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Southern California Edison Company

P. O. BOX 800 2244 WALNUT GROVE AVENUE ROSEMEAD, CALIFORNIA 91770 December 28, 1982

ROBERT DIETCH

TELEPHONE 213-572-4144

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Director, Office of Nuclear Reactor Regulation Attention: D. G. Eisenhut, Director Division of Licensing U. S. Nuclear Regulatory Commission Washington, D. C. 20555

Gentlemen:

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ADOCK

PDR

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

The purposes of this letter are (1) to discuss an event which occurred on San Onofre Unit 3 on December 17, 1982, (2) to describe Southern California Edison Company (SCE) actions as a result of that event, and (3) to request NRC concurrence with power operation of San Onofre Unit 2 (up to and including Mode 1) and continuation of the Unit 3 startup test program.

Regarding the scenario for the December 17, 1982 Engineered Safety Features Actuation System (ESFAS) actuation event, the following describes the sequence of events:

Unit 3 was operational in Mode 5 (cold shutdown) with the reactor coolant system at 180°F and 350 psia. One reactor coolant pump was operating and shutdown cooling was being provided by one low pressure safety injection (LPSI) pump. At about 1405, two test technicians performing surveillances in the plant protection system (PPS) cabinet heard reactor protection system (RPS) rotary relays operate and upon investigation noted partial operation of RPS trip circuit breakers (TCB's). This phenomenon was attributed at the time to work which was being performed simultaneously in the control element drive mechanism control system (CEDMCS) cabinets. At about 1410, the same two test technicians heard relay operation in an ESFAS interface cabinet located directly behind the PPS and upon further investigation, noted that the light indicators on the ESFAS status panel showed actuation of all the ESFAS functions, except for emergency feedwater. The bistable trip channels, however, had not actuated. The control room annunciator for loss of power to the PPS was not illuminated. The event resulted in the running LPSI pump stopping, charging pumps starting and containment isolation. The high pressure safety injection (HPSI) and containment spray pumps were inoperative as allowed by technical

Mr. D. G. Eisenhut

December 28, 1982

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specifications. At 1445, operating personnel began resetting the ESFAS per procedure and by 1500 all systems were returned to normal. No equipment damage was experienced as a result of this event.

SCE initiated two parallel reviews to determine the cause of the subject event. The purpose of the first review was to identify design deficiencies which might explain the sequence of events observed at Unit 3. This review, which is being conducted by Combustion Engineering (CE), is described in Enclosure 1. The only potential cause identified by this review is a single connector (J-3109), disconnection of which would cause simultaneous actuation of all safeguards features including the recirculation actuation signal (RAS).

Subsequent examination of the Unit 3 connector indicated a firm connection secured by two screws. Attempts at repeating the actuation signals by manipulation of the connector were unsuccessful. An ongoing review of the remaining plant protection system design has revealed no other connectors with a similar problem. This review will be finalized by December 31, 1982. Although SCE does not consider this design configuration to be the source of the December 17, 1982 event, SCE will identify design changes resulting from this review (and the schedule thereof) in a letter to the NRC by January 14, 1982.

The purpose of the second review initiated by SCE was to identify any Unit 3 equipment anomalies which could have caused or initiated the Emergency Safeguards Features Actuation System (ESFAS). The PPS cabinets and associated equipment and power supplies were thoroughly examined. As a result of this review, two independent equipment problems were identified which together might have caused the event. An overheated circuit breaker was discovered in the "A" vital bus power supply feed to the PPS and two loose screws were found on the output lead connectors of the channel "D" matrix power supply. The simultaneous existance of these two problems could have resulted in a momentary interruption of the power to all the ESFAS actuation relays. Since the Emergency Feedwater Actuation System (EFAS) relays require a somewhat longer time to latch, it is not unexpected that these relays did not actuate. Since no other equipment configuration problems were discovered. SCE concluded that the power supply anomalies are the most probable cause of the event. A description of the actions taken by the Task Force which conducted this review is provided in Enclosure 2.

A summary of short term actions taken or to be taken by SCE to reduce the probability of recurrence on Unit 2 and Unit 3 of the spurious ESFAS signal experienced by Unit 3 on December 17, 1982 is as follows:

These steps are intended to specifically address the two potential causes of the event as identified in the reviews described above.

1. In conjunction with the PPS and ESFAS cabinet and equipment review, the PPS components on both Unit 2 and Unit 3 were verified to have tight power supply and cable connections.

December 28, 1982



- 2. The overheated "A" vital bus power supply circuit breaker was replaced, and all others were verified to be performing acceptably.
- 3. The J-3109 amphenol connector identified by CE as a potential cause of the event has been verified securely connected with the retaining screws in place, and all other cable connectors were verified securely fastened.
- 4. Administrative controls have been imposed on personnel access to the PPS cabinets. SCE has instituted specific steps to reduce even further the possibility of inadvertent actuation of ESFAS due to technician or maintenance personnel access to the cabinets. These controls include use of locking devices or dedicated security officers to prevent unauthorized personnel access to the cabinets. Access to the cabinets can be authorized only by the Watch Engineer and then only for required monthly surveillance or for a pre-planned repair. Upon authorization of access, the Watch Engineer is required to immediately inform the senior reactor operator in the control room who has been instructed on the potential for complete ESFAS actuation during the relatively brief period the cabinet is opened. The operator can then take rapid action if required to mitigate the consequences of simultaneous RAS.
- 5. Combustion Engineering is completing their design review. CE is presently performing an in-depth review of the PPS in an attempt to determine why the spurious signals occurred and what actions are appropriate to reduce the probability of reoccurrence. The reviews to date have revealed that similar ESFAS actuation including RAS actuation could be experienced if the J-3109 connector were momentarily disconnected. As a result, further reviews of all connectors in each channel are in process. It is expected that this effort will include an analysis of what signals would be present and their effect if the connector were disconnected.

During a meeting with SCE and CE on December 27, 1982, the NRC requested that SCE identify the basis for San Onofre Units 2 and 3 meeting General Design Criterion 35 concerning the effect of single failures on the emergency core cooling system. The design review described above did identify one component (the J-3109 connector) that contains signals, which acting in concert, could cause simultaneous Safety Injection Actuation Signal (SIAS) and RAS. This combination of signals, if not corrected by prompt operator action, could result in damage to both high pressure safety injection pumps. However, due to the mechanical and electrical configuration of the connector, the seismic qualification of the connector and the immediate short term administrative controls which have been placed on access to the cabinet in which the connector is located, SCE and CE do not consider that within the relatively short period of time prior to proposing and implementing a permanent design change, failure of this connector in such a way as to cause simultaneous SIAS and RAS actuation is a credible single failure. Therefore, Mr. D. G. Eisenhut

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SCE considers that neither the December 17, 1982 event at Unit 3 nor the results of the subsequent reviews constitute an impediment to safe plant operation and SCE requests NRC staff concurrence with proceeding to higher modes on both Units 2 and 3.

Very truly yours, Cobert Dietch

Enclosures

cc: R. H. Engelken, Director Office of Inspection and Enforcement Region V

> George W. Knighton (TO BE OPENED BY ADDRESSEE ONLY) Branch Chief Licensing Branch 3

Enclosure 1

COMBUSTION ENGINEERING DESIGN REVIEW

On the evening of December 17, 1982 Combustion Engineering, Inc. (CE) was notified by SONGS Unit 3 that two spurious Plant Protection System actuations had occurred. The first incident was a partial trip of the Reactor Protection System (RPS) resulting in the deenergization of four out of the eight Reactor Trip Circuit Breakers. The second incident, which occurred approximately 5 minutes later, was the complete actuation of all Engineered Safety Features (ESF) systems, with the exception of Emergency Feedwater Actuation System (EFAS).

The following morning a group was formed to evaluate the plant data and to postulate causes of the incidents. This review consisted of two areas of concentration. The first was to evaluate the data gathered and compare it with the system design to pinpoint areas within the design which could be suspect. Since a half trip condition was observed during the RPS incident without the presence of coincident bistable trips, the matrix logic became suspect. This was reinforced by the observed pattern of actuated trip circuit breakers (TCB 1, 2, 5 and 6). Identical indications can be seen upon deenergization of a matrix power supply or short circuiting of a matrix relay coil. However, the second incident resulted in a completed ESF system actuation. Review on a system level and a component level indicated that complete actuation of the system is not possible without multiple failures. Therefore the review proceeded to a second area of concentration which involved an evaluation of the equipment within the channel being tested. An evaluation of each of the electrical connectors used to form the matrix revealed that a momentary disconnection of one connector (J-3109) could result in the identical indications observed during the second incident. CE has therefore expanded their review and is presently analyzing each connector within the PPS to ensure that this same condition does not exist elsewhere in the system.

ENCLOSURE 2

SAN ONOFRE TASK FORCE REVIEW

As the result of the SONGS Unit 3 event of December 17, 1982 a Task Force headed by station personnel was formed to review the PPS equipment in the as-found condition, record the test technicians observations and attempt to identify equipment anomalies which could result in the observed event scenario. In addition, any corrective actions that resulted from this review were performed on both Units 2 and 3. These actions are summarized as follows:

- o The Task Force held an immediate event reconstruction meeting.
- Technicians conducted a 31-day surveillance of PPS to verify system operability.
- o A Channel Independence Test was performed on the PPS.

o Investigated all Vital Buses(VB) and Inverters.

- Replaced defective(high resistance contact) breaker on VB"A"[PPS Breaker 3Y102 on VB "A"].
- o Tightenedloose(1-1¹/₂ turn) screws on Power Supply 32(PS32) output.
- Concluded that conditions resulting from the defective 3Y102 breaker and PS32 screws were a possible cause of the event.
- Reviewed startup procedures for tell-tale anomalies. None were found.
- Unable to reproduce trips by agitating wire, connectors, etc. None were found.
- Monitored the DC power supplies' output, Units 2 and 3 with oscilloscope
 Satisfactory results were obtained.
- Monitored VB outputs on chart recorders. No indications of excessive noise.were found.

o Checked PPS for other loose screws, etc. None were found.

o Held Onsite Review Committee Meeting on December 24, 1982.