March 27, 2000

MEMORANDUM TO: File

FROM: Thomas W. Alexion, Project Manager, Section 1 ***/RA/***
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2, RE: LICENSEE'S 10 CFR 50.59 EVALUATION OF MAIN STEAM LINE BREAK REANALYSIS (TAC NOS. M98914 AND M98915)

By letter dated December 17, 1996, the licensee provided its 10 CFR 50.59 Summary Report. Based on my initial review of the Summary Report and subsequent discussions with the Office of Nuclear Reactor Regulation (NRR) technical staff, Unreviewed Safety Question Evaluation (USQE) 95-0013, titled "CN-1962, Revise Analysis of the Main Steam Line Break [MSLB] in the IVC [Isolation Valve Cubicle] and RCB [Reactor Containment Building]," was selected for further review.

Accordingly, in response to my request, the licensee provided the details of USQE 95-0013, which included Justification for Continued Operation (JCO) 93-004, "MSLB Blowdown Model for IVC, Revision 5." In addition, by letters dated September 3, 1997, and June 23, 1999, the licensee provided additional information in response to NRC questions. However, since the NRC's intent is to evaluate the licensee's design basis as it stands today, the NRC's review was focused on the licensee's last response.

This issue was initiated by the licensee during its review of NRC Information Notice (IN) 93-55, "Potential Problem with Main Steamline Break Analysis for Main Steam Vaults/Tunnels." NRC issued IN 93-55 to alert licensees to a potential inadequacy in the MSLB analysis (i.e., a dry steam release in a vented compartment such as the main steam valve vault may not be conservative, because of moisture entrainment within the discharge) which could place some pressurized-water reactor plants outside their current structural design basis for the main steam valve vaults or main steam tunnels.

Structural Evaluation

As a part of developing a rationale for its JCO 93-0004, the licensee made certain structural related assumptions in its MSLB reanalysis. The staff, in its November 13, 1998, request for additional information (RAI) to the licensee, indicated that these assumptions should be verified by engineering calculations in order for the staff to accept the licensee's conclusion that there are no unreviewed safety questions related to the licensee's MSLB reanalysis. The licensee responded by letter dated June 23, 1999.

One item of concern relates to the method and assumptions used by the licensee in obtaining the new dynamic load factors for the reanalysis. In its response, the licensee stated that the revised dynamic load factors were computed based on a standard structural dynamics approach with the use of a conservatively obtained rise time "t" of the load and the structural period of the IVC structural walls. The licensee's response provided a detailed explanation of how the most conservative dynamic load factors were computed and applied in the MSLB reanalysis. The staff reviewed the calculations and found them adequate and acceptable.

In the structural capacity reanalysis, the licensee originally made an assumption that if a localized area is overstressed by 10% in the concrete configuration, redistribution of the stresses could reasonably be assumed and thus the applied loads would be carried by other structural areas or members. The staff requested the licensee to demonstrate that the assumption is consistent with the principle of structural dynamic response analysis. In response to the staff's request, the licensee stated that it performed additional design calculations which indicated that all stresses are within the American Concrete Institute Code allowables. As a result, the 10% overstress concern raised by the staff is considered resolved.

In the reanalysis pertaining to the RCB pressure determination due to an MSLB event, the licensee made an assumption that the maximum stress in the building is strongly correlated to the maximum pressure in the break node, and that non-peak pressure increases have relatively little impact on the maximum stress of the RCB. In its RAI, the staff requested the licensee to provide results of the engineering analysis to substantiate the above assumption. In its June 23, 1999, response to the staff's RAI, the licensee stated that a reassessment of pertinent engineering analysis data was implemented and the validity of the assumption is confirmed by the results of the detailed final analysis. The staff reviewed the additional information provided by the licensee which included a summary discussion of the final analysis and found the summary discussion reasonable and acceptable. The staff considers the concern related to RCB maximum pressure versus stress resolved.

Another staff concern was related to a licensee statement that "The small increase (results of RCB short-term MSLB pressure analysis) has been evaluated and found to be within the existing margin of the structure." The staff's RAI requested the licensee to provide additional engineering analysis data to support the above statement. In response to the staff's request, the licensee stated that Table 6.2.1.2-13 of the UFSAR has been updated to show the new slightly higher pressure, and the licensee further stated that it is readily apparent from the table that all calculated pressures are well below the structural design values. The table also lists the higher pressures conservatively used in the structural design calculation and a minimum design margin of 1.16. This minimum safety factor of 1.16 for the IVC and RCB concrete elements is judged acceptable by the staff.

In addition to the above specific responses to the staff's RAI, the licensee provided a summary of its initial and revised engineering calculation document CC-6251. The staff reviewed the methodology, the assumptions and the conclusions provided in the summary, and found them acceptable.

Thermal-Hydraulic Evaluation

In the November 13, 1998, RAI, the staff asked what had changed in the thermal-hydraulic calculations in going from the JCO to the final analysis used to determine the subcompartment pressure loads. The licensee's June 23, 1999, response attached a table that summarized the changes. Our evaluation is provided below.

For the final calculation of the pressure response versus time for the IVC and the RCB, the mass and energy release rates are calculated using the bounding mass release and the bounding energy release values for the 100% quality and the 4% quality cases. This maximizes both energy and mass flow rates and is therefore acceptable.

The licensee claims to have done detailed walk-downs of the concerned areas of the plant to obtain more accurate geometrical data for the IVC and the RCB. Since this provides a more accurate model, the staff finds this to be acceptable.

The licensee developed a more accurate computer representation of the blowout panels of the IVC. The Standard Review Plan recommends that the modeling of the blow out panels be done so as to not minimize the subcompartment pressure differentials. The licensee's model appears less conservative than that used for the JCO, but the licensee states that it complies with ANSI/ANS 56.10-1982, "Subcompartment Pressure and Temperature Transient Analysis in Light Water Reactors," Appendix E. The staff's review confirms the licensee's statement. Therefore, it is acceptable.

In summary, the staff reviewed the important input assumptions to the licensee's calculations and found them to be acceptable.

Conclusion

Based on its review of the licensee's submittals, including the licensee's June 23, 1999, response to the staff's RAI, the NRC staff concludes that the licensee's 50.59 evaluation report pertaining to the reanalysis of the South Texas MSLB event and its effects on IVC and RCB does not contain an unreviewed safety question and is, therefore, acceptable.

Principal Contributors: D. Jeng
R. Lobel

Docket Nos. 50-498 and 50-499

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