UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO APPLICATION OF LEAK-BEFORE-BREAK TO REACTOR COOLANT SYSTEM PIPING

SOUTHERN CALIFORNIA EDISON COMPANY

SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 AND 3

DOCKET NOS. 50-361 AND 50-362

1.0 INTRODUCTION

By letter dated April 17, 1995[1], Southern California Edison Company (SCE or the licensee) submitted for NRC approval, its plant-specific applicability of Combustion Engineering Topical Report, CEN-367A[2], "Leak-Before-Break Evaluation of Primary Coolant Loop Piping in Combustion Engineering Designed Nuclear Steam Supply Systems," for San Onofre Nuclear Generating Station, Units 2 and 3. Topical Report CEN-367A was approved by the NRC with the condition that licensees referencing it should submit information to demonstrate that leakage detection systems installed at the specific facility are consistent with Regulatory Guide (RG) 1.45, "Reactor Coolant System Pressure Boundary Leakage Detection Systems." The April 17, 1995, submittal is intended to demonstrate that San Onofre Units 2 and 3 satisfy this condition and therefore, leak-before-break (LBB) technology may be applied to eliminate the dynamic effects associated with high energy pipe ruptures in the reactor coolant system (RCS) piping from the licensing and design bases of these two units. Specifically, the licensee requests NRC's approval to (1) remove pipe whip restraints from the RCS loop, (2) eliminate jet impingement loads from the RCS piping and branch lines connected to the RCS, and (3) relax the in-service testing criteria for the reactor coolant pump snubbers and steam generator hydraulic snubbers. The request was based on the LBB analysis of the primary loop piping in Topical Report CEN-367A as permitted by General Design Criterion 4 (GDC 4) of 10 CFR 50 Appendix A.

2.0 BACKGROUND

GDC 4 allows the use of analyses to eliminate from the design basis the dynamic effects of postulated pipe ruptures in high-energy piping in nuclear power units. Implementation of the LBB technology permits the removal of pipe whip restraints and jet impingement barriers as well as other related changes in operating plants. The acceptable technical procedures and criteria of the LBB evaluation are defined in NUREG-1061[3] and were summarized in the NRC safety evaluation[4] of Topical Report CEN-367A. Therefore, they are not reproduced here.

3.0 EVALUATION AND CONCLUSIONS

The staff has reviewed the applicant's submittal. As mentioned above, Topical Report CEN-367A was approved by the NRC with the condition that licensees referencing it should submit information to demonstrate that leakage detection systems installed at the specific facility are consistent with RG 1.45. Consequently, approval of LBB application and compliance with GDC 4 depend upon whether the current submittal satisfies this condition.

The licensee summarized the method of compliance with RG 1.45 for San Onofre Units 2 and 3 in Table 1 of the April 17, 1995, submittal. The licensee stated that alternative methods were used for Position C.5 and C.7, while all other positions were met without exceptions.

Position C.5 requires that the sensitivity and response time of each of the three required leakage detection systems employed in any nuclear power plant for unidentified leakage should be adequate to detect a leakage rate, or its equivalent, of 1 gpm in less than 1 hour. The staff notes that SCE is in the process of upgrading one of its three independent leakage detection systems, the gas channel method, with a state-of-the-art more responsive design. This new system will provide for greater sensitivity and faster response times compared to the current gas channel method system. The licensee intends to utilize the LLB methodogy prior to the completion of this design change for both units, and will rely on the current leakage detection systems, two which fully meet the RG requirements, for monitoring RCS leakage during this interim period. The staff agrees that the LBB methodology can by employed at San Onofre Units 2 and 3 in the interim with the current gas channel monitoring system, based on the availability of redundant and diverse RCS leakage detection systems. The staff also notes that NUREG-1432, "Standard Technical Specifications for Combustion Engineering Plants," which has been adopted by the licensee, only requires two diverse leakage detection systems to be operable during plant operations.

Position C.7 of RG 1.45 requires that indicators and alarms for each leakage detection system be provided in the main control room, procedures for converting various indications to a common leakage be available to the operators, and the calibration of the indicators should account for needed independent variables. The licensee's procedures do not provide means for converting various indications to a common leakage. However, the licensee's procedures provide operators the methods for locating and quantifying the leakage by a system approach which involves RCS, chemical and volume control, steam generators, etc. The staff concludes that this method for quantifying system leakage will provide the operators with sufficient knowledge of overall RCS leakage and therefore satisfies the common leakage requirement of RG 1.45. The licensee's procedures also do not provide for estimating system leakage as quickly as the direct converting method described in RG 1.45. Using standard operating procedures, system leakage estimates for San Onofre Units 2 and 3 would take 4 hours to perform, and using shortened procedures it would take 1 hour to estimate system leakage. When the direct converting procedure in accordance with the RG method is used, it would take the operator only minutes to estimate the leakage. The staff accepts this time lag associated with the

licensee's leakage estimation method because once the criterion and guidelines for the LBB application are satisfied, fast unstable crack growth is very unlikely to occur on the piping; and therefore a delay of up to several hours in performing the leakage estimation becomes insignificant.

The staff concludes that Topical Report CEN-367A is applicable to the reactor coolant system piping of San Onofre Units 2 and 3, contingent on the licensee implementing its proposed gas monitor design change. This proposed monitor change will completely satisfy Position C.5 of RG 1.45, and will replace the existing gas channel monitor with a more responsive, state-of-the-art design. The staff also considers that the licensee's alternative method in regards to Position C.7 is acceptable and all other positions are met without exceptions. Consequently, the staff concludes that this LBB application complies with GDC 4. The licensee may, after the new gas channel monitor is installed and operable, eliminate primary loop pipe rupture from the design basis for San Onofre Units 2 and 3, remove pipe whip restraints from the RCS loop, and eliminate jet impingement loads from the RCS piping and branch lines connected to the RCS.

The licensee's third request concerns the relaxation of the in-service testing criteria for the reactor coolant pump snubbers and steam generator hydraulic snubbers. The staff cannot review this request at this time because it lacks specificity.

4.0 REFERENCES

1. W. C. Marsh (SCE), letter to USNRC Document Control Desk, "Application of Leak-Before-Break Technology to Reactor Coolant System Piping San Onofre Nuclear Generating Station Units 2 and 3," April 17, 1995.

2. Combustion Engineering, "Leak-Before-Break Evaluation of Primary Coolant Loop Piping in Combustion Engineering Designed Nuclear Steam Supply Systems," Topical Report CEN-367A, November 1987.

3. U.S. NRC, NUREG-1061, Volume 3, "Report of the U. S. Nuclear Regulatory Commission Piping Review Committee, Evaluation of Potential for Pipe Breaks," November 1984.

4. J. E. Richardson (NRC), letter to E. C. Sterling (Combustion Engineering Owners Group), "Acceptance for Referencing of Topical Report CEN-367, 'Leak-Before-Break Evaluation of Primary Coolant Loop Piping in Combustion Engineering Designed Nuclear Steam Supply Systems,'" October 25, 1990.

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