

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING PROJECTED VALUES OF MATERIAL PROPERTIES

FOR FRACTURE TOUGHNESS REQUIREMENTS

FOR PROTECTION AGAINST PRESSURIZED THERMAL SHOCK EVENTS

SOUTHERN CALIFORNIA EDISON COMPANY

SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1 (SONGS-1)

DOCKET NO. 50-206

1.0 INTRODUCTION

As required by 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock" (PTS Rule) which was published in the Federal Register July 23, 1985, the licensee for each operating pressurized water reactor "shall submit projected values of RT_{PTS} (at the inner vessel surface) of reactor vessel beltline materials by giving values from the time of submittal to the expiration date of the operating license. The assessment must specify the bases for the projection including the assumptions regarding core loading patterns. This assessment must be submitted by January 23, 1986, and must be updated whenever changes in core loadings, surveillance measurements or other information indicate a significant change in projected values."

By letter dated January 23, 1986, Southern California Edison Company (SCE, the licensee) submitted projected values of RT_{pTS} together with material properties and fast neutron fluence of reactor vessel beltline material for SONGS-1. The RT_{pTS} and fluence values were projected to 24.05 effective full power years (EFPY) which is considered to be the end of life of the facility occurring on March 27, 2007.

2.0 EVALUATION

2.1 MATERIALS ASPECTS

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The controlling beltline material from the standpoint of PTS susceptibility was identified to be intermediate shell plate W7601-9. The material properties of the controlling material and the associated margin and chemistry factor were reported to be:

	Utility Submittal	Staff Evaluation
Cu (copper content, %) =	0.18	0.18
Ni (nickel content, %) =	0.20	0.20
I (Initial RT_{NDT} , ^{o}F) =	55	55
M (Margin, °F) =	48	48
CF (Chemistry Factor, °F)=		87.2

The controlling material has been properly identified. The justification given for the copper and nickel contents and the initial RT_{NDT} are acceptable. The margin has been derived from consideration of the bases for these values, following the PTS Rule, Section 50.61 of 10 CFR Part 50. Assuming that the reported values of fluence are correct, Equation 1 of PTS rule governs, and the chemistry factor is as shown above.

2.2 FLUENCE ASPECTS

The SONGS-1 Provisional Operating License (POL) was issued on March 27, 1967. Efforts are currently underway to convert the license to a Full-Term Operating License which would expire 40 years from the issuance date of the Construction Permit (March 2, 1964). The licensee's submittal used March 27, 2007 (40 years from the issuance of the POL) as the end of life for the plant; a conservative assumption for the purposes of the PTS analyses. The licensee then calculated a fluence based upon a projection of 24.05 effective full-power years (EFPY) as of March 27, 2007. The 24.05 EFPY was calculated using the actual 10.12 EFPY as of the date of the January 23, 1986 submittal and projecting an additional 16.93 EFPY from January 23, 1986 until March 27, 2007 based upon an equilibrium cycle length of 484 effective full-power days and a production factor of 75% with an assumed 90 day refueling outage. However, for the purposes of this analysis, the staff has chosen to apply a more conservative capacity factor of 80% for projecting EFPY at the end of life resulting in an estimated 27.06 EFPY as of March 27, 2007.

2.3 EVALUATION OF THE CALCULATED RT

The equation specified in 10 CFR 50.61 as applicable for the San Onofre Unit 1 plant is:

 $RT_{PTS} = I + M + (-10+470xCu+350xCuxNi)xf^{0.27}$ where: I = Initial RT_NDT °F = 55 M = Uncertainty Margin °F = 48 Cu= w/o of Copper in int. plate W-7601-9 = .18 Ni=w/o of Nickel in int. plate W-7601-9 = .20 F = peak pressure vessel fluence in units of 10¹⁹ n/cm² = 9.98

then: $RT_{PTS} = 55+48+(-10+470x0.18+350x0.18x0.20)x9.985^{0.27}$

 $RT_{PTS} = 103+87.2x1.86 = 103+162.3 = 265.3^{\circ}F \le 270^{\circ}F$

The resulting estimated RT_{PTS} value of 265.3°F is acceptable since it is below the 270°F screening criterion for plate materials.

3.0 CONCLUSION

The licensee has calculated an $\mathrm{RT}_{\mathrm{pTS}}$ of 260°F for the limiting plate material at the end of plant lifetime based upon a projection of 24.05 EFPY as of March 27, 2007. The staff has calculated an $\mathrm{RT}_{\mathrm{pTS}}$ of 265.3°F based upon a more conservative estimate of 27.06 EFPY at the end of plant lifetime. Since the results of both calculations are less than the 270°F screening criterion, the staff concludes that this issue is acceptably resolved for SONGS-1. In order to confirm the licensee's projected estimated $\mathrm{RT}_{\mathrm{pTS}}$ throughout the duration of the license, the staff will request the licensee to submit a reevaluation of the $\mathrm{RT}_{\mathrm{pTS}}$ and comparison to the predicted value with future Pressure-Temperature submittals required by Appendix G to 10 CFR Part 50.

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4.0 ACKNOWLEDGEMENT

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Nuclear Engineering

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Mr. Kenneth P. Baskin, Vice President

Safety and Licensing Department Southern California Edison Company 2244 Walnut Grove Avenue PO Box 800 SAUBLERETI, CA 81770 SAN ONOFRE NUCLEAR GENERATING STATION, UNIT NO. 1 The following documents concerning our review of the subject facility are transmitted for your information. Notice of Receipt of Application, dated Draft/Final Environmental Statment, dated_____. Notice of Availability of Draft/Final Environmental Statement, dated ______ Safety Evaluation Report, or Supplement No. _____, dated _____. □ Notice of Hearing on Application for Construction Permit, dated □ Notice of Consideration of Issuance of Facility Operating License, dated_____. Monthly Notice; Applications and Amendments to Operating Licenses Involving no Significant Hazards Considerations, dated Application and Safety Analysis Report, Volume ______ Amendment No._____ to Application/SAR dated ______ Construction Permit No. CPPR-_____, Amendment No._____ dated Facility Operating License No. _____, Amendment No. _____, dated _____. Order Extending Construction Completion Date, dated_____ I Other (Specify) Biweekly Notice covering period January 28, 1987. Expiration date for hearing requests and comments February 27, 1987. Division of PWR Licensing-A Office of Nuclear Reactor Regulation Enclosures: As stated cc: See Next Page OFFICE) PAD#1 PShuttleworth SURNAME MAR

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