Southern California Edison Company

P. O. BOX 800

2244 WALNUT GROVE AVENUE

ROSEMEAD, CALIFORNIA 91770

M. O. MEDFORD
MANAGER OF NUCLEAR ENGINEERING
AND LICENSING

TELEPHONE
(818) 302-1749

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

Gentlemen:

Subject: Docket No. 50-206
Engineered Safety Features Single Failure Analysis
San Onofre Nuclear Generating Station
Unit 1

By letter dated December 1, 1987, SCE submitted better estimate end of life (EOL) analysis of the core response during a main steam line break to support justification for continued operation. On December 4, 1987, a conference call was held between SCE and NRC staff to discuss this analysis. During this conference call, the NRC staff requested additional information. The purpose of this letter is to provide the requested information.

The NRC staff requested that SCE identify where the Macbeth DNB correlation, utilized for the EOL analysis, had been previously reviewed by the NRC. The Macbeth correlation is referenced in the FSARs for the Palo Verde and Millstone Unit 2 nuclear generating stations. Additionally, the Macbeth correlation is referenced in the CESSAR-80. Enclosure 1 provides a discussion of the method used to determine the minimum acceptable DNBR applicable for this correlation at system pressures established by the analysis. The transient analysis indicates that the limiting steamline break results in a minimum DNBR value well above the minimum limit of 1.37. The minimum value of DNBR resulting from this transient has been requested by the NRC. Since this information is considered proprietary by Westinghouse, it will be provided in a letter to be submitted tomorrow with appropriate documentation requesting that it be withheld from public disclosure.

The NRC staff also requested that SCE identify the better estimate assumptions which differ from the design basis San Onofre Unit 1 steam line break analysis. First, credit was taken for charging pump flow to the RCS. The safety injection sequencer realigns a charging pump to provide flow to the RCS from the refueling water storage tank. Second, the end of life shutdown margin value assumed all control rods in. Third, the reactor coolant pumps were assumed to trip, consistent with actual plant behavior. The reactor

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coolant pumps would trip on turbine/generator trip due to loss of bus power; additionally, the pumps get a trip signal from the safety injection sequencer. The last assumption was the addition of thick metal heat to the reactor coolant system.

The NRC staff asked about the identification of the moderator density coefficient (MDC) as an analysis input for the end of life analysis instead of the moderator temperature coefficient (MTC) used in the middle of life (MOL) analysis. SCE explained that MDC and MTC are both a measure of the same physical parameter and using one or the other does not affect the analysis. A figure indicating both the end of life and middle of life MTC is provided as Enclosure 2 to this letter. Additionally, a figure showing the Doppler power defect is provided as requested. It should be noted that the doppler effect was not included in the MOL analysis since no return to power was calculated.

The last NRC staff question was regarding Pressurized Thermal Shock (PTS) for the previously identified single failure scenarios resulting in less severe cooldown transients which may have higher terminal pressures. These less severe cooldown cases have now been evaluated and are bounded by the previous San Onofre Unit 1 analysis.

If you have any questions regarding the above, please contact me.

Very truly yours,

M. O. Medford

Enclosure

cc: J. O. Bradfute, NRR Project Manager, San Onofre Unit 1
J. B. Martin, Regional Administrator, NRC Region V
F. R. Huey, NRC Senior Resident Inspector, San Onofre Units 1, 2 and 3

Correlation Limit for Macbeth Correlation at Low Pressures

The San Onofre Unit 1 Steamline Break Evaluation gave pressures as low as 35 psia. The Macbeth correlation[1] was used to evaluate the DNBRs. The high velocity form of the correlation was used. The correlation limit is given by the following equation

$$CL = \frac{1}{m_{M/P} - K \quad S_{M/P}}$$

where $m_{M/P}$ = mean of the measured/predicted data

$S_{M/P}$ = standard deviation of the measured/predicted data

K = value from Owen's tables[2]

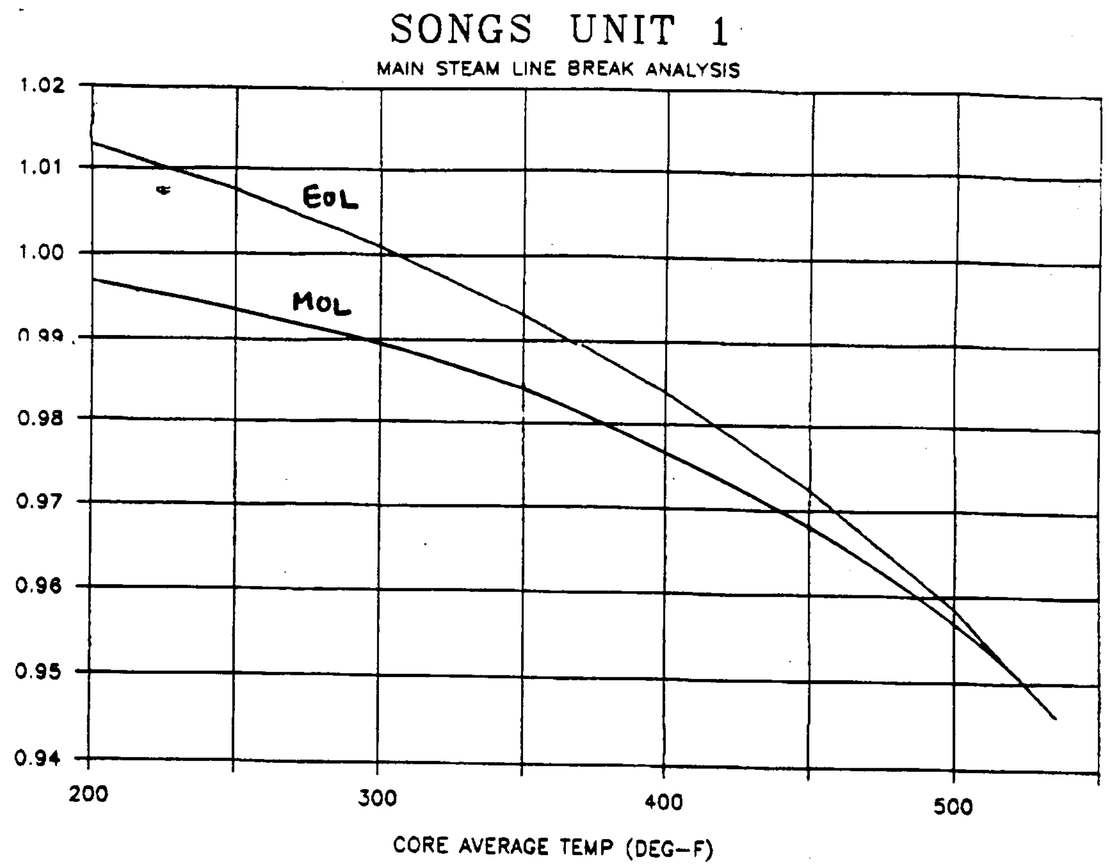
From Table 3 of Reference 1, at p = 15 psia, the RMS error is 13.8% and the number of data points is 88. From Owen's tables, at a confidence level of 95%, n = 88 gives K = 1.948. Taking $m_{M/P} = 1.0$, we thus have

$$CL = \frac{1}{1 - 1.948*.138} = 1.37$$

(1) R. V. Macbeth, "Burnout Analysis, Part 4, Application of Local Conditions Hypothesis to World Data for Uniformly Heated Round Tubes and Rectangular Channels", AEEW-R-267 Aug., 1963 (also given on p. 164 of "Boiling Heat Transfer and Two Phase Flow", by L. S. Tong).

(2) D. B. Owen, "Factors for One-Sided Tolerance Limits and for Variable Sampling Plans", SCR-607, March, 1963.

MODERATOR TEMPERATURE COEFFICIENT



$MTC_{EOL}(535\,^{\circ}F) = -33.6$ pcm/°F

$MTC_{MOL}(535\,^{\circ}F) = -16.2$ pcm/°F