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SUBJECT: Submits response to 970310 RAI re review & approval of implementation of SG tube alternate plugging criteria for axial indications in W explosive tube expansion region that exceed current TS depth-based plugging limit.

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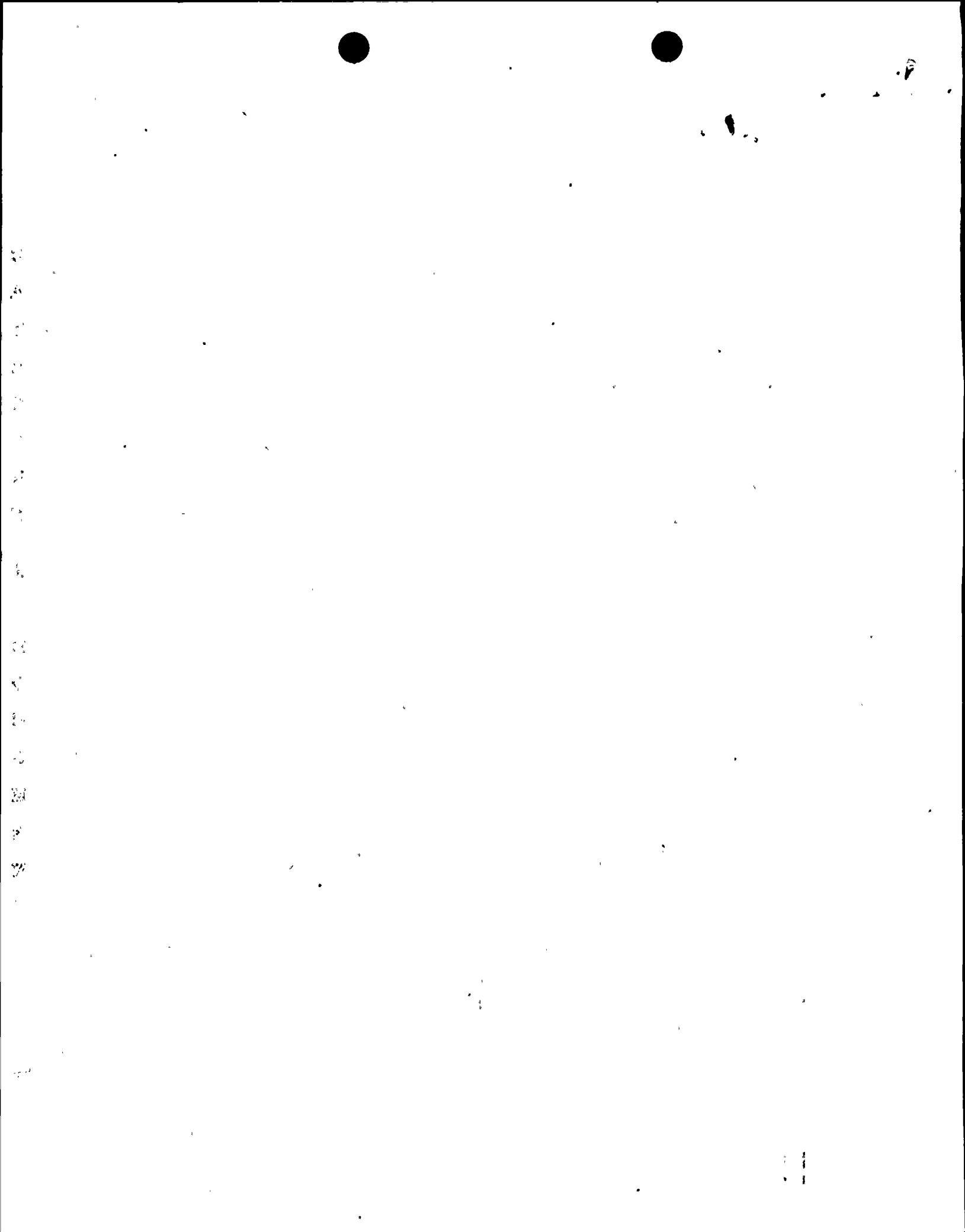
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March 13, 1998



PG&E Letter DCL-98-039

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

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Response To Request For Additional Information
License Amendment Request 97-04

Dear Commissioners and Staff:

On March 10, 1997, PG&E submitted License Amendment Request (LAR) 97-04 to the NRC in PG&E Letter DCL-97-038. The LAR requested NRC review and approval of implementation of steam generator tube alternate plugging criteria for axial indications in the Westinghouse explosive tube expansion region that exceed the current Technical Specification depth-based plugging limit.

In a letter to PG&E dated January 6, 1998, the NRC staff identified additional information required for them to complete their review of the LAR. PG&E's response to the request for additional information is enclosed. The additional information does not affect the results of the safety evaluation performed for LAR 97-04.

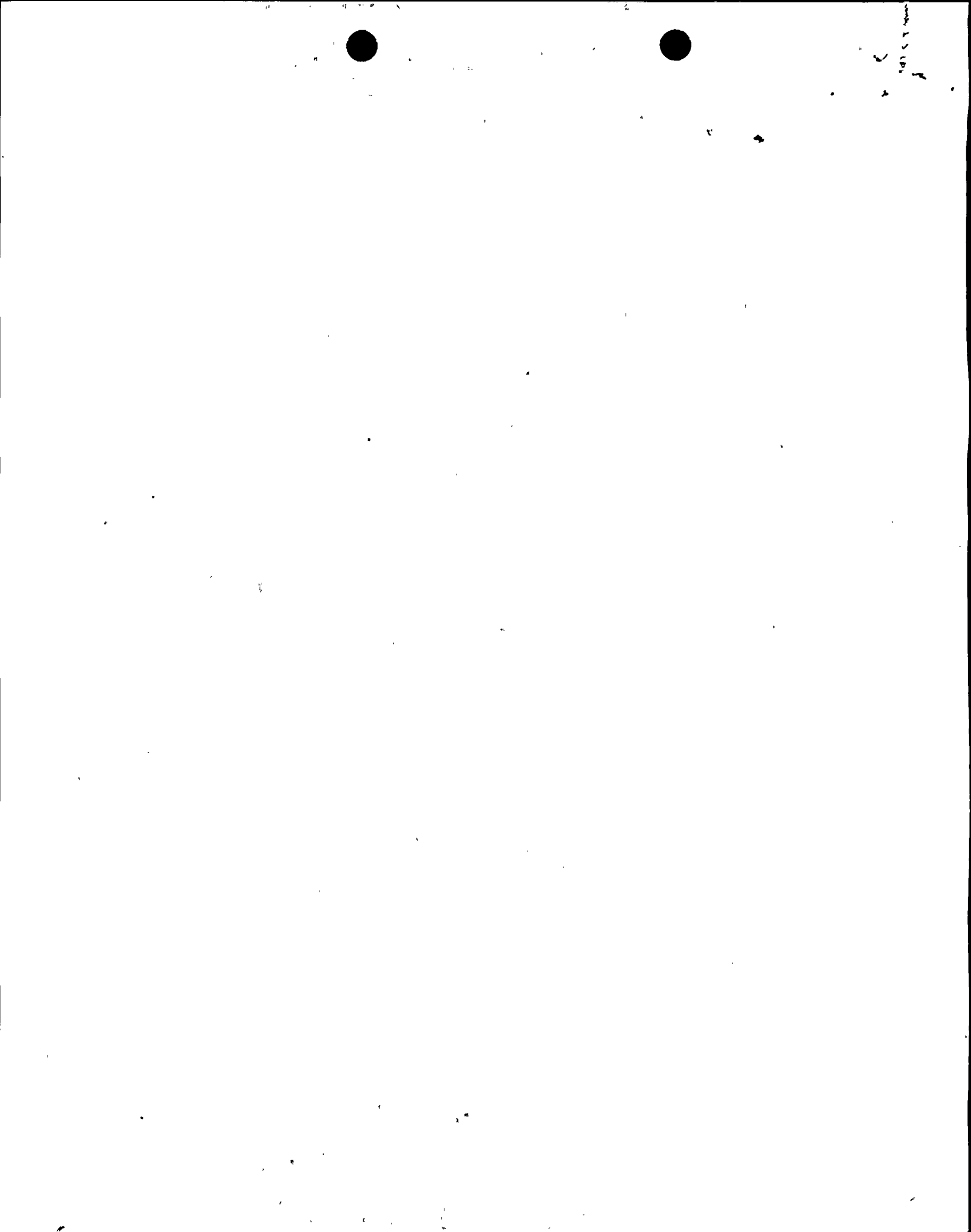
Sincerely,

Gregory M. Rueger

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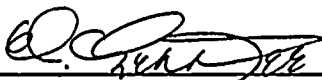


U.S. Nuclear Regulatory Commission
March 13, 1998
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PG&E Letter DCL-98-039

Subscribed and sworn to before me
this 13th day of March 1998
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State of California

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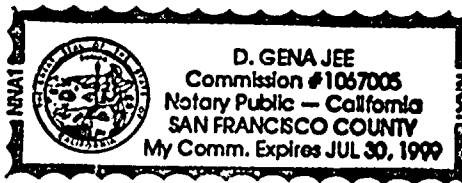


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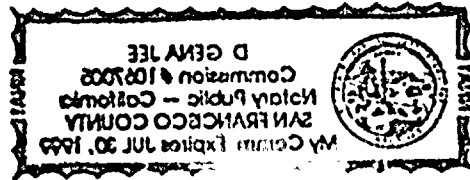
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Enclosure

RLJ/2057



**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
LICENSE AMENDMENT REQUEST 97-04**

In a letter dated January 6, 1998, the NRC requested additional information relative to PG&E's License Amendment Request 97-04, "Steam Generator Tube Alternate Repair Criteria for Indications in the Westinghouse Explosive Tube Expansion (WEXTEx) Region," dated March 10, 1997 (PG&E Letter DCL-97-038). The NRC question and PG&E's response follow:

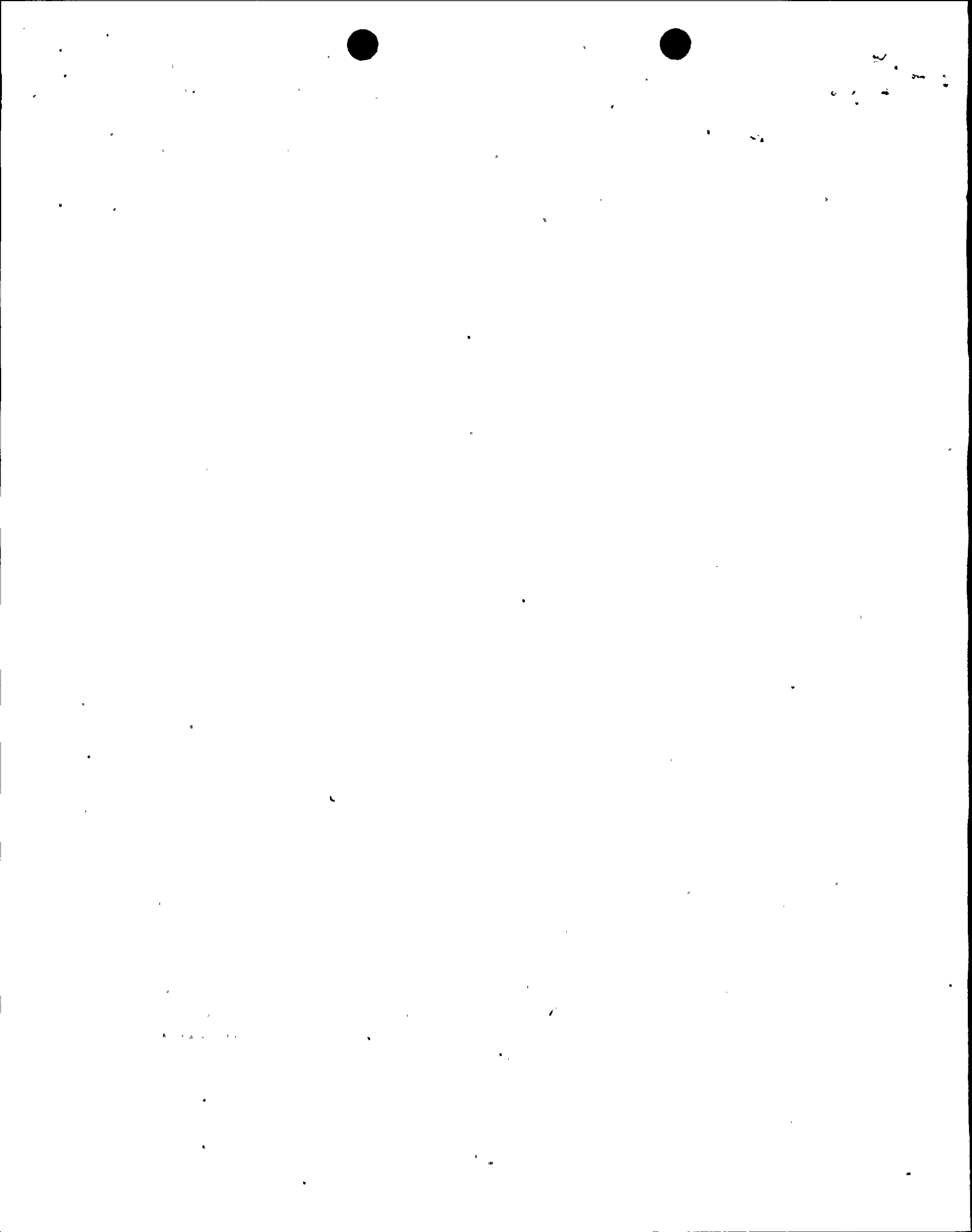
NRC Question

The structural and leak analyses documented in WCAP-14797, Revision 1, "Generic W Tube Plugging Criteria for 51 Series Steam Generator Tubesheet Region WEXTEx Expansions," rely on the ability to accurately calculate the radial contact pressure between the outside diameter of the tube and the tubesheet. The expression for determining this contact pressure is given in equation 4.4-7. The basis for the formulation of this equation utilized thick shell equations included in Reference 9.11 of WCAP-14797. The staff notes that the equations presented in the noted reference and used in the derivation of the radial contact pressure expression appear to assume there is no longitudinal loading on the tube. Such a condition could be established by locking between the tube and the tube support plates. However, this assumption is not stated in the report. Discuss whether the derivation of the expression for the radial contact pressures between the tube and tubesheet assumes locked tube conditions. If locked tube conditions are assumed in the report, explain how such a condition is validated for inservice steam generator tubes proposed to be repaired by a W* approach. If the tubes are not assumed to be in a locked state, explain how the interaction between the longitudinal tube stresses and the radial contact pressure is accounted for in the expression included in WCAP-14797. If this interaction is not accounted for in equation 4.4-7, discuss how this effect is addressed in each of the calculations that utilized the radial contact pressure expressions.*

PG&E Response

1. *"Discuss whether the derivation of the expression for the radial contact pressures between the tube and tubesheet assumes locked tube conditions."*

WCAP-14797 does not assume locked tube conditions for derivation of the expression for the radial contact pressures between the tube and tubesheet. WCAP-14797 develops W* as a tube-to-tubesheet engagement length of nondestructively examined, undegraded tube material, below which location degradation of any extent would not be cause for removing the tube from service. The basis for the criterion value for a single tube is premised on the fact that the radial interface load between the tube and tubesheet over the W* length is



sufficient to resist all postulated axial loads on the tube with margins equal to or greater than those specified in Regulatory Guide 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes." Therefore, not taking credit for any additional resistance to tube pullout due to the tube being locked at the tube support plates is conservative with respect to determining the W^* value.

2. Since the tubes are not assumed to be in a locked state, "*... explain how the interaction between the longitudinal tube stresses and the radial contact pressure is accounted for in the expression included in WCAP-14797. If this interaction is not accounted for in equation 4.4-7, discuss how this effect is addressed in each of the calculations that utilized the radial contact pressure expressions.*"

W^* criteria have been developed to provide a margin of safety of three relative to the loads corresponding to normal operating conditions regardless of whether the tube is locked. Tube locking occurs because of packing and/or denting of the tube-to-tube support plate (TSP) crevice at normal operating pressure and temperature (NOP/NOT), i.e., when the tube is strained in the axial direction by the primary-to-secondary end cap load. Cooling down the plant results in a residual force remaining in the tube. When the plant is returned to NOP/NOT, the residual axial loads are restored to the same level that was present at the time locking occurred. Since the TSP is returned to the elevation it occupied at the time of locking, it imparts no load on the tube. Therefore, tube axial loading while the plant is operating is not dependent on tube support plate locking.

Another potential effect of TSP locking on tube loading is the Poisson contraction of the tube in the hoop direction. However, because the end cap pressure load is always present during plant operation at NOP/NOT, this effect is independent of TSP locking. The value used for the coefficient of friction was determined through conservative tensile test results. The coefficient of friction equations do not take credit for any resistive axial loading from the TSP; therefore, the calculated values for the tests are conservative in comparison to actual, expected values.

Moreover, the configuration of tensile tests also results in a Poisson contraction of the tube over the full range of test load without the offsetting internal pressure that is present during operation. Therefore, the Poisson contraction, and thus the loosening of the contact, associated with the tensile tests is at least three times that of the normal operating condition while still demonstrating that a factor of safety of three is met for the axial pull-out load.

In conclusion, WCAP-14797 does not take credit for locked TSP conditions. Therefore, W^* lengths as calculated per WCAP-14797 are conservative since the additive resistance to tube pullout from a partial or total locked tube condition is not included in W^* calculations.



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