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SUBJECT: Forwards addl info re Generic Ltr 83-10 & NUREG-0737,Item II.K.3.5 re reactor coolant pumps,per 850506 request.

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June 5, 1985

Director, Office of Nuclear Reactor Regulation
Attention: Mr. George W. Knighton, Branch Chief
Licensing Branch No. 3
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Subject: Docket Nos. 50-361 and 50-362
San Onofre Nuclear Generating Station
Units 2 and 3

The purpose of this letter is to provide the additional information requested in your letter of May 6, 1985 regarding Generic Letter 83-10 and NUREG-0737 Item II.K.35. The specific information requested is provided in Enclosure 1.

If you have any questions or comments, please let me know.

Very truly yours,

M. O. Medford

cc: Mr. J. B. Martin, USNRC Region V Administrator
Mr. H. Rood, USNRC (to be opened by addressee only)
F. R. Huey (USNRC Senior Resident Inspector, Units 1, 2 and 3)

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RESPONSE TO NRC QUESTIONS

Question 1

Does any containment isolation signal result in the termination of systems essential for continued operation of the reactor coolant pumps? If so, identify the signals and systems affected.

Response

A containment isolation actuation signal (CIAS) results in interruption of cooling water to the Reactor Coolant Pump (RCP) motors and seals. Cooling water supply to RCP seals and motors is considered a non-essential function of the Component Cooling Water System (CCWS). Typically, during emergency operation, the non-essential portion of the CCWS is taken out of service, thereby allowing the remainder of the CCWS to serve those components essential to safe shutdown of the plant (e.g., HPSI pumps). Non-essential CCW could be restored in order to support operation of the RCP during a "trip two/leave two" strategy or to enhance seal life. However, it should be emphasized that, although a RCP "trip two/leave two" strategy may provide the most effective plant cooldown, plant operations are bounded by FSAR analyses which do not credit RCP operation. In addition, cooling water supply to an idle pump is not considered to be required to maintain pump and seal integrity.

Question 2

If essential water services are terminated, provide a description of the operator guidelines, training and procedures in place (or to be implemented) which assure that these services are restored in a timely manner to prevent seal damage or failure once a non-LOCA situation has been confirmed.

Response

Emergency Procedure Guidelines (CEN-152, Rev. 2), developed by C-E which have been approved for implementation by the NRC, provide guidance with respect to maintenance of auxiliary systems which support RCP operation. This guidance, (which is to be implemented at the startup following the next refueling outage scheduled to occur six months or more subsequent to NRC approval of the Rev. 2 guidelines) in combination with associated training materials and operating procedures, meets the operators' information needs concerning RCP seal protection. The following excerpt was obtained from CEN-152 training material prepared for the CE Owner's Group (CEOG):

" ... the RCP operating strategy results in tripping the final two RCPs if RCP operating limits are not satisfied. The RCPs may be operating in a pressure-reduced RCS and, in some cases, degraded containment conditions are also possible. This could result in the loss of vital RCP auxiliaries. The operator must continuously monitor RCP operating limits (e.g., temperatures, seal flow, oil pressures, NPSH, motor amperage, vibration) and trip the remaining two RCPs if concerned about RCP operating equipment integrity."

A CIAS results from LOCA events or Main Steam Line Break (MSLB). For these events, Standard Post Trip Actions in the EPGs include guidance for tripping two RCPs in opposite loops if pressurizer pressure decreases below a specified value. For a LOCA situation, operators are instructed to trip all four RCPs (i.e., the remaining two RCPs).

Should a non-LOCA situation be confirmed (e.g., SGTR, excess steam demand), the operators are instructed to ensure that two of four RCPs are tripped in opposite loops if pressurizer pressure decreases below a specified value. Additional instructions associated with operating RCPs include the following guidance:

"<u>If</u> RCP operating limits are not satisfied, <u>Then</u> trip the remaining two RCP's."

This step is performed continuously. Plant specific RCP operating limits (for operating pumps) include a specified time period (typically ten minutes) during which CCW may be unavailable for seal cooling. If seal cooling cannot be reestablished, the pumps are tripped to preclude any potential impact on future seal performance. Plant specific operating limits are developed from, and consistent with, guidelines provided by C-E and the pump manufacturer.

If all RCPs were stopped, the EPGs provide guidance for RCP restarts, provided all restart criteria are satisfied. For example, the following step appears in the SGTR emergency procedure guideline:

"<u>If</u> the RCPs were stopped, <u>then</u> one in each loop should be restarted if possible. Determine whether RCP restart criteria are met by the following:

a) the unaffected steam generator (or the least affected, if both steam generators have leaks) is available (feed and steam flow) for removing heat from the RCS.

b) pressurizer level is greater than 200" and not decreasing.

c) The RCS is at least 20°F subcooled.

This step is performed continuously. As discussed earlier, training materials indicate what parameters constitute operating limits.

In conclusion, in context of the RCP trip-two/leave-two strategy, if the operator is unable to maintain or restore RCP measured parameters within operating limits (e.g., seal temperature), the RCPs will be tripped or remain tripped. The effects of this situation are addressed in the EPGs and are bounded by FSAR safety analyses which do not credit RCP operation. Sufficient guidance is therefore provided to the operator to preclude pump operation outside the pump operating limits. In addition, C-E plant operating experience and pump tests support assurance of seal integrity in the event of loss of CCW to an idle pump. In operating C-E plants, there has never been a complete loss of seal function. Complete loss of seal function is defined as failure of all three full pressure seals and the vapor seal, the result being the inability of the multi-stage seal package to hold system pressure, and is not considered to be a credible event.

Question 3

Provide confirmation, including the technical basis, that containment isolation with continued RCP operation will not lead to seal or pump damage or failure.

Response

As discussed in the response to Question 2, operator instructions in the EPGs and associated training materials preclude a situation where a plant would be operating its RCPs outside the RCP operating limits. However, in the highly improbable event that the operator inadvertently fails to follow RCP operating instructions and maintains RCP operation outside operating limits (e.g., without seal cooling), it should be realized that these limits were developed with the intent of being conservative with respect to seal reliability and performance. In addition, operating experience and the results of a thirty-minute loss of seal cooling water test with the pump running substantiate the position that RCPs can operate without loss of seal function for time periods significantly in excess of the time periods defined in plant specific RCP operating limits.

Question 4

Since RCP trip will be required for LOCA events, assurance must be provided that RCP trip, when required, will occur. To address this concern, provide the following information:

a) Identify the components required to trip the RCPs. Include relays, power supplies and breakers. Address reliability and alternate trip methods.

b) If necessary, as a result of the location of any critical component, include the effects of adverse containment conditions on RCP trip reliability. Describe the basis for the adverse containment parameters selected.

Response

a) Each reactor coolant pump (RCP) is supplied power through its individual 6.9 kV breaker and the bus supply breakers. (There are two RCPs per bus.) These breakers can be tripped automatically, remote-manually and locally at the breaker (switchgear) cubicle. The breakers are located with their 6.9 kV bus in panels A01 and A02 in the 45 ft. and 63 ft. elevation of the penetration areas outside containment. The undervoltage sensors are also located in panels A01 and A02 and are connected directly to the breakers.

The switches utilized in remote-manual tripping of individual RCPs are located in the control room and also on the control room evacuation shutdown panel. Both of these switches are wired directly to the RCP breakers. The switches utilized in remote-manual tripping of the bus supply breakers are also located in the control room and are directly wired. Control power to trip the RCP supply breakers is 125V DC power supplied directly from the station batteries. Control power to trip the 6.9 kV bus supply breakers is 125V DC power supplied directly from the station batteries of the other unit.

Thus, there are three means of tripping the RCPs from three separate locations. In addition, the RCPs can be tripped via their individual supply breakers, or via the bus supply breakers which have an independent source of control power. The RCP trip paths are therefore considered to be highly reliable.

b) All components required to trip the RCPs are located outside containment such that containment parameters are not considered to directly affect RCP tripping.