Southern California Edison Company

23 PARKER STREET

IRVINE, CALIFORNIA 92718

WALTER C. MARSH
MANAGER OF NUCLEAR REGULATORY AFFAIRS

TELEPHONE
(714) 454-4403

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

Gentlemen:

Subject: **Docket No. 50-362**
Reactor Water Level Probe Inoperability
San Onofre Nuclear Generating Station
Unit 3

Reference: Generic Letter 88-17, dated October 17, 1988, Subject: Loss of Decay Heat Removal

The purpose of this letter is to inform the NRC of Southern California Edison's (Edison's) planned course of action to address inoperability of the San Onofre Unit 3 reactor coolant system Reactor Water Level Probe during Unit 3 Cycle 8 and the Unit 3 Cycle 9 Refueling Outages. This operational change is needed while a root cause evaluation of two consecutive Reactor Water Level Probe failures is being completed and improvements are implemented.

BACKGROUND:

San Onofre Units 2 and 3 are each provided with five methods to determine reactor coolant system water level: (1) Refueling Water Level Indication, (2) the Reactor Water Level Probe, (3) the Heated Junction Thermocouple Probes, (4) the Reactor Vessel Water Level Sightglass, and (5) water inventory control. Each of these methods is described below. The figure provided in the Enclosure illustrates the range of each of the methods (relative to the reactor vessel hotleg) and the location of the thermocouples for the Reactor Water Level Probe and Heated Junction Thermocouple Probes.

Refueling Water Level Indication

The Refueling Water Level Indication (RWLI) system provides the primary control room indication for monitoring the Reactor Coolant System level during reduced inventory operations in Modes 5 and 6. There are two differential pressure transmitters, one wide range and one narrow range. The wide range and narrow range transmitters share common reference legs, which are connected to a drain line on the hotleg and to a vent on the pressurizer. An adjustable Hi/Lo level alarm is provided for each differential pressure loop which actuates a common alarm in the control room. The RWLI is only connected during Modes 5 and 6. During Modes 1 through 4 the RWLI instrumentation piping is isolated and capped off.

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Reactor Water Level Probe

The Reactor Water Level Probe (RWLP) provides a secondary means of control room indication for monitoring the reactor coolant system level during reduced inventory operations in Modes 5 and 6. The RWLP is a heated junction thermocouple based reactor vessel water level detection probe which resides in an in-core instrument guide path and provides inputs to the Critical Functions Monitoring System (CFMS) for monitoring the reactor vessel water level during reactor coolant system reduced inventory operations. Heated junction thermocouples are spaced three inches apart from five inches below the top to four inches above the bottom of the hotleg in the hotleg region (see enclosed figure). The presence of water at a specific elevation is detected by monitoring the temperature difference between the heated junction thermocouple and the bulk water temperature. In addition to control room indication, the RWLP also provides an adjustable low level alarm via the CFMS. The RWLP remains in the reactor vessel during Modes 1 through 5, however it is only used during Mode 5. The RWLP is attached to the reactor vessel upper guide structure and removed with it during refueling.

Heated Junction Thermocouple Probes

The Heated Junction Thermocouple (HJTC) Reactor Vessel Level Monitoring System provides another alternate indication of reactor vessel water level. Two safety-related HJTC probes are provided (Channels A and B). The HJTC probes remain in the reactor vessel during Modes 1 through 5 to provide direct reactor vessel water level indication and are primarily used during design basis accident conditions. Each HJTC probe has eight sensors. Three of the eight sensors are located at 42, 21, and 0 inches above the bottom of the hotleg. During reduced inventory operations the 21-inch sensor provides a control room low level indication and alarm.

Reactor Vessel Water Level Sightglass

A sightglass is installed during Modes 5 and 6 to provide direct reactor vessel water level indication. The sightglass, which must be read locally, is located inside containment. The sightglass uses the same common reference legs as the RWLI narrow range and wide range transmitters.

Water Inventory Control

San Onofre has performed extensive benchmarking of the water inventory required to change water level from one level to another. The volume of water removed from the reactor vessel is monitored closely when the reactor coolant system is drained for reduced inventory operations. San Onofre has had excellent success and agreement between actual conditions and expected values when using the benchmarking described above. This method represents an additional diverse measure to validate the reactor coolant system level control during drain down.

Regulatory Commitments

Generic Letter (GL) 88-17, Loss of Decay Heat Removal, (Reference) recommends the following:

> "Provide at least two independent, continuous RCS water level indications whenever the RCS is in a reduced inventory condition."

Edison met this recommendation by installing the RWLP as the second independent reactor coolant system water level indicator. The RWLI is the primary level indicator. The NRC accepted the RWLP in Inspection Report Nos. 50-361/91-34 and 50-362/91-34 as meeting the recommendation in GL 88-17. The Units 2 and 3 Updated Final Safety Analysis Report states Edison's use of the RWLP as a backup to the RWLI to meet the recommendation in GL 88-17.

Previous to installation of the RWLP, Edison used the HJTC probes for alternate reactor coolant system level indication for levels above 21 inches above the bottom of the hotleg (i.e., above HJTC point No. 6). The NRC staff, however, noted that the HJTC probe did not have the level resolution necessary for all reduced inventory operations and thus did not satisfy the recommendation in GL 88-17.

DISCUSSION:

Refueling Water Level Probe Inoperability

On November 26, 1994, during a routine quarterly test of the RWLP heater, all three heater leg fuses blew. This test failure indicated that the RWLP, which is only used during Mode 5, was not functional. Subsequent investigation identified low insulation resistances between the RWLP thermocouples, heaters, and shield which caused the fuses to blow.

Edison is continuing its investigation of the cause of RWLP failure and repair efforts; however, these efforts are not expected to be completed in time for the RWLP to be restored to operability during Unit 3 Cycle 8 and the Unit 3 Cycle 9 Refueling Outage. The Unit 3 Cycle 8 Refueling Outage is currently scheduled to begin in July of 1995.

Planned Compensatory Actions

It is planned to perform the Unit 3 Cycle 8 and 9 Refueling Outages and any unscheduled reactor coolant system reduced inventory operations during Unit 3 Cycle 8 without the RWLP probe with the provision that the following compensatory measures be implemented:

1. Provide an Alternate Method of Correlating RWLI

   When decreasing reactor coolant system level the RWLI narrow range indication will be correlated using an alternate method. This method will utilize the reactor vessel water level sightglass.

2. Change Procedures for Operator Response to Abnormal Conditions

The water level during reduced reactor coolant system inventory operations is nominally well above 21 inches above the bottom of the hotleg (i.e., about 26 inches). This level is at least 3.5 inches higher than the current minimum water level. At the 21 inch level the time available for operator responses to abnormal conditions will be greater than it would be at the current minimum water level when the RWLP is operable.

In addition, the following will be implemented during reduced inventory operations while the RWLP is unavailable:

A. RWLI narrow range control room indication will be maintained functional; and

B. At least one channel with 21-inch (No. 6) HJTC Low Level indication and alarm will be maintained operable; and

C. If a HJTC probe 21-inch low level alarm is received, Operations will:

(1) stop draining; and

(2) validate the alarm using the other HJTC #6 (if available--if a second HJTC #6 is not available then the alarm will be assumed valid); and

(3) if the alarm is valid, add water until the alarm clears.

If a second 21-inch HJTC probe low level alarm is received during the same midloop operations, Operations will immediately refill and maintain level above 21 inches using a method which is independent of RWLI (e.g., HJTC #5 at 42 inches above the bottom of the hotleg, a camera positioned within the steam generator, or through some other means).

These actions will be taken until RWLI instruments are verified to be operable.

Acceptability of Edison's Proposed Course of Action

A Probabilistic Risk Assessment (PRA) was performed to determine the incremental probability of a loss of shutdown cooling event due to an inoperable RWLP. (The loss of shutdown cooling event is the event the RWLP helps to prevent.) The results showed that, with implementation of the planned compensatory measures, performing reduced inventory operations while the RWLP is inoperable will result in a negligible increase in the probability of a loss of shutdown cooling event.

A 10 CFR 50.59 Safety Evaluation found that, with implementation of the planned compensatory measures, operation in a reduced inventory condition with

the RWLP inoperable does not present an unreviewed safety question. Based on implementation of the proposed compensatory measures, the results of the PRA, and 10 CFR 50.59 analyses, Edison concludes that using the HJTC probe as a backup to the RWLI during the period that the RWLP is inoperable and under repair is acceptable.

Previous Edison reactor coolant system reduced inventory practices included reducing the reactor coolant system water level to as low as 17.5 inches above the bottom of the hotleg. Operation with the reactor coolant system water level this low required operation within an area in which the HJTC probes do not provide indication. Raising the midloop level was made possible in 1993 when the level required for installing nozzle dams was increased from 17.5 to 26 inches by procurement of a new type of nozzle dam which is positioned higher in the steam generators. This change has significantly reduced the risk associated with midloop operations and has made it possible to utilize the HJTC probe as backup to the RWLI while at midloop when the RWLP is out of service. This increase in midloop operating level gives further assurance of the acceptability of use of the HJTC probe as a backup to the RWLI during the period that the RWLP is inoperable and under repair.

In addition to the above, existing station procedures require at least two means of providing inventory makeup during reduced inventory operations (this requirement is normally met by maintaining one High Pressure Safety Injection (HPSI) pump operable and one additional HPSI or Containment Spray pump available).

SUMMARY:

Edison believes it is acceptable to perform reduced inventory operations with the RWLP probe inoperable for the following reasons:

- The primary means of reactor vessel water level indication (RWLI wide and narrow range indication) will be available and is reliable; and
- The reactor vessel water level sightglass is normally monitored while reducing reactor vessel level and will be monitored when reducing reactor vessel until the level is stable and correlates satisfactorily; and
- The HJTC probe provides an independent indication of an unanticipated reactor coolant system draindown and will alert operators to such an event; and
- The minimum reactor coolant system level during reduced inventory operations will be increased by 3.5 inches to 21 inches above the bottom of the hotleg; and
- Operating procedures will be modified to improve operator response to unanticipated reactor coolant system draindown events; and
- A PRA analysis and a 10 CFR 50.59 Safety Evaluation show that performing reduced inventory operations while the RWLP is inoperable with the

compensatory measures in place will result in a negligible increase in the probability of a loss of shutdown cooling event and that such operation does not present an unreviewed safety question.

Edison plans to examine the failed Unit 3 RWLP probe to confirm the suspected failure mechanism after it is removed during the Cycle 8 refueling outage. It is expected that an improved reduced inventory level monitoring system will be available for installation by the end of the Unit 3 Cycle 9 Refueling Outage.

If you have any questions or would like additional information on this subject, please let me know.

Sincerely,

Walter C. Marsh

Enclosure

cc: L. J. Callan, Regional Administrator, NRC Region IV
A. B. Beach, Director, Division of Reactor Projects, Region IV
K. E. Perkins, Jr., Director, Walnut Creek Field Office, NRC Region IV
J. A. Sloan, NRC Senior Resident Inspector, San Onofre Units 2 & 3
M. B. Fields, NRC Project Manager, San Onofre Units 2 and 3

ENCLOSURE

DEPICTION OF SAN ONOFRE UNITS 2 AND 3
LEVEL INDICATION INSTRUMENTATION

COMPARISON OF SAN ONOFRE UNITS 2 AND 3
REACTOR COOLANT SYSTEM
LEVEL INDICATION INSTRUMENTATION