Southern California Edison Company

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September 16, 1980

U. S. Nuclear Regulatory Commission
Region V
Office of Inspection and Enforcement
Suite 202, Walnut Creek Plaza
1990 North California Blvd.
Walnut Creek, California 94596

Attention: Mr. R. H. Engelken, Director

Docket No. 50-206
San Onofre Unit 1

Dear Sir:

By letter dated September 2, 1980 you were notified of a potential design problem with the sequencer system at San Onofre Unit 1. This letter provides a written followup and is submitted in accordance with Specification 6.9.2.a of the San Onofre Unit 1 Technical Specifications.

The September 2, 1980 letter indicated that under a certain sequence of events involving safety injection and loss of offsite power, the sequencers would attempt to load the safety injection loads simultaneously onto the diesel generators as opposed to sequentially as they are designed to do in the event of safety injection and loss of offsite power. This design problem was discovered by performing various accident scenarios on the sequencer test box utilizing a sequencer circuit board. Subsequently, tests have been performed on one of the sequencers to verify the results obtained from the test box. The results of these tests are discussed in detail below.

The sequencer system at San Onofre Unit 1 is designed to actuate the safety injection system upon receipt of a safety injection signal (SIS). The SIS is initiated at a pressurizer pressure below 1,685 psig or a containment pressure above 2 psig. Upon receipt of the SIS, the sequencers automatically start the diesel generators and simultaneously load the safety injection loads onto their respective busses. Under a loss of offsite power (LOP) condition without a SIS, the sequencer system is designed to automatically start the diesel generators but not load the busses. In the event an SIS and an LOP (SISLOP) occur together, the sequencer system is designed to automatically start the diesel generators, place the diesel generators onto the 4 kV busses and sequentially load the safety injection equipment onto their respective busses.

During a normal reactor shutdown, to prevent actuation of the safety injection system when the pressurizer pressure reaches 1,685 psig, an alarm to alert the operator to block actuation of safety injection is initiated when pressurizer pressure reaches 1,750 psig. The operator manually blocks actuation of safety injection by placing the two safety injection block switches in the block position. This action will prevent the automatic (but not manual) actuation of the safety injection system and extinguish the alert to block alarm.

The main concern regarding the design and operation of the sequencer system involves the safety injection block switches. Following a loss of coolant accident (LOCA) the sequencers will automatically start the diesel generators and actuate the safety injection system as designed. Although not required for a safety function, as part of the emergency operating procedure the operator is instructed early in the accident to engage the block switches to the block position in order to silence the alert to block alarm. This action will block the safety injection actuation signal but will not interfere with proper operation of the safety injection system. In the event an LOP occurs following engaging of the block, the safety injection system loads will trip and the diesels will continue to run. However, the sequencers will not place the diesels on the 4 kV busses and begin automatic loading of the safety injection system since the safety injection actuation signal has been blocked. The operator will have to either manually load the safety injection equipment or manually initiate automatic actuation at the sequencer panels. The concern with this situation is that the flow of borated water to the reactor coolant system may be interrupted longer than necessary due to the safety injection system not being immediately loaded onto the diesel generators following an LOP.

Our September 2, 1980 letter indicated that the safety injection loads would be simultaneously loaded following the above sequence of events. This conclusion was based on tests conducted using the sequencer test box. These tests involved use of a sequencer circuit board but not the complete sequencer system. Based on the actual sequencer tests, it is concluded that the loads will not be loaded. Additional tests have been done on the sequencer test box to resolve the discrepancy between the test box results and the sequencer results.

In addition to the above design deficiency, there is another sequence of events identified during the sequencer tests which leads to an undesirable situation. As described above, when pressurizer pressure drops below 1,685 psig or containment pressure goes above 2 psig, the sequencers will automatically start the diesel generators and actuate the safety injection system as designed. Following successful operation of the safety injection system, it is postulated that pressurizer pressure and containment pressure return to their normal range. Subsequent to return of the SIS actuation parameters to normal, if an LOP occurs the safety injection system loads will trip and the diesels will continue to run. However, the sequencers will not place the diesels on the 4 kV busses and begin automatic loading of the safety injection system since the SIS parameters are in the normal range.

Actuation of the safety injection system will depend upon operator manual action or reaching of an SIS setpoint. Since the above sequence of events could occur for a small break LOCA or secondary line break, it would be desirable for the safety injection loads to automatically resequence.

In summary, the necessary automatic reloading of the safety injection loads following a LOP does not occur in either of the two events described above. The first sequence is due to early operation of the block switch. The second sequence is associated with events not in the design basis of the sequencer. We are presently developing design changes to correct both of the above conditions. These changes will be implemented prior to startup from the current outage.

If you have any questions on this matter, please call me.

Sincerely,

J. G. Haynes

J. G. Haynes
Manager of Nuclear Operations

cc: Director, Office of Management
and Information Program Control (2)