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February 1, 1991

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

Gentlemen:

Subject: **Docket No. 50-206**
Overpressure Mitigation System
San Onofre Nuclear Generating Station, Unit 1

References: A) Letter, F.R. Nandy, SCE to NRC, dated June 25, 1990
B) Letter, F.R. Nandy, SCE to NRC, dated June 1, 1990
C) Letter, F.R. Nandy, SCE to NRC, dated March 30, 1990

Prior to the current Cycle 11 refueling outage, we implemented administrative controls for the Overpressure Mitigating System (OMS). The administrative controls assured adequate margins for overpressure protection while we developed a new design basis for the OMS (References A and B). We have completed our analysis of the OMS and will implement revised administrative controls as necessary for restart as described in this letter. An amendment application will be submitted by May 1, 1991 to incorporate the new design basis and new heatup/cooldown curves into the Technical Specifications. Mr. James Tatum, the former NRC Project Manager for SONGS 1, requested that we inform you of the revised administrative controls in advance of submittal of the amendment application to provide you with the opportunity to review these controls prior to restart.

Background

In April 1989, during a review of IE Notice 89-32, "Surveillance Testing of Low-Temperature Overpressure Protection Systems," we determined that the opening response time of the Power Operated Relief Valves (PORVs) had not been considered in the OMS design basis, and that the OMS enable temperature stated in the Technical Specifications was not consistent with the heatup and cooldown curves. As a result of our findings, we initiated a complete design review of the OMS. In the interim we imposed administrative controls that required placing the OMS in service and limiting operation to a single

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charging pump prior to reducing the Reactor Coolant System (RCS) temperature below the OMS enable temperature of 360°F. We also required the OMS to be operable whenever the Residual Heat Removal (RHR) system was in service.

Subsequent to establishing the administrative controls, Westinghouse informed all Westinghouse NSSS owners that the design flow capacity of the RHR relief valves was questionable (Reference C). We initiated a testing program with the manufacturer of the valve to evaluate the design capabilities of the RHR Relief Valve, RV-206. While the testing was in progress, new OMS calculations were performed to consider the potential impact of reduced flow through the relief valve. The calculations included a single failure evaluation of the OMS.

Based on the initial results of our OMS calculations, we informed you (Reference B) that additional administrative controls were necessary. The administrative controls were conservative limits that accounted for instrumentation inaccuracies in the calibration of the pressurizer pressure transmitters and potential single failures affecting both PORVs. The administrative controls required the RHR relief valve, RV-206, to be operable and connected to the RCS below the OMS enable temperature. Other requirements included, a recalibration of the OMS pressurizer pressure transmitters to reduce the instrument inaccuracy prior to enabling OMS, restrictions in charging flow, and additional restrictions for starting a single Reactor Coolant Pump (RCP) based on pressurizer level and the primary to secondary temperature difference.

New OMS Design Basis

We have completed our calculations and have established a new design basis for low temperature overpressure protection based on the operation of the RHR relief valve, RV-206. Our new OMS analysis is based entirely on the operation of RV-206 and does not credit operation of the PORVs. However, we plan to maintain the PORVs operable as specified by the existing Technical Specifications until the amendment application incorporating the new OMS design basis is approved. The PORV low temperature overpressurization actuation setpoint will be ≤ 500 psig, in accordance with the existing specifications.

New OMS Enable Temperature

The OMS enable temperature of 360°F, specified in Technical Specification 3.20, was determined from the existing heatup/cooldown curves. The new OMS enable temperature was determined in accordance with NRC Branch Technical Position RSB 5-2, "Overpressure Protection of Pressurized Water Reactors While Operating at Low Temperatures," Revision 1, November, 1988. The new OMS

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enable temperature, corrected for instrumentation inaccuracies, is 316°F. Additional information about the determination of the enable temperature will be provided in the OMS amendment application. Until the amendment application is approved, we will retain the current 360°F enable temperature required under the existing specifications.

Design Basis for RV-206

RV-206 is a Crosby Model J4 JB-35-TD, 2.5 in. Type E relief valve, located on the discharge header from the RHR pumps, discharging to the Pressurizer Relief Tank. The design flowrate for RV-206 assumed in the OMS analysis is 469 gpm at 550 psig, with a 10% accumulation (setpoint of 500 psig at 70°F). This exceeds the flow capacity provided by the operation of a single PORV.

The flow rate and performance of the valve were verified by a test program with the manufacturer, Crosby Valve and Gage Company. Backpressures in excess of 120 psig were developed in the discharge piping of the relief valve to simulate the combined effects of line losses and operation of the PRT rupture disk at 100 psig. The tests were performed at temperatures and pressures which bound the actual pressures and temperatures of the RCS/RHR system during an overpressure transient. The tests included high temperature flow measurements which confirmed the flow rate utilized in the analysis was conservative. The relief capacity demonstrated during the tests was also considerably more than the design rating and the capacity assumed in the analysis.

Overpressure Protection Provided by RV-206

RV-206 is connected to the RCS whenever the RHR system is placed in service, and will provide overpressure protection for both the reactor vessel and the RHR system. The RHR system would normally be placed in operation at about 350°F and 350 - 400 psig. To comply with the existing Technical Specifications, it is aligned to the RCS whenever the RCS is below the OMS enable temperature of 360°F. Since RV-206 is a passive component, it is not subject to single failure. We confirmed by calculation that an adequate flow path to RV-206 would be maintained in the event of a failure of other RHR or RCS components.

The maximum RHR system pressure is limited by the design of the RHR heat exchanger. The design pressure of the RHR heat exchanger is 500 psig which limits the maximum allowable pressure to 110% of the design, or 550 psig. The OMS analysis considered RCS overpressure transients caused by mass addition or thermal energy input from the steam generators which would also affect the pressure in the RHR system. The setpoint of RV-206, 500 ± 15 psig, was shown to maintain pressure within both the requirements of 10 CFR 50 Appendix G and the design limits of the RHR system. The worst case mass addition transient analyzed was the operation of a charging pump at 420 gpm and 500 psig pressurizer pressure. The analysis confirmed that RV-206 had

sufficient capacity for these conditions at an RCS temperature of 388°F, which is well above the new OMS enable temperature of 316°F. The valve test also confirmed that the flow capacity of RV-206 increases with decreasing fluid temperature. Limitations have been placed on charging flow to assure potential failures of the loop injection valves (FCV-1115 A through F) would not cause charging flow to exceed 420 gpm.

For the overpressure transient due to thermal energy addition, the analysis determined the maximum temperature difference between the RCS and steam generators that would allow RV-206 to maintain the RHR system within the maximum pressure limits. The attached operating limit curve, "RCP Start Allowable Steam Generator to RCS Delta-T," replaces the current administrative limits for starting a single RCP and will also be submitted with the proposed Technical Specifications.

The analysis also considered start of an RCP with an intermediate pressurizer level. The previous administrative controls were based on an earlier Westinghouse analysis which did not credit flow through RV-206. The resultant pressurization rates of the Westinghouse analysis are well within the boundaries of the new OMS analysis. The restrictions on pressurizer level, and RCS to Steam Generator temperature difference shown on the attached curve were conservatively selected to be within the limits of the Westinghouse analysis.

Revised Administrative Controls

The administrative controls will limit low temperature operation of the RCS and assure overpressure protection for the RHR system until the proposed OMS Technical Specifications are approved. These controls are within the limits of the existing Technical Specifications. The revised controls are:

- Starting of a single RCP will be limited by the attached curve. The curve replaces the discrete limits on RCS to Steam Generator temperature differential in the current administrative controls (Reference B) to allow RCP starts over a range of conditions. The curve is more restrictive than the existing Technical Specifications.

- The OMS enable temperature will remain at 360°F until the new Technical Specifications are approved. The PORV actuation setpoint will be ≤ 500 psig, in accordance with the existing specifications. We will continue to align the RHR system, and RV-206, to the RCS prior to cooling down below the OMS enable temperature of 360°F.

- We will retain the existing administrative control restricting operation to a single charging pump below the OMS enable temperature of 360°F.

- When operating below the OMS enable temperature of 360°F, the charging flow rate through the charging flow control valve will be limited to ≤ 150 gpm, and the seal injection flow rate will be limited to ≤ 75 gpm, with FCV-1115D, FCV-1115E and FCV-1115F closed and prevented from opening. With the charging flow control valve isolated, or closed and prevented from opening, charging through the seal injection path is limited to ≤ 150 gpm total through one of the three valve pairs, FCV-1115A/D, FCV-1115B/E, or FCV-1115C/F. Only 1 of FCV-1115D, E or F shall be used and the other two valves will be isolated or closed and prevented from opening. We will require action to restore these limits within one hour, in the event they are exceeded.

- We will continue to observe the appropriate action statement requirements of the existing Technical Specifications governing the PORVs. Additionally we will follow the actions specified by Technical Specification 3.20, Action Statement C for RV-206.

- Since we will rely on RV-206 to provide overpressure protection, we will remove the current administrative requirements associated with the PORVs (Reference B). These are the recalibration of the pressurizer pressure transmitters, alignment of an air compressor from Train A to the PORVs, and the restrictions on alignment of the vital busses and transfer switches.

Summary

The new OMS design basis credits the operation of the RHR system relief valve RV-206 for low temperature overpressure protection of both the reactor vessel and the RHR system. We have analyzed the response of RV-206 to both mass addition, and thermal energy induced overpressure transients and have determined that RV-206 meets the design requirements for OMS without requiring operation of the PORVs. We expect to submit an amendment application prior to May 1, 1991, to revise the Technical Specifications consistent with the new OMS design basis and heatup/cooldown curves. We had planned to submit the amendment application prior to restart from the current Cycle 11 refueling outage, however we have found it necessary to place priorities on the requirements of the outage. The administrative controls in this letter will

assure the limits of the OMS analysis are maintained, until the amendment application is approved.

If you have any questions or require additional information, please contact me.

Very truly yours,

Attachment

cc: J. B. Martin, Regional Administrator, NRC Region V
C. Caldwell, NRC Senior Resident Inspector, San Onofre Units 1, 2 and 3
C. D. Townsend, NRC Resident Inspector, San Onofre Unit 1

ATTACHMENT

RCP START ALLOWABLE STEAM GENERATOR TO RCS DELTA-T