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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 71 TO FACILITY OPERATING LICENSE NO. NPF-15

SOUTHERN CALIFORNIA EDISON COMPANY

SAN DIEGO GAS AND ELECTRIC COMPANY

THE CITY OF RIVERSIDE, CALIFORNIA

THE CITY OF ANAHEIM, CALIFORNIA

SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 3

DOCKET NO. 50-362

1.0 INTRODUCTION

By letter dated June 12, 1989 and supplemented July 19 and November 6, 1989, Southern California Edison Company et al. (the licensee) requested a change to the Technical Specifications for Facility Operating Licensee No. NPF-15 that authorizes operation of San Onofre Nuclear Generating Station, Unit No. 3 in San Diego County, California. The proposed changes would revise TS 3/4.4.8.1, "Pressure/Temperature Limits;" TS 3.4.1.4.1 "Cold Shutdown-Loops Filled;" TS 3.4.1.3, "Hot Shutdown;" TS 3.4.8.3.1 "Overpressure Protection Systems, RCS Temperature less than or equal to 285°F;" and TS 3.4.8.3.2, "Overpressure Protection Systems, RCS Temperature greater than 285°F," and related tables, figures and surveillance requirements. These changes revise the pressure/temperature and low temperature overpressure protection limits for operation through 8 effective full power years (EFPY). Our staff has reviewed the licensee's submittals. Our evaluation and conclusions are discussed below.

The supplemental letters dated July 19 and November 6, 1989 did not alter the action, or affect the NRC staff's proposed determination that the proposed amendment did not involve a significant hazards consideration, published in the Federal Register on August 9, 1989 (54 FR 32718). The July 19 letter, which forwarded a copy of the enclosure to the NRC Document Control Desk, was inadvertently omitted from the notice.

2.0 EVALUATION

2.1 Neutron Surveillance

Appendix H to 10 CFR Part 50 requires the licensees to establish a surveillance program to periodically withdraw surveillance capsules from the reactor vessel. The licensee has established this surveillance

program. The licensee has six surveillance capsules in the San Onofre 3 reactor vessel, but has not removed any because they have not received the requisite neutron fluence. Therefore, current neutron surveillance estimates are still adequate and applicable.

The licensee has proposed to change the current surveillance capsule removal schedule to remove the initial surveillance capsule from the reactor vessel at 4.4 EFPY instead of the current schedule at 5.6 EFPY.

According to 10 CFR Part 50 Appendix H, Item II.B.1, for each capsule withdrawal after July 26, 1983, the test procedures and reporting requirements must meet the requirements of ASTM E 185-82 to the extent practical for the configuration of the specimens in the capsule. The requested change in the withdrawal schedule is the closest practical time period that the licensee can achieve in order to satisfy the requirements of ASTM E 185-82. According to 10 CFR Part 50 Appendix H, Item II.B.3, the proposed schedule must be approved prior to implementation. Therefore, this modification to the Technical Specifications is acceptable based upon the need to conform to ASTM E 185-82.

2.2 Pressure/Temperature Limits

Appendix G to 10 CFR Part 50 specifies fracture toughness and testing requirements for reactor vessel materials in accordance with the ASME Code and, in particular, to test the beltline materials in the surveillance capsules in accordance with Appendix H to 10 CFR Part 50. These tests define the condition of vessel embrittlement at the time of capsule withdrawal in terms of the increase in the reference temperature (RT_{NDT}). Appendix G also requires the licensee to predict the effects of neutron irradiation on vessel embrittlement by calculating the adjusted RT_{NDT} and upper shelf energy. A method of calculating RT_{NDT} that is acceptable to the NRC staff is described in Regulatory Guide (RG) 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," which was endorsed by the staff in Generic Letter 88-11, "NRC Position on Radiation Embrittlement of Reactor Vessel Materials and Its Impact on Plant Operations." An acceptable method for constructing pressure/temperature limits is described in the Standard Review Plan (SRP) Section 5.3.2.

2.2.1 Evaluation

The staff evaluated the effect of neutron irradiation embrittlement on each beltline material in the San Onofre 3 reactor vessel. The amount of neutron irradiation embrittlement was calculated in accordance with RG 1.99, Rev. 2. The material with the highest adjusted reference temperature at 8 EFPY was plate C-6802-1 in the intermediate shell with 0.05% copper and 0.57% nickel and initial reference temperature of 40°F.

The licensee has six surveillance capsules in the San Onofre 3 reactor vessel, but has not removed any because they have not received the requisite neutron fluence. All surveillance capsules contained Charpy impact specimens and tensile specimens made from base metal, weld metal, and heat affected zone metal.

For the limiting beltline material, C-6802-1, the staff calculated the adjusted reference temperature at 8 EFPY at 1/4T (T = reactor vessel beltline thickness) to be 92°F. The adjusted reference temperature was determined by section 1 of RG 1.99, Rev. 2 because no surveillance information was available.

The licensee used the method in section 1 of RG 1.99, Rev. 2, to calculate an adjusted reference temperature of 92.4°F for the same limiting material. Substituting the adjusted reference temperature of 92°F into the equations in SRP 5.3.2, the staff verified that the proposed pressure/temperature limits for heatup, cooldown, and hydrotest meet the beltline material requirements in Appendix G of 10 CFR Part 50. (Table 1 (shown below) depicts the NRC staff calculated adjusted reference temperature for limiting reactor beltline material at San Onofre Nuclear Generating Station, Unit No. 3.)

TABLE 1

The NRC Staff Calculated Adjusted Reference Temperature for the Limiting Reactor Beltline Material at San Onofre Nuclear Generating Station, Unit No. 3

Limiting Beltline Material	Plate from intermediate shell
Code No.	C-6802-1
Copper Content	0.05%
Nickel Content	0.57%
Initial Reference Temperature	40°F
Neutron Fluence (n/cm^2) at Inside Surface at 8 EFPY	9.2E18
Adjusted Reference Temperature	92°F (Licensee: 92.4°F)

In addition to beltline materials, Appendix G of 10 CFR Part 50 also imposes pressure/temperature limits based on the reference temperature for the reactor vessel closure flange materials. Section IV.2 of Appendix G states that when the pressure exceeds 20% of the preservice system hydrostatic test pressure, the temperature of the closure flange regions highly stressed by the bolt preload must exceed the reference temperature of the material in those regions by at least 120°F for normal operation and by 90°F for hydrostatic pressure tests and leak tests. Based on the flange reference temperature of 0°F, the staff has determined that the proposed pressure/temperature limits satisfy section IV.2 of Appendix G.

Section IV.B of Appendix G requires that the predicted Charpy upper shelf energy at end of life be above 50 ft-lb. Based on the data from the San Onofre 3 Final Safety Analysis Report, the lowest measured transverse Charpy upper shelf energy is 90 ft-lb for plate C-6802-6 in the lower shell. Using the method in RG 1.99, Rev. 2, the predicted Charpy upper shelf energy of the plate material at the end of life (3.68E19 n/cm^2) will be about 67 ft-lb. This is above the required 50 ft-lb and, therefore, is acceptable.

2.2.2 Conclusion

The staff concludes that the proposed pressure/temperature limits for the reactor coolant system for heatup, cooldown, leak test, and criticality are valid through 8 EFPY because the limits conform to the requirements of Appendices G and H of 10 CFR Part 50. The licensee's submittal also satisfies Generic Letter 88-11 because the licensee used the method in RG 1.99, Rev. 2 to calculate the adjusted reference temperature. Hence, the proposed pressure/temperature limits may be incorporated into the San Onofre 3 Technical Specifications.

2.3 Low Temperature Overpressure Protection Limits

Low temperature overpressure protection (LTOP) is provided by the shutdown cooling system (SDCS) relief valves, which must be aligned to the reactor coolant system (RCS) when the RCS is below the specified temperature. This provides assurance that the reactor vessel will be operated in the ductile region in accordance with 10 CFR Part 50, Appendix G, during both normal operation and overpressurization events due to equipment malfunction or operator error. The technical specifications require alignment of the SDCS relief valves to the RCS whenever RCS temperature is below the temperature corresponding to the pressure/temperature curve pressurizer relief valve setpoint of 2500 psia.

The proposed pressure/temperature limits would require the LTOP system to be aligned whenever RCS temperature is less than 267° F during RCS cooldown and less than 302°F during RCS heatup. The current Technical Specification pressure/temperature limits only require LTOP alignment when RCS temperature is less than 285°F during RCS cooldown and heatup. However, the licensee asserts that the LTOP analyses performed and documented in the FSAR remain applicable to support the proposed changes.

2.3.1 Evaluation

The staff questioned whether or not the original LTOP analysis was still bounding for all transients involving LTOP system design. This concern arose because the initial reactor coolant system temperatures in postulated LTOP transients will be higher in accordance with the proposed LTOP alignment temperatures.

The licensee responded to the staff's concern in its letter dated November 6, 1989 by providing the following information. As documented in the FSAR, the two limiting pressure transients for the LTOP system are: (1) mass addition transient which assumes an inadvertent actuation of safety injection (startup of two high pressure safety injection pumps and three charging pumps), and (2) energy addition transient which assumes reactor coolant pump start with a temperature difference of 100°F between the steam generator and the reactor coolant system. For the mass addition transient, the shutdown cooling system relief valve was sized to accommodate

this LTOP transient for shutdown cooling system temperatures from 120°F to 400°F and assuming a 417 psia relief valve setpoint. Therefore, the change in the LTOP alignment temperature from 285°F to 302°F is still bounded by the orginial relief valve sizing calculation.

For the energy addition transient, the original LTOP analysis assumed that one reactor coolant pump was started with a maximum allowed differential temperature of 100°F between the primary and secondary systems. The most limiting energy addition transient would be with the secondary system at 350°F and the primary system at 250°F. However, this condition is prevented from occurring through administrative controls. Changing the reactor coolant system temperature at which the LTOP must be aligned from 285°F to 302°F would not change the results of the most limiting energy addition transient. The energy addition transient is driven by the differential temperature between the primary side and the secondary side rather than the reactor coolant system initial temperature. In order to be consistent with the assumptions in the original LTOP analysis, the following conditions would have to exist for the transient to occur: (1) the reactor coolant system would need to be water solid; (2) there would need to be a 100°F delta temperature between the primary system and the secondary system (with the secondary system being hotter); and (3) the reactor coolant pumps would be not running. The plant procedures prevent these conditions from occurring by the following: (1) the reactor coolant system is normally water solid only below 140°F during a plant cooldown or following reactor coolant system fill and vent during plant startup; (2) if the reactor coolant pumps are not available for a normal plant cooldown, the maximum delta temperature between the primary system and the secondary system is procedurally limited to 20°F before a reactor coolant pump can be started; and (3) a normal plant cooldown is performed using two reactor coolant pumps until the primary system temperature is below 140°F.

2.3.2 Conclusion

Based on the above, the staff agrees with the licensee's conclusion that changing the LTOP alignment temperature from 285°F to 302°F would not increase the severity of the most limiting LTOP transient. The proposed Technical Specifications regarding LTOP system are bounded by the original FSAR analysis. Therefore, the staff finds that the proposed technical specification changes are reasonably conservative and acceptable to support the updated pressure/temperature limits applicable for the period of 4 EFPY to 8 EFPY.

3.0 CONTACT WITH STATE OFFICIAL

The staff has advised the Department of Health Services, State of California, of the proposed determination of no significant hazards consideration. No comments were received.

4.0 ENVIRONMENTAL CONSIDERATION

The amendment involves changes to requirements with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 or changes to an inspection or surveillance requirement. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

5.0 CONCLUSION

We have concluded, based on the considerations discussed above that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner; (2) such activities will be conducted in compliance with the Commission's regulations; and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Dated: December 14, 1989