INTERIM REPORT
SMALL BREAK LOSS OF COOLANT ACCIDENT ANALYSIS
SAN ONOFRE NUCLEAR GENERATING STATION
UNITS 2 AND 3

INTRODUCTION

This report is submitted pursuant to 10CFR50. 55(e)(3). It is an interim report describing the results of preliminary small break Loss of Coolant Accident (LOCA) calculations performed by Combustion Engineering, the NSSS supplier, in accordance with 10CFR50.46 for San Onofre Units 2 and 3. A complete report will be submitted by November 12, 1979.

BACKGROUND

By letter dated July 12, 1979, Southern California Edison Company confirmed verbal notification to the NRC concerning the results of preliminary small break LOCA calculations performed in accordance with 10CFR50.46 and Appendix K. Southern California Edison reported that these preliminary calculations assuming high pressure safety injection (HPSI) performance characteristics based on recent pump vendor acceptance test results indicate that the peak fuel cladding temperatures will exceed 10CFR50.46 limits for a 0.05 ft^2 LOCA. This condition was determined by Southern California Edison Company to be a deviation from expected Safety Injection System performance requiring further evaluation and to be reportable in accordance with 10CFR50.55(e).

DISCUSSION

The following discussion is responsive to 10CFR50.55 (e)(3).

Description of Deficiency

In October 1977, Combustion Engineering provided a small break LOCA evaluation for Southern California Edison Company in response to NRC Question 212.21 (see Amendment 5 to the San Onofre Units 2 and 3 FSAR). This evaluation compared several plant designs with respect to power, primary system volume and safety injection system performance, particularly HPSI pump performance. The HPSI delivery curve assumed for San Onofre in this comparison is shown in Figure 212.21-1 of the referenced response. Because of the similarities of design between the different plant types, it was concluded that San Onofre would show small break results similar to other C-E designed plants and that the large break LOCA's reported in the San Onofre FSAR would be more limiting than the small break LOCA's. It was acknowledged in the response that the predicted HPSI pump performance used in the development of the assumed HPSI delivery curve would be verified by final as-built pump performance testing at the pump vendor's shop in 1978. In addition, it was implicitly assumed in the response that HPSI performance would be further verified by preoperational testing in 1980 (see FSAR Section 14.2.12.45).

After completion of the HPSI pump tests in August, 1978, a comparison was made between the assumed HPSI delivery curve (see Figure 212.21-1 of the referenced response) with the revised delivery curve based on the pump performance tests. Although the HPSI pump performance specifications were met, the as-built pump flow rates were less than the previously assumed rates. As a result of both the HPSI performance tests and NRC Question 212.151 SCE requested Combustion Engineering to perform an evaluation of three small breaks, i.e., 1.0, 0.1 and 0.01 ft^2 using the revised HPSI delivery curve. These breaks were analyzed using the NRC approved Combustion Engineering small break model defined by References (1) through (5). These analyses assumed the typical conservative assumptions with respect to moderator temperature coefficient, power distribution, safety injection system performance, etc. The results of these calculations show that all of the acceptance criteria in 10CFR50.46 are met.

Based upon further review of the San Onofre Units 2 and 3 HPSI delivery data and following completion of the analysis of the three breaks noted above, a small break calculation of the 0.05 ft^2 break was performed. Evaluation of preliminary calculations for this break indicate that the peak fuel cladding temperature exceeds the acceptance criteria in 10CFR50.46.

Analysis of Safety Implications

Preliminary analyses for the 0.05 ft^2 break showing a peak fuel cladding temperature exceeding 10CFR50.46 acceptance criteria indicate a safety concern. These analyses used as-built pump flow rates, which were recently determined by test and are less than previously assumed rates, and other conservative assumptions such as for the moderator density coefficient, power distributions, etc. Additional evaluation of the small break analysis is being conducted to identify whether the composite conservatism of the assumptions can be reduced or whether any plant modifications are necessary to demonstrate that all criteria of 10CFR50.46 are met.

Corrective Action

Corrective action has been initiated to investigate further the response of San Onofre Units 2 and 3 to break sizes within the range of 0.01 to 0.1 ft^2. This investigation includes a survey of the plant parameters and assumptions which have impact on the analysis to reduce unnecessary margins and may include evaluation of hardware changes if necessary to meet 10CFR50.46 criteria.

Following this investigation, additional small break LOCA calculations for San Onofre Units 2 and 3 will be performed to demonstrate compliance with 10CFR50.46. Less conservative analysis assumptions as can be justified will be used, or hardware modifications will be made if necessary. A final report of the results of this additional effort will be submitted by November 12, 1979.

REFERENCES

1. "CEFLASH-4A, A FORTRAN-IV Digital Computer Program for Reactor Blowdown Analysis," CENPD-133, April 1974 (Proprietary).

   "CEFLASH-4AS, A Computer Program for Reactor Blowdown Analysis of the Small Break Loss of Coolant Accident," CENPD-133, Supplement 1, August 1974 (Proprietary).

   "CEFLASH-4A, A FORTRAN-IV Digital Computer Program for Reactor Blowdown Analysis (Modification)," CENPD-133, Supplement 2, December 1974 (Proprietary).

   "CEFLASH-4AS, A Computer Program for the Reactor Blowdown Analysis of the Small Break Loss of Coolant Accident", CENPD-133, Supplement 3, January 1977 (Proprietary).

2. "COMPERC-II, A Program for Emergency Refill-Reflood of the Core," CENPD-134, April 1974 (Porprietary).

   "COMPERC-II, A Program for Emergency Refill-Reflood of the Core (Modification)," CENPD-134, Supplement 1, December 1974 (Proprietary).

3. "STRIKIN-II, A Cylindrical Geometry Fuel Rod Heat Transfer Program," CENPD-135, April 1974 (Proprietary).

   "STRIKIN-II, A Cylindrical Geometry Fuel Rod Heat Transfer Program (Modification)," CENPD-135, Supplement 2, December 1974 (Proprietary).

   "STRIKIN-II, A Cylindrical Geometry Fuel Rod Heat Transfer Program," CENPD-135, Supplement 4, August 1976 (Proprietary).

4. "PARCH, A FORTRAN-IV Digital Program to Evaluate Pool Boiling, Axial Rod and Coolant Heatup," CENPD-138, August 1974, (Proprietary).

   "PARCH, A FORTRAN-IV Digital Program to Evaluate Pool Boiling, Axial Rod and Coolant Heatup," CENPD-138, Supplement 1, February 1975 (Proprietary).

   "PARCH, A FORTRAN-IV Digital Program to Evaluate Pool Boiling, Axial Rod and Coolant Heatup", CENPD-138, Supplement 2, January 1977 (Proprietary).

5. "Calculative Methods for the C-E Small Break LOCA Evaluation Model," CENPD-137, August 1974 (Proprietary).

   "Calculative Methods for the C-E Small Break LOCA Evaluation Model," CENPD-137, Supplement 1, January 1977 (Proprietary).