REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8301180081 DOC.DATE: 83/01/14 NOTARIZED: NO DOCKET #
FACIL:50-361 San Onofre Nuclear Station, Unit 2, Southern Californ 05000361
50-362 San Onofre Nuclear Station, Unit 3, Southern Californ 05000362
AUTH.NAME AUTHOR AFFILIATION
BASKIN,K.P. Southern California Edison Co.
RECIP.NAME RECIPIENT AFFILIATION
KNIGHTON,G.W. Licensing Branch 3

SUBJECT: Advises that commitments identified in util 821228 & 29 ltrs ESF actuation sys 821217 actuation event addressed.Short-term actions resulting from event satisfactorily implemented.

DISTRIBUTION CODE: B021S COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 10
TITLE: OR/Licensing Submittal: Combined General Distribution

NOTES:J Hanchett 1cy PDR Documents. ELD Chandler 1cy. 05000361
NRR Scaletti 1cy.
J Hanchett 1cy PDR Documents. ELD Chandler 1cy. 05000362
NRR Scaletti 1cy.

	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL
	NRR LB3 BC	05	1	1	NRR LB3 LA		1	0
	ROOD,H.	01	1	1				
INTERNAL:	ELD/HDS2		1	0	IE/DEP EPDS		1	1
	IE/DEP/EPLB		3	3	NRR/DE/CEB	09	1	1
	NRR/DHFS DEPY	12	1	1	NRR/DHFS/HFEB	16	1	1
	NRR/DHFS/LQB		1	1	NRR/DHFS/OLB		1	1
	NRR/DL DIR		1	0	NRR/DL/ORAB		1	0
	NRR/DL/SSPB		1	0	NRR/DSI/ADRS		1	0
	NRR/DSI/AEB	28	1	1	NRR/DSI/CPB	11	1	1
	NRR/DSI/CSB	10	1	1	NRR/DSI/ICSB	18	1	1
	NRR/DSI/METB	13	1	1	NRR/DSI/PSB	21	1	1
	NRR/DSI/RSB	25	1	1	REG FILE	04	1	1
	RGN5		1	1	RM/DDAMI/MIB		1	0
EXTERNAL:	ACRS	29	8	8	FEMA-REP DIV		1	1
	LPDR	03	1	1	NRC PDR	02	1	1
	NSIC	06	1	1	NTIS		1	1
NOTES:			3	3				

TOTAL NUMBER OF COPIES REQUIRED: LTTR 43 ENCL 36

Southern California Edison Company

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

K. P. BASKIN
MANAGER OF NUCLEAR ENGINEERING,
SAFETY, AND LICENSING

TELEPHONE
(213) 572-1401

January 14, 1983

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

References: 1) Letter from SCE (Dietch) to NRC (Eisenhut) dated December 28, 1982

2) Letter from SCE (Dietch) to NRC (Eisenhut) dated December 29, 1982

3) Letter from SCE (Baskin) to NRC (Knighton) dated December 29, 1982

4) Letter from NRC (Knighton) to SCE (Dietch, Cotton) dated December 30, 1982

In the Reference (1) letter, Southern California Edison Company (SCE) discussed the Engineered Safety Features Actuation System (ESFAS) actuation event which occurred at San Onofre Unit 3 on December 17, 1982 and also described the short term actions which were taken to address the issue. In the Reference (2) letter, SCE augmented these short term actions by committing to implement a design change where the isolation valves in the safety injection pumps miniflow line are now manually closed by the operator from the control room using emergency procedures rather than automatically by a recirculation actuation signal (RAS). In addition, SCE committed to provide certain additional information (addressed below) by January 14, 1983. The Reference (3) letter submitted a request for a change to the Technical Specifications consistent with the safety injection pumps miniflow isolation valves design change requirements. In Reference (4) the NRC provided SCE with the license amendment approval to incorporate the Reference (3) Technical Specification change.

B021

The foregoing references detailed several actions which SCE agreed to complete and summarize by January 14, 1983 to respond fully to the concerns raised subsequent to the December 17, 1982 San Onofre Unit 3 event. These actions are listed below, along with the resolution for each:

1. Per the Reference (2) letter, SCE has implemented the design change to the safety injection pumps miniflow isolation valves on San Onofre Units 2 and 3. Emergency procedures have been modified accordingly and the operators have been instructed in their use.

2. Per the Reference (1) and (2) letters, the comprehensive design review of the Plant Protection System (PPS) has been completed. The methodology for and results of this review are provided in Enclosure 1 to this letter. In summary, the only components in the PPS which upon momentary disconnection could result in simultaneous ESFAS actuations were identified as the J-3109 connectors in the A and D channels.

3. Per the Reference (1) and (2) letters, SCE intends to implement a design change to the PPS which will eliminate the problem of ESFAS actuation upon momentary disconnection of the Channel A and D J-3109 connectors identified in Item 2 above. This design change will consist of exchanging specific trip path signals between connectors J3109 and J3110 in Channels A and D. The result is that disconnection of any single connector in the PPS cabinet will not cause an ESFAS actuation. This change is also addressed in Enclosure 1. SCE intends to implement this design change on San Onofre Units 2 and 3 at the first cold shutdown (Mode 5) of sufficient duration. The change plus associated retesting is expected to take five days. SCE considers this proposed schedule to be consistent with the actions taken to date to minimize the chance of a momentary disconnection causing an actuation. To recapitulate these actions, SCE verified the tightness and integrity of all PPS power supply and cable connections, and in particular the Channel A and D J3109 connectors, and administrative controls as well as locking devices have been implemented to restrict access to the PPS cabinets. Access is allowed only after the senior reactor operator in the control room has been alerted, and only for monthly surveillance or for a specific maintenance procedure. Consequently, SCE believes that the Channel A and D J3109 connectors do not constitute a credible single failure in the time prior to implementing the above design change.

4. Per the Reference (2) letter, SCE has completed a review of the effect of various ESF system simultaneous actuations initiated from normal plant operation. The objective of this review was to verify that any combination of inadvertant actuations (independent of cause) would result in acceptable consequences. In conjunction with implementation of the design change to the safety injection pump miniflow isolation valves discussed in Item 1 above, it was

previously concluded that actuation of the recirculation actuation signal (RAS) concurrently with any other ESFAS from normal plant operation would not result in unacceptable consequences. The review of the other ESFAS actuation combinations is provided in Enclosure 2 and concludes that there are no other problems with inadvertant ESFAS combinations.

5. Per the Reference (2) letter, SCE considers that San Onofre Units 2 and 3 are in conformance with General Design Criterion (GDC) 35. The discussion on this subject provided in Reference (1) is supported by the actions already taken as described in Items 1, 2 and 4 and by the actions scheduled to be taken as described in Item 3. SCE further considers that these actions and associated design changes do not constitute an unreviewed safety question and are consistent with safe plant operation.

Based on the actions discussed above, SCE considers that all commitments identified to NRC in the Reference (1), (2) and (3) letters have been addressed and that the short term actions resulting from the December 17, 1982 San Onofre Unit 3 event have been satisfactorily implemented. Since the results of these short term actions indicate that multiple failure was the probable cause of the event (two separate, unrelated conditions of an intermittent nature as described in Reference (1)), SCE considers it prudent to maintain two longer term actions. The objectives of these two tasks are to evaluate the merit of the present RAS automation with respect to overall ESF system reliability and to monitor vital bus power supply (VBPS) performance as regards noise levels and momentary de-energizations. Monitoring VBPS performance is an on-going task and can provide information on potential component failures for immediate resolution. The automatic RAS evaluation will investigate multiple failure scenarios which could cause concurrent false actuations and will also investigate the feasibility of corrective actions, hardware and procedures which would be appropriate to reduce the potential for such events. In addition, system modifications will be considered which have the potential to mitigate the consequences of a presumed false actuation signal. System modifications such as a permissive time-delay between SIAS and RAS, Manual RAS on one train, and energize-to-actuate-RAS are typical of the approaches to be considered.

If you have any questions concerning this subject, please call me.

Very truly yours,

Enclosures

cc: R. H. Engelken, Region V
H. Rood, Project Manager, NRC

Enclosure 1

SAN ONOFRE UNITS 2 AND 3 PLANT PROTECTION SYSTEM (PPS)
DESIGN REVIEW SUMMARY

The design philosophy of the Plant Protection System (PPS) has been established for many years, i.e., matrix/trip path logic. This system design philosophy is presented in the San Onofre Units 2 and 3 FSAR Chapters 7.2 and 7.3 and has been reviewed and approved by the NRC Staff, as were the preceeding CE designs for other utilities. This approval was received after the resolution of numerous staff questions concerning single failure criteria, independence of vital buses, etc. Realizing that this design philosophy has been accepted for many years, the design review engineers concentrated their efforts in reviewing the implementation of this design philosophy.

Since the event at SONGS Unit 3 caused full ESF system actuation, all four channels of the PPS circuitry were involved. Therefore, the PPS circuitry associated with only a single channel could not be suspect. The design review efforts therefore, focused on the area within the design where circuits/wiring crossed the channel boundary, i.e., power distribution, matrix and trip path logic. Since the matrix and trip path logic circuitry is formed through the use of interchannel cabling/connectors, an evaluation of this cabling for its potential to cause an event similar to the December 17, 1982 San Onofre Unit 3 event was performed. This evaluation revealed that momentary disconnection of J3109 in either Channel A or D could result in similar indications observed by SCE technicians during the ESF actuation. In addition, an extensive review of each connector in the system was conducted to ensure disconnection of any other connector in the system would not cause a complete system actuation. This review concluded that the only connectors within the PPS which upon disconnection could cause a complete system actuation are AJ3109 and DJ3109. The reason for full system actuation is as follows.

Each matrix is divided into two sections. The wiring for each half of the matrix, along with its associated matrix relay contacts which form the trip path, should be in different connectors to prevent full system actuation upon disconnection. In the case of AJ3109 and DJ3109 signals from all 4 trip paths are combined into one connector.

A design change package has been developed to modify the wiring going to these connectors. This wiring change swaps trip path signals between J3109 and J3110 in both Channels A and D such that only half of the matrix and its associated trip path are wired to one connector. Therefore, upon implementation of this design change, disconnection of any single connector within the PPS will not cause full system actuation.

Based on this review, it is concluded that:

1) Subsequent to this design change, no single failure within the PPS can cause full system actuation.

2) The cause for the event on SONGS Unit 3 was the result of a multiple failure.

Enclosure 2

ANALYSIS OF INADVERTANT ESFAS COMBINATIONS

The December 17, 1982 event at San Onofre Unit 3 resulted in the spurious actuation of all engineered safety feature actuation signals with the exception of emergency feedwater (EFAS). Because of the plant condition at the time of the event (Mode 5), no adverse consequences resulted.

However, it was recognized that should a similar event occur with the plant at some other normal operating modes, simultaneous SIAS and RAS signals could lead to damage of both high pressure safety injection pumps without prompt operator action. This issue was resolved with the design change to remove RAS from the safety injection pump miniflow isolation valves.

In conjunction with the comprehensive design review of the PPS which was described in Enclosure 1 of this letter, a separate study was initiated to evaluate mechanical system responses to multiple spurious action signals. The system review conducted does not consider the impact of the spurious ESF signals concurrent with a design bases event. The safety system design basis is for single failures. The PPS design review did not identify that any combination of spurious ESF signals could result from a single failure. It is considered outside the present design basis for San Onofre Units 2 and 3 to analyze spurious signals generated as a result of multiple, diverse failures in conjunction with design basis events. Consequently, this study considers multiple ESFAS actuations from normal operating modes.

There were two objectives of the system study. One was to identify any additional equipment failures resulting from other combinations of spurious signals which could be detrimental to mitigating an event or could result in complete loss of safety functions. The second was to verify that current analyses in FSAR Chapter 15 bound the potential plant transients resulting from the spurious actuation of various combinations of engineered safety feature signals. The results of this effort are provided below.

The Engineered Safety Features Actuation System (ESFAS) provides the actuation signals (either automatic or manual) for the systems in Table 1 that perform protective actions. For the purposes of this study, it has been postulated that, independent of cause, any combination of the ESFAS systems can be spuriously actuated (manual control and cycling logic is retained). Mathematically, over a hundred combinations of inadvertent ESFAS actuations are possible. These combinations have been reviewed, and it has been determined that the subset of combinations addressed herein are the only ones that involve significant interfacing. The following discussion explains the methodology used in selecting the key combinations of inadvertent ESFAS actuations for impact evaluation.

Of the ESF systems listed in Table 1, items 8 through 11 are non-NSSS systems and per their design can safely accommodate actuation at any time without impact to either plant operation or equipment. Furthermore, the actuation logic for the ESF systems in items 8 through 11 is separate and distinct from the PPS cabinets.

A review of the FSAR Chapter 15 has determined that spurious actuation of the individual ESF systems in items 1 through 7 of Table 1 would be enveloped by existing analyses.

TABLE 1

ENGINEERED SAFETY FEATURES ACTUATION SYSTEMS (ESFAS)

1.	Safety Injection (SIAS)	(NSSS)
2.	Recirculation (Containment Emergency Sump) (RAS)	(NSSS)
3.	Containment Spray (CSAS)	(NSSS)
4.	Containment Isolation (CIAS)	(NSSS)
5.	Main Steam Isolation (MSIS)	(NSSS)
6.	Emergency Feedwater (EFAS)	(NSSS)
7.	Containment Cooling (CCAS)	(NSSS)
8.	Control Room Isolation (CRIS)	(Non-NSSS)
9.	Fuel Handling Building Isolation (FHIS)	(Non-NSSS)
10.	Toxic Gas Isolation (TGIS)	(Non-NSSS)
11.	Containment Purge Isolation (CPIS)	(Non-NSSS)

Therefore, the NSSS ESF actuation systems listed in items one through seven in Table 1 can be subclassified into groups whose systems interface among each other or effect a common system. One such group affects the reactor coolant system (RCS) and consists of the MSIS, EFAS, SIAS and CIAS actuation systems with the MSIS being the dominant actuation and the others being contributors.

To reduce the number of combinations, SIAS and CIAS are assumed to activate concurrently. This assumption will be shown to be conservative later in this discussion. As a result, the following four combinations are the only ones which warrant further consideration: (1) MSIS, EFAS, SIAS/CIAS; (2) MSIS, EFAS; (3) MSIS, SIAS/CIAS; and (4) EFAS, SIAS/CIAS.

The MSIS, SIAS/CIAS combination bounds the MSIS, EFAS and MSIS, EFAS, SIAS/CIAS combinations. This is because EFAS reduces the severity of a spurious MSIS since the Emergency Feedwater helps cool the RCS and because SIAS/CIAS increases the severity of a spurious MSIS by: (a) isolating letdown; (b) starting all charging pumps; and (c) disabling pressurizer spray by isolating instrument air.

The effects on the RCS from the spurious simultaneous actuation of MSIS, SIAS/CIAS are similar to and bounded by the Loss of Condenser Vacuum event presented in Section 15.2.1.3 of the FSAR. The Loss of Condenser Vacuum analysis assumed instantaneous termination of main steam and feedwater flow as part of the definition of the initiating event. In addition, the analysis assumed that the pressurizer pressure control system was inoperative, i.e., pressurizer sprays were assumed to be off. Further, the analysis did not credit reactor trip on turbine trip (reactor trip occurs immediately upon closure of the turbine stop valves when the plant is operating above 55 percent power). The FSAR evaluation shows that RCS pressure does not exceed 110 percent of design pressure. During a loss of condenser vacuum with a concurrent failure in the PZR level control system, there are two factors which are responsible for the RCS pressure increase: heat up due to the loss of steam flow and isolation of letdown with actuation of all charging pumps. The charging pumps contribution to the pressure increase is very small since it is responsible for only 2% of the increase in the PZR water volume; the predominant course of the surge line in-flow to the PZR and the pressure increase is due to the expansion of the reactor coolant by the heat up event.

The multiple ESFAS events of Table 2 are enveloped by either the Chapter 15 increased steam flow analysis or the Loss of Condenser Vacuum analyses even if reactor coolant pumps are tripped.

TABLE 2

SPURIOUS ESFAS COMBINATION WHICH AFFECT THE NSS

Notes on Frequency do not Apply to ESFAS Signals		
Event	Chapter 15 Enveloping Analysis	Comments
EFAS EFAS with CIAS or SIAS	15.1.1.3 - Increased Main Steam Flow	EFAS is enveloped by 15.1.1.2 - Increase in main feedwater flow. The maximum main feedwater flow increase is about 10% above the nominal flow at 100% power or an increase of about 1600 gpm per steam generator. Total EFW capacity is 1400 gpm. Both 15.1.1.2 and 15.1.1.3 are increased heat removal by the secondary system events. The FSAR presents 15.1.1.3 because it envelopes 15.1.1.2. Both are moderate frequency events which envelope EFAS. Note that 15.1.1.3 assumes a spurious signal in the SBS which opens all of the turbine bypass valves.
MSIS	15.2.1.3 - Loss of Condenser Vacuum	15.2.1.3 is a moderate frequency event.
MSIS and CIAS or SIAS	15.2.2.3 - Loss of Condenser Vacuum with a Concurrent Single Failure of an Active Component	15.2.2.3 assumes a failure in the pressurizer level control system which results in closing of letdown and starting of standby charging pump. This is an infrequent event.
MSIS, EFAS and CIAS or SIAS	15.2.2.3	EFW acts to reduce the pressure increase, however, peak pressure occurs before EFW reaches steam generator.
SIAS and CIAS	15.5 - CVCS Malfunction	

In addition to the ESF system combinations which could affect the RCS, there are combinations which could adversely affect safety system and/or other plant equipment. The following provides a discussion of what equipment is affected and the measures taken to mitigate the concerns.

1. If a SIAS occurs simultaneously with an RAS without a CSAS the containment spray pumps may be damaged due to operation in a dead headed condition resulting from closure of the miniflow isolation valves on RAS.

   This situation has already been addressed by a design change implemented as described in SCE letter of December 28, 1982 (Reference (2)) to remedy the same type of problem previously identified for the HPSI pumps. The miniflow isolation valves (HV-9347, -9348, -9306, -9307) which are in the miniflow header common to all safety injection and containment spray pumps have been changed to manual operation from the control room and emergency procedures have been changed and associated training has been completed to insure the operators accomplish these actions as required.

2. If an inadvertent CIAS occurs when the Reactor Coolant Pumps (RCP) are in operation, component cooling water will be shut off from the Reactor Coolant Pump seals which could damage the seals if this cooling flow was not restored. The CIAS signal to these valves can be overriden by the operator and the valves manually reopened at the component level.

   This loss of CCW to the RCP situation is already known to exist and is a well rehearsed emergency procedure. It should also be noted that this event is not a safety concern.