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

Gentlemen:

Subject: Docket No. 5 362
Surveillanc apsule Test Report
San Onofre Nuclear Generating Station
Unit 3

This letter transmits as Enclosure A the Unit 3 surveillance capsule material summary technical report required by 10 CFR 50, Appendix H. The report, entitled "Analysis of the Southern California Edison Company (SCE) San Onofre Unit 3 Reactor Vessel Surveillance Capsule Removed from the 97° Location," contains the test results of the first irradiated surveillance capsule which was removed from San Onofre Unit 3 on May 4, 1990, after 4.33 Effective Full Power Years (EFPY) of operation.

SUMMARY

The test results indicate that the existing Unit 3 heatup and cooldown curves in Technical Specification 3/4.4.8 are not conservative. A 2.8% under-prediction of the neutron flux at the vessel inside surface and a slightly higher copper content, both identified from the testing, resulted in the current pressure-temperature (P-T) limits estimated at 8 EFPY to be 14.8% non-conservative. Therefore, we will be using the existing Unit 2 heatup and cooldown curves in the near term until we complete the necessary calculations for revised Unit 3 curves based on the test results. As discussed below, the existing Unit 2 limits are more restrictive than the new Unit 3 limits will be.

TEST RESULTS

The test results from the Unit 3 surveillance capsule indicated a "measured" neutron fluence of 0.663E19 n/cm$^2$ at the reactor vessel wall. This is about 4% higher than the predicted neutron fluence at 8 EFPY is 1.124E19 n/cm$^2$. This exposure is 2.8% greater than the 1.093E19 n/cm$^2$ fluence originally predicted and used in calculating the existing reactor vessel nil-ductility transition temperature ($RT_{NDT}$) and Reactor Coolant System (RCS) P-T limits.

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The surveillance capsule measured fluence at 4.33 EFPY of plant operation, though higher than expected, is not unreasonable. It is generally accepted within the industry that flux values determined through neutron transport analysis have a tolerance of ±40%. Sources of this discrepancy include calculation bias errors (e.g., fast neutron cross-section uncertainties, transport calculation approximations, etc.), and random errors (e.g., reactor vessel ovality, reactor vessel off-center from the core axis, etc.). This difference between the predicted fluence and the measured fluence is expected to decrease due to fuel management changes (checkerboard fuel loading pattern) that were made following Cycle 3 to achieve lower leakage cores.

IMPACT OF TEST RESULTS

While there will be no consequential long range effects from the higher than predicted surveillance capsule fluence, this measured fluence does affect the existing RCS pressure-temperature (P-T) limit curves in Technical Specification 3/4.4.8. As a result of the surveillance capsule evaluation, the current P-T limits have been estimated to be 14.8°F non-conservative at 8 EFPY.

The predicted Adjusted Reference Temperature (ART) at 8 EFPY had been 92.4°F at the 1/4 thickness position versus an ART of 107.2°F calculated from the neutron flux determined from the evaluation of the 4.33 EFPY surveillance capsule. This 14.8°F non-conservatism resulted from 1) the 2.8% under prediction of the neutron flux, 2) the slightly higher copper content attributed to normal material variations which increased the Chemistry Factor (CF) used in calculating the $RT_{NDT}$ shift, and 3) the margin required by Regulatory Guide 1.99, Revision 2, which is now increased.

Margin is added to obtain conservative, upper bound values of ART for the calculations required by Appendix G to 10 CFR 50. Margin is calculated, using Equation (4) of Regulatory Guide 1.99, Revision 2, from the standard deviations of both the initial $RT_{NDT}$ and the $RT_{NDT}$ shift. This results in a margin increase to 35.4°F from the previous value of 25.1°F, which was used in the calculation of the existing Unit 3 P-T limits.

The current exposure on the reactor vessel is 5.04 EFPY. The 1/4 thickness position ART corresponding to this exposure has been calculated to be 103.2°F. The calculated ART used in the existing Technical Specification P-T limits is 92.4°F. This makes the existing Technical Specification heat up and cooldown curves 10.8°F non-conservative with respect to the original margin desired. However, there still is a remaining margin of 24.6°F (new margin of 35.4°minus the 10.8°F non-conservative deviation) in the ART and the Technical Specification P-T limits.

CORRECTIVE ACTIONS

By May 17, 1991, we will issue a special order which will require use of the Unit 2 Heatup, Cooldown, and Low Temperature Overpressurization Technical Specifications at Unit 3 to compensate for the non-conservatism of the existing Unit 3 limits. The Unit 2 Technical Specifications to be used at Unit 3 are 3/4.4.8.1, "Pressure Temperature Limits," 3.4.8.3.1, "Overpressure Protection System, RCS Temperature ≤312°F," and 3.4.8.3.2, "Overpressure Protection System >312°F." The existing Unit 2 limits are more restrictive than the new Unit 3 limits will be, because at 8 EFPY and 1/4 thickness location, the Unit 2 vessel will have a higher $RT_{NDT}$ (111.5° F) than Unit 3 (107.2°F). By June 3, 1991, the normal operating instructions for Unit 3 will be updated to reflect this change, and by December 16, 1991, we will submit the proposed revisions to the Unit 3 Technical Specifications. The emergency operating instructions will not be affected.

EVALUATION OF HEAT-AFFECTED ZONE MATERIAL TEST RESULTS

As part of our review of the surveillance capsule results, the use of heat-affected zone (HAZ) materials was reevaluated because of the scatter and anomalous data from the tests of HAZ materials. As discussed with the NRC staff during our April 18, 1991, telephone call, HAZ material is not limiting. Therefore, HAZ material data are not used in determining $RT_{NDT}$. Additional details are included in Enclosure B.

If you would like any additional information on this subject, please let me know.

Very truly yours,

J. Rainsberry for F. C. Dandy

Enclosures

cc: J. B. Martin, Regional Administrator, NRC Region V
C. W. Caldwell, NRC Senior Resident Inspector, Units 1, 2, and 3

ENCLOSURE A

ANALYSIS OF THE SOUTHERN CALIFORNIA EDISON COMPANY
SAN ONOFRE UNIT 3 REACTOR VESSEL SURVEILLANCE
CAPSULE REMOVED FROM THE 97° LOCATION

WEC PROPRIETARY CLASS 3