wedge region exclusion zone are inspected by bobbin coil every outage. If the bobbin coil detects degradation at a wedge region exclusion zone tube, then the tube intersection is inspected by a rotating pancake coil (RPC). If a RPC inspection confirms a crack-like indication at the wedge region exclusion zone, then the tube will be excluded from ARC and repaired. Because in-service tube intersections in wedge region exclusion zones do not have detectable cracking, they will not be susceptible to in-leakage if deformed following a LOCA plus seismic event.

4.6 Conclusion

The potential for combined LOCA and SSE loads to cause tube deformation and possible in-leakage has been analyzed using a conservative method. SG tubes in wedge region exclusion zones that are found to contain crack-like indications via enhanced eddy current inspections will be repaired. Thus, the proposal change to revise the wedge region exclusion zone for application of ODSCC ARC and PWSCC ARC will not adversely affect the health and safety of the public.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

Pacific Gas and Electric Company (PG&E) has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

   Response: No.

   Application of a smaller steam generator (SG) wedge region exclusion zone will allow more degraded tubes to remain in service under alternate repair criteria (ARC). Previously approved ARC limits will be applied to tubes outside the exclusion zone, and therefore the probability and consequences of tube burst or leakage is not significantly increased following a steam line break (SLB).

   Exclusion zones tubes are inspected by bobbin coil every outage and by rotating pancake coil (RPC) if the bobbin coil detects degradation. SG tubes containing RPC-confirmed crack-like degradation at wedge region exclusion zone intersections will be repaired. Because in-service tube intersections in wedge region exclusion zones do not have detectable cracking, they will not be susceptible to in-leakage if deformed following a loss-of-coolant-accident (LOCA) plus seismic event. Therefore, the consequences of a LOCA plus seismic event are not increased.

Thus, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

   Response: No.

   Implementation of revised SG ARC wedge region exclusion zones will allow more degraded tubes to remain in service under ARC. Implementation of ARC has been previously approved and does not introduce any significant change to the plant design basis. A single or multiple tube rupture event would not be expected in a SG in which ARC has been applied.

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

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

   Response: No.

   Revised wedge region exclusion zones are based on a DCPP-specific analysis for the combined effects of a LOCA and safe shutdown earthquake (SSE) loads. The number of wedge region tubes that are predicted to deform has been decreased when compared to the prior analysis, which used highly conservative assumptions. The revised analysis incorporates DCPP-specific LOCA and seismic loads that were not available when the prior analysis was performed. The revised analysis also yields conservative results, such that the number of tubes in the exclusion zone (262 per SG) bound the number of tubes predicted to deform (120 per SG). Tubes located in the revised wedge region exclusion zone will continue to be subject to enhanced eddy current inspection requirements and will be excluded from application of ARC. Thus, existing tube integrity requirements continue to be met for these tubes and there is no change to the dose contribution from tube leakage. Offsite and control room doses will continue to meet the appropriate guidelines and regulations established in Standard Review Plan 15.1.5 and 6.4, 10 CFR 100, and 10 CFR 50, Appendix A General Design Criterion (GDC) 19.

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

Based on the above evaluation, PG&E concludes that the proposed change presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

NRC Generic Letter (GL) 95-05 provides guidance to implement alternate tube repair criteria applicable to ODSCC at the tube to TSP intersections in the Westinghouse-designed SGs. PG&E responses to each recommendation in this GL were documented in Attachment D of PG&E Letter DCL-97-034. It was stated that PG&E would not apply the repair criteria to tube-to-TSP intersections where the tubes with degradation may potentially collapse or deform as a result of the combined postulated LOCA plus SSE loads. The GL allows analysis to be performed to identify which intersections are to be excluded. Therefore, the revised analysis performed by Westinghouse is consistent with the guideline provided in this GL. This revised analysis allows fewer number of tubes to be plugged but ensures that tubes acceptable for continued service will retain adequate structural and leakage integrity during normal operating, transient and postulated accident conditions, consistent with GDC 19 of 10 CFR 50, Appendix A and 10 CFR 100.

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.

6.0 ENVIRONMENTAL CONSIDERATION

PG&E has evaluated the proposed amendment and has determined that the proposed amendment does 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 amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 REFERENCES

1. PG&E Letter DCL-99-165, "License Amendment Request 99-02 Exclusion Zones for Alternate Repair Criteria," dated December 23, 1999

2. PG&E Letter DCL-01-046, "Withdrawal of License Amendment Request 99-02, Exclusion Zones for Alternate Repair Criteria (TAC Nos. A7861/A7862)" dated April 27, 2001

3. NRC Letter for Amendment Nos. 124 and 122 for Diablo Canyon Power Plant Units 1 and 2 respectively, "Issuance of Amendments for Diablo Canyon Nuclear Power Plant, Unit No. 1 (TAC No. M97254) and Unit No. 2 9TAC No. M97255)," dated March 12, 1998

4. NRC Letter for Amendment Nos. 152 and 152 for Diablo Canyon Power Plant Units 1 and 2 respectively, "Issuance of Amendments for Diablo Canyon Nuclear Power Plant, Unit No. 1 (TAC No. MB3392) and Unit No, 2 (TAC No. MB3393)," dated May 1, 2002

5. PG&E Letter DCL-97-034, "License Amendment Request 97-03, Voltage-Based Alternate Steam Generator Tube Repair Limit for Outside Diameter Stress Corrosion Cracking at the Tube Support Plate Intersections," dated February 26, 1997

Table 1
Number of SG Tubes Potentially Susceptible to Collapse and In-leakage Excluded from ARC
Diablo Canyon Units 1 and 2

Number of Deformed Tubes per Wedge Group (Based on Crush Test) and per Bundle						Number of Tubes Excluded from ARC[2]	
TSP	12 deg (168 deg)[1]	72 deg (108 deg)[1]	132 deg[3] (48 deg)[1]	Hot leg Total	Full Bundle Total	Hot Leg Total	Full Bundle Total
1	49	0	0	49	98	71	142
2	0	0	9	9	18	60	120
3	0	0	7	7	14	60	120
4	0	0	11	11	22	60	120
5	0	0	8	8	16	60	120
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
Total tubes	49	0	11	60	120	131	262

1. The wedge group numbers in parentheses are for TSP 1.
2. The number of tubes excluded from ARC is greater than the number of deformed tubes in crush tests due to application of uncertainties.
3. Tubes in wedge group 132 deg are common to TSP 2 through TSP 5.

Table 2

DCPP SG Tube Intersections Potentially Susceptible to Collapse and In-leakage Excluded from ARC
Tube Support Plate 1, Left-Hand SGs
DCPP Unit 1 SGs 1-1, 1-3
DCPP Unit 2 SGs 2-2, 2-4

Hot Leg			Cold Leg		
Wedge Location	Row	Column	Wedge Location	Row	Column
48 degrees	No tubes affected		228 degrees	No tubes affected	
108 degrees	No tubes affected		288 degrees	No tubes affected	
168 degrees	4	88-91	348 degrees	4	4-7
	5	86-94		5	1-9
	6	86-94		6	1-9
	7	86-94		7	1-9
	8	86-93		8	2-9
	9	86-93		9	2-9
	10	86-93		10	2-9
	11	86-93		11	2-9
	12	86-93		12	2-9

Table 3

DCPP SG Tube Intersections Potentially Susceptible to Collapse and In-leakage
Excluded from ARC
Tube Support Plates 2 through 5, Left-Hand SGs
DCPP Unit 1 SGs 1-1, 1-3
DCPP Unit 2 SGs 2-2, 2-4

Hot Leg			Cold Leg		
Wedge Location	Row	Column	Wedge Location	Row	Column
12 degrees	No tubes affected		192 degrees	No tubes affected	
72 degrees	No tubes affected		252 degrees	No tubes affected	
132 degrees	28	74-78	312 degrees	28	17-21
	29	73-80		29	15-22
	30	72-80		30	15-23
	31	72-81		31	14-23
	32	72-79		32	16-23
	33	73-79		33	16-22
	34	73-79		34	16-22
	35	75-78		35	17-20
	36	76-77		36	18-19

Table 4

DCPP SG Tube Intersections Potentially Susceptible to Collapse and In-leakage
Excluded from ARC
Tube Support Plate 1, Right-Hand SGs
DCPP Unit 1 SGs 1-2, 1-4
DCPP Unit 2 SGs 2-1, 2-3

Hot Leg			Cold Leg		
Wedge Location	Row	Column	Wedge Location	Row	Column
48 degrees	No tubes affected		228 degrees	No tubes affected	
108 degrees	No tubes affected		288 degrees	No tubes affected	
168 degrees	4	4-7	348 degrees	4	88-91
	5	1-9		5	86-94
	6	1-9		6	86-94
	7	1-9		7	86-94
	8	2-9		8	86-93
	9	2-9		9	86-93
	10	2-9		10	86-93
	11	2-9		11	86-93
	12	2-9		12	86-93

Table 5

DCPP SG Tube Intersections Potentially Susceptible to Collapse and In-leakage Excluded from ARC
Tube Support Plates 2 through 5, Right-Hand SGs
DCPP Unit 1 SGs 1-2, 1-4
DCPP Unit 2 SGs 2-1, 2-3

Hot Leg			Cold Leg		
Wedge Location	Row	Column	Wedge Location	Row	Column
12 degrees	No tubes affected		192 degrees	No tubes affected	
72 degrees	No tubes affected		252 degrees	No tubes affected	
132 degrees	28	17-21	312 degrees	28	74-78
	29	15-22		29	73-80
	30	15-23		30	72-80
	31	14-23		31	72-81
	32	16-23		32	72-79
	33	16-22		33	73-79
	34	16-22		34	73-79
	35	17-20		35	75-78
	36	18-19		36	76-77

Proposed Technical Specification Changes (Mark-up)

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",~~ PG&E letter DCL-03-174, dated December 19, 2003, 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)

Proposed Technical Specification Changes (retyped)

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

(iv) Certain intersections as identified in PG&E letter DCL-03-174, dated December 19, 2003, 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)