Southern California Edison Company

P. O. BOX 800
2244 WALNUT GROVE AVENUE
ROSEMEAD, CALIFORNIA 91770

M.O. MEDFORD
MANAGER, NUCLEAR LICENSING

TELEPHONE
(213) 572-1749

January 27, 1984

Director, Office of Nuclear Reactor Regulation
Attention: Mr. H. R. Denton
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Gentlemen:

Subject: Docket No. 50-206
Amendment No. 112
San Onofre Nuclear Generating Station
Unit 1

Reference: SCE letter dated September 7, 1983, R.W. Krieger to H.R. Denton

Amendment No. 112, submitted by letter dated July 20, 1983, and later revised and resubmitted by the referenced letter, consists of Proposed Change No. 120 to the Technical Specifications incorporated into Provisional Operating License No. DPR-13 as Appendices A and B. Subsequent to this resubmittal, discussions with NRC reviewers resulted in the need to modify the Proposed Change in order to resolve concerns and provide clarification. These modifications were provided by letter dated October 25, 1983. Subsequent to this letter, additional discussions with NRC reviewers have resulted in the need to further modify the Proposed Change. These modifications are discussed below.

Proposed Technical Specification 3.8.A.4 establishes a minimum shutdown margin in the reactor coolant system (RCS) during reactor vessel head removal and while loading and unloading fuel. Currently, the proposed specification would require that a shutdown margin greater than 5% Δ K/K be maintained. Discussions with NRC reviewers have indicated a desire to include, in addition to this requirement, a provision for a minimum boron concentration in the RCS. This additional restriction is intended to provide assurance that an adequate shutdown margin will be maintained during refueling operations (Mode 6). The proposed specification has been revised to require that the more restrictive of these reactivity conditions be met during Mode 6. The areas of the Proposed Change where this additional requirement has been incorporated are provided in the enclosure.

Modifications to the Basis for Technical Specification 3.8 were provided in our October 25, 1983 letter. Through an oversight, the last four words of the first sentence of this Basis ("with all rods inserted") were not removed in accordance with our previous discussions. Please note that these words have now been removed.

A001
1/1

In addition to the above discussed modifications to the Proposed Change, you have requested additional information regarding the Proposed Change Safety Analysis. This information is provided below:

1. In the referenced letter, it is stated that the maximum charging flow is 195 gpm for one charging pump and 225 gpm for both charging pumps running. However, in the FSAR it is stated that the charging flow is 213 gpm per pump at 2300 psig system pressure. Justify using the flows in the referenced letter in light of the FSAR information.

   Response:

   The flow rate of 213 gpm is the design capacity of one charging pump at 2300 psig system pressure. This flow rate was obtained from the charging pump performance curve which does not take into account losses due to system resistance. The flow rates stated in the referenced letter were identified as the charging flows for one and both charging pumps running, respectively. Subsequent review has revealed that these flows are due to one and both primary plant make-up pumps delivering directly to one charging pump suction at atmospheric pressure with all valves wide open. The addition rate is limited to less than 225 gpm for both makeup pumps and 195 gpm for a single pump. However, in order for water to be delivered to the RCS at this rate a charging pump would have to be running. Based on the configuration that whenever a charging pump is running the charging flow will be regulated by FCV-1112, it can be assumed that supplying additional water to the suction side of the charging pump (i.e., failure of FCV-1102A) will not significantly increase the flow of water into the RCS. Based on the discussion provided in Response 4, this configuration is determined to be acceptable.

2. In the referenced letter, reliance is placed on an alarm that sounds if two primary plant makeup pumps (PPMP's) are operating simultaneously. However, if only one PPMP is operating, the dilution to criticality may take longer but, on the other hand, the two PPMP-running alarm will not alert the operator. Therefore, the dilution may go unnoticed for some time. Explain why the two PPMP's running event is worse than the one PPMP running event.

   Response:

   The one PPMP running event was considered to be less severe than the two PPMP running event based on the postulation that one PPMP running injection rate would be approximately one half that of two pumps running. Additional investigation has determined that at these pressures one PPMP will supply almost the same flow rate as both pumps. Based on this consideration, and the lack of immediate alarms, this event is considered to be more severe than the two PPMP

In Mode 5, whenever a charging pump is being used (e.g., testing of the pump), flow is controlled by FCV-1112. Postulating the single failure of FCV-1102A, there will be only a slight increase of flow through FCV-1112. Since the discharge pressure of the PPMP's is higher than the pressure on the suction side of the charging pump, and any additional flow will be restricted by FCV-1112, flow will be forced into the VCT. Assuming a conservative case where the charging pump is limited to 90 gpm (letdown flow into the VCT would be controlled to coincide with the charging flow) and subsequent to valve failure, suction is taken from only the demineralized water source, the level in the VCT will increase due to the letdown flow. The VCT high level alarm is annunciated at 48% level. Based on a letdown flow of 90 gpm and initial level of 30% in the VCT the high level alarm will actuate in less than 5 minutes. Continuing to dilute the RCS at this rate it will take approximately 55 additional minutes to reach criticality. This is within the acceptance criteria of the SRP.

At any time when a charging pump is running, flow will be restricted by FCV-1112 to prevent cavitation of the pump. Based on this configuration, any additional inventory resulting from a single valve failure will result in an increase in the VCT level and actuate the high level alarm relatively early into the boron dilution event.

If you have any questions or desire additional information in this regard, please contact me.

Very truly yours,

M. O. Medford

Enclosure

cc: J. O. Ward, Chief, Radiological Health Branch,
State Department of Health Services

running event. Based on our investigation discussed below, the time available for operator action is greater than 30 minutes in accordance with the requirements of the Standard Review Plan (SRP).

Under normal Mode 5 operating conditions, the VCT is pressurized to force flow into the RCS (conservatively assumed to be drained to mid loop). The pressure is normally maintained at approximately 30 psig which results in a circulating flow of approximately 25 gpm. Assuming the single failure of FCV-1102A and knowing the discharge pressure of the PPMP, water will be forced into the circulating flow. This additional inventory will be added to both the RCS and the VCT. For purposes of our investigation, it was assumed that all of the demineralized water goes to the RCS and the discharge flow out of the VCT is zero. This would be the most conservative case and, based on the plant configuration, is considered highly improbable. However, regardless of these flow characteristics, the existing letdown rate will not change (i.e., 25 gpm). If the initial level of the VCT is 30% and the high level alarm is at 48% (of level), this alarm will be actuated in approximately 15 minutes. Based on the fact that a dilution rate of 70 gpm will require approximately 80 minutes to result in criticality, there is still 65 minutes for operator action.

As noted above, this would be the scenario for normal Mode 5 operating conditions. However, there are no administrative controls to maintain a letdown/charging flow at a specific rate. Based on this consideration, it would be possible to have smaller letdown flows which would result in longer durations before the VCT high level alarm is actuated. However, assuming the failure of FCV-1102A, smaller letdown/charging flows would result in an increase in the amount of water forced back into the VCT because of the much higher discharge pressure of the PPMP. In order to analyze the one PPMP running event and determine the worst case accident scenario, it would be necessary to do a parametric analysis of the flow characteristics for various letdown/charging flows subsequent to failure of FCV-1102A. Because the one PPMP running event was not previously analyzed, the alarms denoted in our previous analyses were determined to be adequate to alert the operator of the dilution event with sufficient time before loss of shutdown margin to satisfy the SRP. An additional alarm, not taken credit for in our previous analyses, is the source range high neutron count rate alarm. This alarm annunciates when the neutron count rate exceeds twice background (i.e., count rate doubles). Based on the principles of subcritical multiplication, the neutron count rate will double when the shutdown margin is decreased by approximately one-half. As stated above, a dilution rate of 70 gpm will require approximately 80 minutes to result in criticality. Conservatively assuming that the rate at which the shutdown margin is decreased is linearly proportional to the rate of dilution, it will take approximately 40 minutes to decrease the shutdown margin from 5% to 2.5% (at which time the neutron count rate will have doubled) and activate the source range high neutron count rate alarm. This leaves 40 minutes before loss of shutdown margin which satisfies the requirements of the SRP.

It should be noted that if the letdown system is not in service, there are administrative controls that isolate the charging line, thereby eliminating this dilution path.

3. According to the plant's FSAR, there is a VCT low-low level alarm. Please verify whether that is an audible alarm and whether you can take credit for it in the boron dilution analysis.

Response:

There is an audible low level alarm when the level in the VCT reaches 30% if the chemical blending device is not in automatic. If the blend device is in auto, this alarm will not annunciate in the control room; however, a separate audible alarm will annunciate in the control room when the level in the VCT reaches 22%. Based on the plant configuration discussed below, the 22% alarm would not be indicative of a boron dilution transient more severe than those previously analyzed.

The VCT is normally filled with RCS inventory. Assuming a spurious actuation of a charging pump and FCV-1112 was wide open, water could be delivered to the RCS at a rate of 320 gpm. However, this would only be a dilution event if the VCT was filled with demineralized water. Injection of water at this rate will cause the level in the VCT to rapidly decrease. When the level in the VCT decreases to 20%, there is an automatic switchover which isolates the VCT and transfers the pump suction from the VCT to the refueling water storage tank (RWST). The RWST is filled with approximately 220,000 gallons of water having a boron concentration of not less than 3750 ppm and not greater than 4300 ppm. Based on this configuration, dilution of the primary system would be automatically terminated when the VCT level reaches 20%. Since the quantity of demineralized water injected into the RCS is not sufficient to deplete the 5% shutdown margin this scenario is determined to be acceptable.

4. Considering the charging flows obtained from 1 above, and the PPMP operating configuration, calculate the time from the first alarm until criticality is attained.

Response:

The charging flows stated in 1 above are based on hypothetical situations which were considered to be the worst case accident scenarios. As stated in Response 1, these charging flows are a result of one and both PPMP's discharing directly to the charging pump suction. However, as explained below, these charging flows will not result in a single failure boron dilution transient more severe than those previously analyzed.