Omaha Public Power District
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402/636-2000

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LIC-93-0297

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

References:
1. Docket No. 50-285
2. IE Bulletin No. 88-11, "Pressurizer Surge Line Thermal Stratification," dated December 20, 1988
3. Combustion Engineering Owners Group Report (CEOG) CEN-387-P, Rev. 1, "Pressurizer Surge Line Thermal Stratification Evaluation," December 1991
4. Letter from NRC (S. D. Bloom) to OPPD (T. L. Patterson) dated June 22, 1993
5. Letter from OPPD (W. G. Gates) to NRC (Document Control Desk) dated September 23, 1993

Gentlemen:

SUBJECT: Response to Safety Evaluation for Combustion Engineering Owners Group (CEOG) Report CEN-387-P, Revision 1, "Pressurizer Surge Line Thermal Stratification Evaluation" (TAC No. M72134)

The purpose of this letter is to document completion of the requests contained in Reference 4 for the Fort Calhoun Station (FCS). Reference 4 transmitted the NRC Safety Evaluation for Combustion Engineering Owners Group Report CEN-387-P, Revision 1, "Pressurizer Surge Line Thermal Stratification Evaluation" (IE Bulletin 88-11, TAC No. M72134). Reference 4 specifically requested, in part, that Omaha Public Power District (OPPD) verify the applicability of the CEOG bounding analysis in CEN-387-P, Revision 1, to FCS. This request corresponds with Action Item 1.b of Reference 2 (IE Bulletin 88-11).

OPPD participated in CEOG Task 662 wherein ABB-Combustion Engineering (ABB-CE) performed a bounding analysis which demonstrated that all participating utility pressurizer surge lines are qualified for thermal stratification/striping loads in combination with other design loads. A bounding fatigue usage factor of 0.937 was calculated for a 40-year design life (Reference 3, p. 4-3). We have confirmed that the conditions and conclusions of the bounding analysis apply to the FCS pressurizer surge line.

Action Item 1.c of Reference 2 requested that if the analysis of Action Item 1.b does not show compliance, OPPD should obtain data on thermal stratification and demonstrate the similarity of surge line design and operation between plants.

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Although the analysis of I.b demonstrated compliance, OPPD had previously obtained plant specific data on stratification temperatures and displacements by installing thermocouples and linear potentiometers at several key locations on the surge line. Data were collected for start-up and shut-down cycles and made available to the CEOG (Reference 3, Appendix A). In addition, stratification temperature data were collected by the CEOG from a number of other utilities. ABB-CE created an envelope of conditions from this data for use in the bounding analysis performed for Item 1.b. In addition, the modes and number of cycles of occurrence associated with significant stratification were derived by ABB-CE from these data and the original design specifications of the participating plants as documented in Reference 3.

In addition to verifying the applicability of the CEOG bounding analysis to FCS, Reference 4 requested that OPPD update stress and fatigue analyses to ensure compliance with applicable Code requirements. This request corresponds with Action Item 1.d of IE Bulletin 88-11.

The SER (Reference 4) concluded that the results of the CEOG analysis may be used as the basis for CEOG licensees to update their plant-specific code stress reports to demonstrate compliance with applicable Code requirements as requested in IE Bulletin 88-11.

OPPD has performed a detailed stress and fatigue analysis of the FCS pressurizer surge line. The maximum differential temperatures for stratification were based on plant-specific operating/design conditions in lieu of the more conservative bounding values developed for the CEOG. The stratification modes and associated number of cycles defined by ABB-CE were conservatively used. The analysis was performed in a manner consistent with the bounding analysis (Reference 3) performed for the CEOG and reviewed by the NRC (Reference 4). The plant-specific analysis demonstrates compliance with appropriate piping codes (based, per IE Bulletin 88-11, on 1986 ASME Section III Code criteria for high cycle fatigue). A plant specific fatigue usage factor of 0.71 was calculated for a 40-year plant life. Pipe restraints were re-evaluated against the loads derived from the plant specific analysis. One pipe restraint was modified during the 1992 refueling outage to accommodate stratification loads within the normal design criteria for the restraint. The restraint was, however, concluded to be operable in its pre-modified configuration (which was substantiated by calculations and a visual inspection which found no evidence of component damage). Ancillary small diameter branch connections were accounted for in the analysis. A visual inspection of the small diameter sample line was performed which confirmed that adequate flexibility exists to accommodate the relative thermal movements of the surge line expected from stratification and normal expansion.

OPPD participated in CEOG Task 695 to have ABB-CE prepare revised design specifications for the pressurizer, reactor coolant system (RCS) hot leg, and the pressurizer surge line to include thermal stratification in the design loads for these components. The revised specifications have been received.

In addition, OPPD participated in CEOG Task 697 to have ABB-CE prepare revisions to the pressurizer and RCS hot leg nozzle stress reports to include thermal stratification loads. These revised stress reports have been received and document that the nozzles are qualified for the 40-year life of the plant.

Routine ASME Section XI inservice inspections have been performed on various welds in the pressurizer surge line. In addition, 100% of the elbow body attached to the surge line nozzle on the pressurizer was examined with liquid penetrant testing and ultrasonic methods on April 18, 1990. Also, the entire body of the third elbow from the pressurizer and part of the fourth elbow body were similarly examined at the same time. No cracks or anomalies were found. The dates and type of inspections performed are documented in Table 4-2, p. 4-13 of Reference 3. The most recent stress analysis results demonstrate that the elbow at the reactor coolant hot leg has the highest fatigue usage factor (0.71). Future inspections of surge line components to ASME Section XI, 1989, Appendix VIII criteria are planned over the current third 10 year inspection interval. Volumetric examination of the elbows connected to the RCS hot leg and pressurizer nozzles will be performed during this interval.

Finally, OPPD completed Action Item 1.d of IE Bulletin 88-11 by conducting a visual walkdown of the pressurizer surge line and its supports. No obvious distortions, damage, or anomalies were observed. The date and results of this walkdown are documented in Table 4-1, p. 4-10 of Reference 3.

In summary, OPPD has completed the actions requested in Reference 4 for FCS. We have concluded that the pressurizer surge line, its restraints, and the surge nozzles are in compliance with applicable Code requirements as requested by IE Bulletin 88-11.

If you should have any questions, please contact me.

Sincerely,

W. G. Gates

W. G. Gates
Vice President

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c: LeBoeuf, Lamb, Leiby & MacRae
J. L. Milhoan, NRC Regional Administrator, Region IV
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