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BECo Ltr. #2.96-064

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

Docket No. 50-293
License No. DPR-35

UPDATED RESPONSE TO NRCB 93-02

References: (1) Pilgrim response to NRCB 93-02, Supplement 1, dated April 14, 1994 (BECo Ltr. 94-042)
(2) Pilgrim response to NRCB 93-02, Supplement 1, dated June 17, 1994 (BECo Ltr. 94-072)

We are submitting this letter to correct and clarify information provided in the two referenced letters regarding Bulletin 93-02, "Debris Plugging of Emergency Core Cooling Suction Strainers". We have discovered a discrepancy in these response letters we believe can confuse the issue of post-LOCA torus air space pressure. Also, please note the strainer issue is currently the subject of NRC Bulletin (NRCB) 96-03. Pilgrim is participating in the Boiling Water Reactor Owner's Group (BWROG) effort to resolve NRCB 96-03. The attachment to this letter provides details and resolution of the discrepancy. Also, we have scheduled a presentation to the NRC on the NPSH issue for July 31, 1996.

If you have any questions, please call J. W. Keene at (508) 830-7876.

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ETB/PMK/pkk/radmisc/nrcbltr

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Attachment

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Background

NRC Bulletin (NRCB) 93-02 and Supplement 1 concerned debris plugging of emergency core cooling suction strainers. Pilgrim responded to NRCB 93-02 in references (1) and (2). Information provided as "Background" stated the following:

> The NPSH was evaluated at 175°F, maximum debris loading on the strainers, and no overpressure condition in torus. This temperature is greater than the maximum bulk pool temperature for the worst case transient (160°F) or post accident condition (166°F). The above actions provided reasonable assurance the NPSH for RHR and CS pump would be appropriate for all conditions.

The incorrect information in the two referenced letters was taken from the bases of a 10 CFR 50.59 evaluation prepared by Boston Edison to change the drywell piping insulation from reflective metal insulation (RMI) to blankets filled with fiberglass. This change was made in 1984. Recent design information reviews identified that the bases of the subject 50.59 evaluation used the preliminary head loss estimates associated with insulation debris rather than the final head loss estimates that were greater in magnitude. After discovery of the error, a new 10 CFR 50.59 evaluation was prepared which superseded the previous evaluation. The current evaluation confirms the minimum NPSH requirements for Pilgrim's CS and RHR pumps are met consistent with the licensing basis.

The PNPS licensing basis for emergency core cooling system (ECCS) NPSH was established in the PNPS Design and Analysis Report (submitted to the AEC June 23, 1967), the initial FSAR and their associated reviews. It was reflected in the PNPS SER as well as the updated FSAR. Section 5.7 of the PNPS SER states:

> During the course of the construction permit review on Pilgrim, we questioned whether the RHR and core spray pumps, and their respective systems, were designed to provide an adequate NPSH margin to assure their continued operation following a loss-of-coolant accident. In Amendment 9 to the application, Boston Edison Company furnished an analysis based on preliminary design assumptions showing that a positive NPSH margin would be available following the accident without requiring containment overpressure. The applicant provided further information in Amendment No. 24 with an analysis confirming the final design requirement that a positive NPSH margin be available even if the containment spray were operating following a design basis loss-of-coolant accident (LOCA). We conclude that the equipment provided is adequate to assure sufficient NPSH to the emergency system pumps in the unlikely event of a LOCA.

Amendment #24 to Pilgrim's FSAR, dated March 18, 1971, addressed AEC comments on CS and RHR NPSH. It provided a figure (Figure 14.5-13, Rev. 6 in the current FSAR) reflecting Pilgrim's final design and confirms positive NPSH margin will be available at all times following a design basis LOCA both with and without containment spray. The figure's containment pressure curves credit the effect of containment pressure. PNPS SER, Section 5.7 (quoted above) reflects the information provided in amendment #24 that credits containment pressure in concluding Pilgrim's CS and RHR pumps have sufficient NPSH. That conclusion remains our licensing basis. Therefore, our bulletin response statement in the two referenced letters about overpressure is incorrect. The SER statement about overpressure remains correct absent consideration of strainer debris. The results of the current NPSH evaluation are discussed below.

Discussion

Pump operation requires sufficient net positive suction head (NPSH) to avoid cavitation. The low pressure CS pump requires 29 feet of NPSH and the RHR pumps require 23 feet at the run out flow rates assumed in core and containment cooling analysis.

Blankets filled with fiberglass fiber are used to insulate piping inside the Pilgrim Station drywell. The potential exists for insulation destruction and transport of fiberglass fiber to the suppression pool after a LOCA. Fiberglass fiber deposited on the pump suction strainer will result in an additional suction path head loss. The evaluation of the effects of fiberglass insulation debris on NPSH available and low pressure ECCS performance was done in accordance with draft Regulatory Guide 1.82, Rev. 1. The additional head loss from insulation debris has been estimated to be a maximum head loss of 14.5 feet of water for the Residual Heat Removal (RHR) pump(s) and 8.6 feet for the Core Spray (CS) pump(s).

The available NPSH is a function of torus airspace pressure, suppression pool temperature, suppression pool water level, and pump suction line losses. NPSH available for both the RHR and CS pump(s) was evaluated based on each of the above parameters. The limiting event for NPSH analysis was determined to be the design basis accident (e.g., failure of the recirculation pump suction line) because this event causes the most rapid heating of the suppression pool and the highest peak suppression pool temperature from all design basis events. The curves for this were provided to the NRC in previously referenced amendment #24 and take credit for overpressure. The torus airspace pressure was calculated consistent with previous licensing submittals that credit the increased airspace pressure provided by noncondensible gas (nitrogen) trapped inside the containment and heated to the temperature of the suppression pool water. The effect of leakage of the noncondensible gas from the containment was also considered when evaluating NPSH available consistent with the FSAR and Technical Specification limits for containment leakage.

Containment response analysis performed by General Electric for the design basis LOCA using a constant ultimate heat sink temperature at the site maximum of 75°F predicts a peak suppression pool temperature of 178°F. Results from the NPSH analysis indicates that NPSH margin is present throughout the entire accident response. With the maximum debris loading, a torus airspace pressure of approximately 4.1 psig is required at the peak suppression pool temperature of 178°F to provide the required NPSH for both the RHR and CS pumps. Calculations of the available torus airspace pressure predict greater than 7 psig at the peak suppression pool temperature of 178°F.

Conclusion

The minimum requirements for NPSH for Pilgrim's RHR and CS pumps are met at all times following postulated design basis events.