Pacific Gas and Electric Company®

James R. Becker
Site Vice President and
Station Director

Diablo Canyon Power Plant
Mail Code 104/5/502
P. O. Box 56
Avila Beach, CA 93424

805.545.3462
Internal: 691.3462
Fax: 805.545.4234

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PG&E Letter DCL-08-081

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
Response to NRC Request for Additional Information Regarding License Amendment Request 08-02, "Revision to Technical Specifications 3.7.5, 'Auxiliary Feedwater System,' and 3.7.6, 'Condensate Storage Tank and Fire Water Storage Tank'"

References:
1. PG&E Letter DCL-08-023, "License Amendment Request 08-02, Revision to Technical Specifications 3.7.5, 'Auxiliary Feedwater System,' and 3.7.6, 'Condensate Storage Tank and Fire Water Storage Tank,'" dated April 3, 2008

2. PG&E Letter DCL-08-051, "Supplement to License Amendment Request 08-02, 'Revision to Technical Specifications 3.7.5, 'Auxiliary Feedwater System,' and 3.7.6, 'Condensate Storage Tank and Fire Water Storage Tank,'" dated June 20, 2008

Dear Commissioners and Staff:

In Reference 1, Pacific Gas and Electric Company (PG&E) submitted License Amendment Request (LAR) 08-02, which proposes to revise Technical Specification (TS) 3.7.5, "Auxiliary Feedwater System," to remove Surveillance Requirement 3.7.5.6, and revise TS 3.7.6, "Condensate Storage Tank (CST) and Fire Water Storage Tank (FWST)," to remove the FWST level requirements, revise the CST level requirements, and revise TS 3.7.6 to be consistent with the NUREG-1431 Standard TSs. In Reference 2, PG&E submitted a supplement to LAR 08-02.

On July 24, 2008, the NRC staff requested additional information required to complete the review of LAR 08-02. PG&E's responses to the staff's questions are provided in the Enclosure.

This information does not affect the results of the technical evaluation or the no significant hazards consideration determination previously transmitted in Reference 1.

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NRR

PG&E makes no regulatory commitments (as defined by NEI 99-04) in this letter. This letter includes no revisions to existing regulatory commitments.

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

I state under penalty of perjury that the foregoing is true and correct.

Executed on October 1, 2008.

Sincerely,

James R. Becker
Site Vice President and Station Director

kjse/4328 A0740164
Enclosure
cc: Gary W. Butner, California Department of Public Health
Elmo E. Collins, NRC Region IV
Michael S. Peck, NRC, Senior Resident Inspector
Diablo Distribution
cc/enc: Alan B. Wang, NRC Project Manager

Pacific Gas and Electric Company (PG&E) Response to NRC Request for Additional Information Regarding License Amendment Request (LAR) 08-02, "Revision to Technical Specifications 3.7.5, 'Auxiliary Feedwater System,' and 3.7.6, 'Condensate Storage Tank and Fire Water Storage Tank'"

NRC Question 1:

The proposed TS changes are based on modifying the Condensate Storage Tank (CST) to ensure an adequate supply of safety related water is available to the AFW [auxiliary feedwater] system for the limiting condition of operation. The modification consists in the installation of metal plenums at tank mid-height elevation that will increase the volume of safety grade water. Based on the submitted information, the total weight of the plenums is approximately 1350 lb. The center of gravity of these plenums is located approximately 23 feet above the bottom of the CST. The seismic requalification of the CST with the plenums was done under 10 CFR 50.59.

Provide a description of the seismic analysis of the CST with the attached plenums.

PG&E Response:

Seismic Qualification of the CST

- Baseline Seismic Qualification of the CST

  Prior to the addition of the plenums (baseline condition), the seismic qualification of the CST was based on similarity to the refueling water storage tank (RWST). Since the structural configuration of the CST is very similar to that of the RWST (i.e., the tanks have the same inside diameter; the height of the CST, and its design liquid depth, are 5.25 feet less than the height and liquid depth of the RWST), separate evaluations of the CST were not performed. Details are provided in Diablo Canyon Power Plant Design Criteria Memorandum (DCM) No. T-6, "Seismic Analysis of Structures," Appendix E, "Outdoor Water Storage Tanks" (Reference 1), and URS/John A. Blume & Associates, Engineers Report "Diablo Canyon Nuclear Power Plant Units 1 & 2 - Outdoor Water Storage Tanks Dynamic Seismic Analyses for the 7.5M Hosgri Criteria (Revised)" (Reference 2).

- RWST Seismic Analysis

  The seismic analysis of the RWST for the Hosgri Earthquake includes both dynamic and static evaluations, using two different analytical models (Reference 2):

  - Axisymmetric Model: A planar model, representing a vertical slice through the RWST, was constructed with axisymmetric shell-type finite elements. Since the tank is supported on concrete fill over bedrock, the model uses fixed-base boundary conditions. This model was evaluated for gravity load, hydrostatic

pressure, hydrodynamic pressure (impulsive and convective), and seismic inertial loads. The seismic analysis was performed based on the response spectrum method, using the free-field ground response spectra as input.

- Nonaxisymmetric Model: Since the axisymmetric model does not account for the asymmetry associated with vault opening in the tank's concrete encasement, a three-dimensional model, representing one-half of the tank, was constructed with quadrilateral shell elements. Note that because the tank is symmetrical about the centerline of the vault opening, it was not necessary to model the entire tank. The purpose of this model is to obtain a clearer understanding of the stress distribution in the steel liner and concrete shell in and around the vault opening.

  This model was evaluated for gravity load, hydrostatic pressure, hydrodynamic pressure (impulsive only, since the axisymmetric analysis demonstrated that the effects of convective pressures were small), and seismic inertial loads. The seismic analysis was performed based on the equivalent method, using acceleration values extracted from the axisymmetric analysis.

The seismic analyses of the RWST for the design earthquake (DE) and double design earthquake (DDE) are based on scaling of the results associated with the Hosgri earthquake analyses described above (Reference 1).

- Evaluation of CST for Addition of Plenums

  The impact on the baseline seismic analyses, due to the addition of the plenums inside the CST, is assessed in PG&E Calculation No. 52.21.1, "Class I Outdoor Water Storage Tanks - Refueling Water Storage Tanks, Firewater and Transfer Tank, and Condensate Storage Tank: Seismic Verification for Hosgri, DDE and DE Events" (Reference 3). This calculation superimposes the loads associated with the plenums on the results of the previous seismic analyses using the equivalent static method.

NRC Question 2:

State whether the tank wall was checked for local and "elephant foot" buckling, or if not, provide justification for not checking.

PG&E Response:

Local buckling and elephant foot buckling of the tank's walls was addressed as follows:

- Elephant Foot Buckling: This phenomenon is not applicable to the CST, due to its physical configuration. The CST is a cylindrical steel shell (0.25-inches to 0.60-inches thick), with a domed roof, encased in a reinforced concrete shroud

(12-inches to 24-inches thick) on its entire exterior surface, except for a small area within the piping vault (discussed below) where there is no concrete shroud. Steel studs are welded to the exterior surface of the steel shell and embedded in the concrete, assuring composite action of the two materials. Elephant foot buckling has only been observed in plain steel tanks.

- Local Buckling: This phenomenon could occur in the tank wall at the piping vault, an area where there is an opening through the concrete shroud (approximately 150 square feet). A network of stiffeners is provided on the exterior surface of the shell within the piping vault to increase the buckling capacity. The portion of the shell within the piping vault was evaluated for local buckling and found to be acceptable (see compression stress intensity in PG&E Response to NRC Question 4 in this Enclosure).

NRC Question 3:

State that the local stresses induced in the tank wall at the location of the attachment of the plenums meet the design allowable loads or stresses of the licensing basis construction code under the applicable loads and loading combinations.

PG&E Response:

Local stresses induced in the tank wall at the location of the attachment of the plenums were not explicitly calculated by PG&E. However, the evaluation determined that the critical stresses are associated with the welds which connect the plenum reinforcement plate to the tank wall. Details of this evaluation are as follows:

- Licensing Basis Code: The code applicable to the CST steel tank wall is American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section VIII, Division 2, 1974 Edition.

- Attachment Details: The plenum is attached with threaded studs inserted in tapped holes in a 1/2-inch by 3-inch reinforcement plate, which is welded to the tank wall (a 3/16-inch fillet weld to the 1/4-inch thick wall) per Design Change Notice (DCN) No. DC2-SC-50829 (Reference 4)[1].

- PG&E Calculations: The attachment of the plenum is evaluated in PG&E Calculation No. 52.21.14, "Class I Outdoor Water Storage Tanks, Makeup Water System, CST 1-1 and CST 2-1 - Qualification of Internal Plenums"

[1] DCN No. DC2-SC-50829 was submitted to the staff in Enclosure 3 of PG&E Letter DCL-08-051, "Supplement to License Amendment Request 08-02, 'Revision to Technical Specifications 3.7.5, 'Auxiliary Feedwater System,' and 3.7.6, 'Condensate Storage Tank and Fire Water Storage Tank,'" dated June 20, 2008 (Reference 6).

(Reference 5)[2]. Local shear stresses at the weld between the reinforcement plate and the liner are evaluated:

- Maximum Load on Weld (Demand): 0.192 kilo pounds (kips) (Reference 5, Sheet 12, worst case load combination).
- Allowable Load for Weld (Capacity): 1.43 kips (Reference 5, Sheet 13), based on an allowable shear stress of 10.8 kips per square inch (ksi) (Reference 5, Sheet 7).
- Safety Factor: The minimum safety factor (ratio of capacity to demand) is greater than 7.

Therefore, there is a significant margin between the demand and the capacity for the critical weld at the attachment between the plenum and the tank wall. Since the thickness of the tank wall is greater than the weld size, stresses in the wall are acceptable by comparison.

NRC Question 4:

Provide the minimum calculated stress ratio in the CST resulting from the addition of the plenums.

PG&E Response:

Stress ratios in the CST resulting from the addition of the plenums were not explicitly calculated by PG&E. However, adequacy of the CST for the addition of the plenums was evaluated in Reference 3. A summary of the evaluation is as follows:

- Since the qualification of the CST is based on similarity to the RWST (see PG&E Response to NRC Question 1 in this Enclosure), it was not possible to calculate stress ratios for the CST, either with or without the addition of the plenums. However, an assessment is conservatively made using the result for the RWST. Critical stress ratios for the RWST are as follows (Reference 2):
  - Axisymmetric Analysis, Steel Elements
    - Stress Intensity: (18.36 ksi / 40.6 ksi) = 0.45
  - Non-Axisymmetric Analysis, Steel Elements
    - Compressive Stress (buckling): (12.57 ksi / 21.95 ksi) = 0.57
    - Tensile Stress: (23.99 ksi / 25.0 ksi) = 0.96
- The impact of the addition of the plenums on the qualification of the CST is addressed in the calculation contained in PG&E Calculation No. 52.21.1

[2] PG&E Calculation No. 52.21.14 was submitted to the staff in Enclosure 3 of Reference 6.

(Reference 3). The Reference 3 calculation performs an assessment based on the following key parameters associated with the critical location of the tank shell (elevation 115.5 feet - the junction between the wall and bottom plate):

- Base Shear:
  - Increase in shear at the CST base: 3,500 lb
  - Baseline shear at RWST base: 7,163,000 lb
  - Ratio (increase vs. baseline): 0.05 percent
- Overturning Moment:
  - Increase in overturning moment at the CST base: 107,000 ft-lb
  - Baseline overturning moment at RWST base: 214,282,000 ft-lb
  - Ratio (increase vs. baseline): 0.05 percent

Therefore, the impact of the addition of the plenum on the demand levels at the critical location of the tank is insignificant. Since the stresses in the tank are proportional to the base shear and overturning moment, the impact of the plenums on the stress ratios summarized above for the RWST is also insignificant.

References

1. DCM No. T-6, "Seismic Analysis of Structures," Appendix E, "Outdoor Water Storage Tanks," Revision 9, dated November 1999.

2. URS/John A. Blume & Associates, Engineers Report, "Diablo Canyon Nuclear Power Plant Units 1 & 2 - Outdoor Water Storage Tanks Dynamic Seismic Analyses for the 7.5M Hosgri Criteria (Revised)," dated March 1979.

3. PG&E Calculation No. 52.21.1, "Class I Outdoor Water Storage Tanks - Refueling Water Storage Tanks, Firewater and Transfer Tank, and Condensate Storage Tank: Seismic Verification for Hosgri, DDE and DE Events," Revision 4, dated February 2007.

4. DCN No. DC2-SC-50829, Revision 0, dated February 2007.

5. PG&E Calculation No. 52.21.14, "Class I Outdoor Water Storage Tanks, Makeup Water System, CST 1-1 and CST 2-1 - Qualification of Internal Plenums," Revision 0, dated November 2006.

6. PG&E Letter DCL-08-051, "Supplement to License Amendment Request 08-02, 'Revision to Technical Specifications 3.7.5, 'Auxiliary Feedwater System,' and 3.7.6, 'Condensate Storage Tank and Fire Water Storage Tank,'" dated June 20, 2008.