Southern California Edison Company

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January 24, 1992

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

Subject: Docket No. 50-362
Supplemental Report
Licensee Event Report No. 90-014, Revision 2
San Onofre Nuclear Generating Station, Unit 3

Reference: Letter, R. W. Krieger (SCE) to USNRC Document Control Desk, dated January 29, 1991

The referenced letter provided Licensee Event Report (LER) No. 90-014, Revision 1, for an occurrence involving an inoperable Containment Spray System Train "B" pump discharge pressure transmitter. Revision 1 attributed the root cause of the pressure transmitter failure to the presence of foreign material. We have subsequently determined that the foreign material was most likely introduced when the instrument top cover was removed during a calibration activity. Thus, the enclosed supplemental LER is being submitted to provide additional information concerning the root cause of the associated pressure transmitter failure, and incorporates additional corrective actions. Neither the health nor the safety of plant personnel or the public was affected by this occurrence.

If you require any additional information, please so advise.

Sincerely,

Enclosure: LER No. 3-90-014, Rev. 2

cc: C. W. Caldwell (USNRC Senior Resident Inspector, Units 1, 2 and 3)
J. B. Martin (Regional Administrator, USNRC Region V)
Institute of Nuclear Power Operations (INPO)

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LICENSEE EVENT REPORT (LER)

Facility Name (1)	Docket Number (2)	Page (3)
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Title (4)

CONTAINMENT SPRAY SYSTEM PRESSURE INDICATOR INOPERABLE DUE TO FAILED PRESSURE TRANSMITTER

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
Month	Day	Year	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names	Docket Number(s)
									NONE	0 5 0 0 0
1 2	2 3	9 0	9 0	0 1 4	0 2	0 3		9 2		0 5 0 0 0

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)			
		20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	X 50.36(c)(2)	50.73(a)(2)(vii)	Other (Specify in Abstract below and in text)
POWER LEVEL (10)	1 0 0	20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

Name	TELEPHONE NUMBER AREA CODE
R. W. Krieger, Station Manager	7 1 4 3 6 8 - 1 6 2 5 5

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
X	B E	P T	F 1 8 0	YES					

SUPPLEMENTAL REPORT EXPECTED (14)		Expected Submission Date (15)	Month	Day	Year
	XX NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On 12/23/90, with Unit 3 at 100% power, Containment Spray System (CSS) Train "B" pump discharge pressure indicator 3PI-0303-2 was determined to be inoperable due to its failure to display the correct pressure reading. This instrument is a Post-Accident Monitoring Instrumentation (PAMI) component and as such is subject to the requirements of Technical Specification (TS) 3.3.3.6, which allows for the inoperability of PAMI equipment for up to 7 days. Our investigation concluded that 3PI-0303-2 became inoperable on 12/12/90 when the associated pressure transmitter 3PT-0303-2, which provides the input to 3PI-0303-2, failed during subgroup relay testing associated with the CSS. This represents a condition prohibited by TS 3.3.3.6, since 3PI-0303-2 was inoperable for greater than 7 days.

The transmitter failure was caused by the jamming of the feedback coil by a small black, ferrous particle, found in the vicinity of the gap between the feedback coil (moving part) and its housing (stationary part). The particle was most likely introduced during a calibration activity. Jamming of the feedback coil produced a pressure indication which was substantially greater than actual pressure (approximately 400 psig versus 25 psig). The transmitter was replaced, and the indicator was returned to operable status on 12/25/90.

SCE's investigation into the reasons why the instrument failure was not identified more promptly revealed procedural deficiencies and a lack of detailed knowledge by control room operators of important standby system parameters.

CSS Train "B" pressure indicator 3PI-0303-2, which is used for indication purposes only, would not have affected the ability of the CSS to fulfill its safety function. In addition, CSS Train "A", including the required PAMI, remained operable during this event.

Plant: San Onofre Nuclear Generating Station
Unit: Three
Reactor Vendor: Combustion Engineering
Event Date: 12-12-90

A. CONDITIONS AT TIME OF THE EVENT:

Mode: 1, 100% Power Operation

B. BACKGROUND INFORMATION:

1. Post-Accident Monitoring Instrumentation:

Post-Accident Monitoring Instrumentation (PAMI) [IP] provides for remote monitoring of post-accident conditions within the Reactor Coolant System (RCS) [AB], the Steam Generators (SGs) [SB,SG] and the containment [NH]. The instrumentation is used by the control room operating personnel in the evaluation, assessment, and monitoring of plant conditions resulting from an accident, and in the execution of control room functions in response to that accident.

2. Containment Spray System Pressure Indication:

Containment Spray System (CSS) [BE] pressure indication [PI] is the PAMI instrument used for inferring containment spray flow. CSS pressure indication is provided via two control room illumigraph indicators, 3PI-0303-1 for Train "A" and 3PI-0303-2 for Train "B", and a recorder 3PR-0303-1 for Train "A" located directly outside the control room. The indicators range from 0 - 650 psig. CSS pressure indication is also provided on one of the display pages of the Critical Functions Monitoring System (CFMS) and as an entry on the Plant Monitoring System (PMS) computer.

The CSS pressure indicators receive signals from Foxboro N-E11DM pressure transmitters [PT] 3PT-0303-1 for Train "A" and 3PT-0303-2 for Train "B". The pressure transmitters are located downstream of the containment spray pumps [P] 3P-012 and 3P-013, respectively, between the pump discharge check valve and the normally closed containment spray isolation valve. Therefore, the transmitters are located in a section of piping that may trap pressure following operation of the spray pump. This piping section is not vented on a routine basis; therefore, operation of a containment spray pump can cause an elevated pressure to exist in the piping for a period of time until it decays at an acceptably small leakage rate to connecting systems at lower pressures. Nominal pressure in this section of piping is approximately 25 psig.

The CSS pressure indicators are also used to indicate system pressure upstream of the shutdown cooling heat exchangers during the

shutdown cooling mode of operation. In this mode, nominal pressure varies between approximately 200 - 550 psig.

3. PAMI Technical Specification Requirements:

San Onofre Unit 3 Technical Specification (TS) Section 3.3.3.6, "Accident Monitoring Instrumentation," requires that each PAMI channel be maintained operable in Modes 1-3 and permits one channel of CSS pressure indication to be out-of-service for up to seven days. Each PAMI channel is demonstrated operable by performance of a monthly channel check and a 18-month interval channel calibration in accordance with TS 4.3.3.6.

4. Foxboro N-E11DM Pressure Transmitter:

Foxboro N-E11DM pressure transmitters are electronic force-balance instruments that measure differential pressure and transmit it as a proportional current output signal. The output current is transmitted to the associated indicating and recording devices.

C. DESCRIPTION OF THE EVENT:

1. Event:

On December 23, 1990, with Unit 3 at 100% power, CSS Train "B" pump discharge pressure indicator 3PI-0303-2 was determined to be inoperable due to its failure to display the correct pressure reading. This instrument is a PAMI component and as such is subject to the requirements of TS 3.3.3.6, which allows for the inoperability of PAMI equipment for up to 7 days. Our investigation concluded that 3PI-0303-2 became inoperable on December 12, 1990, when the associated pressure transmitter 3PT-0303-2, which provides the input to 3PI-0303-2, failed during subgroup relay testing associated with the CSS. This represents a condition prohibited by TS 3.3.3.6, since 3PI-0303-2 was inoperable for greater than 7 days.

2. Inoperable Structures, Systems or Components that Contributed to the Event:

None

3. Sequence of Events:

DATE	TIME	ACTION
12/12/90	1837	Containment spray pump 3P-013 operated during subgroup relay testing. 3PT-0303-2 failed, resulting in 3PI-0303-2 indicating high.

12/23/90	0245	CSS piping vented with no change in 3PI-0303-2 indication. 3PI-0303-2 declared inoperable.
12/25/90	2315	3PI-0303-2 returned to service following replacement of 3PT-0303-2.

4. Method of Discovery:

On December 22, 1990, the high Train "B" CSS pressure indication was identified by routine, on-shift monitoring of equipment status by the Control Room Supervisor (utility, licensed).

5. Personnel Actions and Analysis of Actions:

An investigation of the high pressure indication was appropriately commenced upon recognition.

6. Safety System Responses:

Not applicable.

D. CAUSE OF THE EVENT:

1. FAILURE OF THE PRESSURE TRANSMITTER

The Foxboro Transmitter failure was caused by the jamming of the feedback coil by a small black, ferrous particle (95X55X29 mils), found in the vicinity of the gap (50 mils) between the feedback coil (moving part) and its housing (stationary part). Jamming of the feedback coil produced a pressure indication which was substantially greater than actual pressure (approximately 400 psig versus 25 psig). Since this black particle did not resemble any of the transmitter material, as determined by laboratory analyses, it was concluded that the particle was most likely introduced into the transmitter when the top cover was removed during I&C calibration. This was considered an isolated occurrence and not a generic design or manufacturing deficiency.

The transmitter was replaced and the indicator returned to operable status on December 25, 1990.

2. DELAY IN DETECTING INSTRUMENT FAILURE

A. Pressurization of CSS Piping

The possibility of experiencing an elevated pressure (following pump operation) for an extended period of time in the section of the CSS discharge piping in which the PAMI instrument transmitter is located was known to exist. However, adequate guidance was not provided to either

periodically check the pressure reading with the expectation that it would decrease in a relatively short period of time (i.e., a few days), or vent the system to return it to its normal condition. Either of these actions would have caused the identification of the failed pressure transmitter more promptly.

B. Knowledge of Standby Equipment Performance Parameters

The displayed CSS discharge pressure was more than 100 psig greater than the discharge pressure of the containment spray pump. Operators (utility, licensed) performing the subgroup relay testing did not recognize this difference as a result of both a procedural deficiency and a lack of detailed knowledge of important standby system performance parameters. Appropriate procedural direction to verify that actuated equipment has generated the proper and anticipated system response (e.g., discharge pressure for a pump is observed to be correct) was not provided. Although we have concluded that this guidance is necessary, we also believe that the knowledge level of control room operators (utility, licensed) should be such that parameters (such as anticipated discharge pressures of standby safety system pumps) are either known or action is taken to verify that indications are appropriate (e.g., use of reference material).

C. Review of Control Board Status

Our investigation indicated that several of the operators working on the shifts following the subgroup relay test did not question the elevated pressure indication. This was due to the practice of marking the various gauge indications using a grease pencil for the purpose of identifying changes which may occur over a period of time. (This practice is considered a valuable aid to the operators in assisting them in quickly identifying and trending important parameter changes). Since in this case the elevated pressure indication was not changing, operator attention was not focused on this indication and it was therefore not addressed. We have concluded that the use of grease pencils as an aid in monitoring the control board status, while performing a useful and necessary function, is not adequately controlled so as to avoid masking equipment deficiencies such as occurred in this event.

E. CORRECTIVE ACTIONS:

1. Corrective Actions Taken:

a. The CSS pressure transmitter was replaced with an in-kind component, calibrated, and returned to service.

b. The particle removed from the suspect pressure transmitter and the transmitter's feedback coil were sent to an independent laboratory for further failure analysis. The conclusion drawn from analysis of the coil hub and case material was that the particle was most likely of foreign origin due to the presence of titanium and sufficient iron to render it ferro magnetic.

c. The significance of this event was discussed with the operating crews by the Shift Superintendents and the Operations Manager.

d. Initial and continuing mandatory I&C training has been modified to include training on foreign material exclusion/inspection requirements during Foxboro transmitter calibration and servicing.

e. A requirement to inspect for foreign material has been added to I&C calibration procedure SO123-II-9.14, "Foxboro Electronic Pressure and Differential Pressure Transmitter E11 and E13 Series."

f. All Unit 2 safety related Foxboro transmitters of a similar type have been inspected for foreign materials. Where possible, inspections were combined with scheduled environmental qualification work. In cases where the pressure transmitter was due for periodic replacement (for EQ reasons), the foreign material inspection was considered satisfied.

g. The Units 2 and 3 control room operators (utility, licensed) have been retrained via on-the-job training concerning parameters (i.e., pressures and flows) expected when starting and operating equipment in the containment spray system, the safety injection system, and the auxiliary feedwater system.

h. Criteria and guidance for when and how to depressurize standby systems has been incorporated into system operating instructions.

i. The use of grease pencils for marking and trending plant parameters has been proceduralized to ensure that a consistent methodology of their use is maintained.

j. Appropriate operating procedures have been enhanced to improve guidance for monitoring pump starts.

2. Planned Corrective Actions:

a. All Unit 3 safety related Foxboro transmitters of a similar type will be inspected for foreign materials during their environmental qualification rebuild, currently scheduled to be

completed prior to startup following the Cycle 6 refueling outage, with particular attention given to the feedback coil/housing gap.

b. A document which contains expected full power operating parameters for all control room indicators will be developed and placed within the control room for ready access.

c. This event will be included in annual licensed operator requalification training for Units 1, 2 and 3.

F. SAFETY SIGNIFICANCE OF THE EVENT:

There was no safety significance to this event since the CSS Train "B" pressure indicator 3PI-0303-2, which is used for indication purposes only, would not have affected the ability of the system to fulfill its safety function. In addition, Train "A", including the required PAMI, remained operable during this event.

G. ADDITIONAL INFORMATION:

1. Component Failure Information:

The failed containment spray pressure transmitter is a Foxboro differential pressure transmitter, model number N-E11DM-1ID2-F.

2. Previous LERs for Similar Events:

None.

3. Results of NPRDS Search:

There were no instances of similar Foxboro differential pressure transmitter failures.