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December 20, 1990

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

Subject: Docket No. 50-361
30-Day Report
Licensee Event Report No. 90-014
San Onofre Nuclear Generating Station, Unit 2

Pursuant to 10 CFR 50.73(d), this submittal provides the required 30-day written Licensee Event Report (LER) for an occurrence involving an inadvertent actuation of the Containment Spray System, Safety Injection System, and the Containment Cooling System. 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,

R W Krieger

Enclosure: LER No. 90-014

cc: [redacted]ell (USNRC Senior Resident Inspector, Units 1, 2 and 3)

[redacted]tin (Regional Administrator, USNRC Region V)

[redacted] 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)

INADVERTENT INITIATION OF CONTAINMENT SPRAY, CONTAINMENT COOLING, AND SAFETY INJECTION SYSTEMS DUE TO PERSONNEL ERROR

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)
1 1	2 0	9 0	9 0	0 1 4	0 0	1 2	2 0	9 0	NONE	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	1
POWER LEVEL (10)	1 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)

___ 20.402(b)	___ 20.405(c)	X 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)	___ 50.36(c)(2)	___ 50.73(a)(2)(vii)	___ Other (Specify in Abstract below and in text)		
___ 20.405(a)(1)(iii)	___ 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 - 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

SUPPLEMENTAL REPORT EXPECTED (14)

		Expected Submission Date (15)	Month	Day	Year
___ Yes (If yes, complete EXPECTED SUBMISSION DATE)	XX NO				

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

At 0946 on 11/20/90, with Unit 2 in Mode 1 at 100% power, the Safety Injection System (SIS), Containment Cooling System (CCS) and Containment Spray System (CSS) were inadvertently actuated while performing a 31-Day interval surveillance of those systems. All systems and components functioned as designed. After verifying that the actuations were spurious, containment spray (CS) was secured at approximately 0947. During the one minute period that CS was initiated, approximately 4800 gallons of borated water from the refueling water storage tanks were sprayed into containment. At 1020, SIS and CCS were reset and at 1029, CSS was reset and actuated components were stopped in accordance with appropriate procedures.

Although no safety systems were affected by the containment spray, degraded electrical conditions were observed in the power supply to the Control Element Drive Mechanisms (CEDM). On 11/23/90, Unit 2 was shut down to correct these degraded CEDM electrical conditions.

The root cause of this event is personnel error. During the surveillance, one trip path for SIS, CCS, and CSS is actuated; contrary to the procedure, the first trip path was not reset prior to testing (and actuating) the next trip path. With these two trip paths actuated, the selective 2 of 4 actuation logic was satisfied, thus initiating SIS, CCS, and CSS. Corrective action to prevent recurrence include: 1) appropriate disciplinary action for involved personnel, 2) reviewing this event with appropriate I&C personnel, and 3) implementation of enhanced testing guidelines and methodology to minimize personnel errors.

Plant: San Onofre Nuclear Generating Station
Unit: Two
Reactor Vendor: Combustion Engineering
Event Date: 11-20-90
Time: 0946

A. CONDITIONS AT TIME OF THE EVENT:

Mode: 1, Power Operation

B. BACKGROUND INFORMATION:

1. Plant Protection System:

The Plant Protection System (PPS) consists of the Reactor Protection System (RPS) [JC] and the Engineered Safety Feature (ESF) Actuation System (ESFAS) [JE]. The RPS monitors selected reactor core parameters and initiates a reactor shutdown when these parameters exceed normal operational limits. The ESFAS monitors selected plant safety parameters; when these parameters exceed normal operational limits, ESFAS automatically actuates those safety systems necessary to mitigate the consequences of postulated Design Basis Accidents.

The PPS processes selected plant parameter signals the RPS and ESFAS. The ESFAS actuation logic consists of four ...annels [CHA] (channels are designated A, B, C, and D) which are arranged via bistables and relays such that there are six "two-out-of-four" logic matrices (AB, AC, AD, BC, BD and CD). Each logic matrix has two power supplies [JX] powered from two independent safety related vital buses. This arrangement prevents an ESFAS actuation when any single power supply or channel is removed from service. The systems actuated by the ESFAS include, in part, the Safety Injection System (SIS) [BQ & BP], Containment Cooling System (CCS) [BK], and the Containment Spray System (CSS) [BE].

The ESFAS design includes testing circuits which allow on-line matrix testing to ensure that the ESFAS remains capable of performing its design function without actuating the associated Engineered Safety Feature (ESF) system(s). There are four ESF trip paths (numbered 1, 2, 3, and 4); matrix testing is accomplished by testing these trip paths one at a time. An ESF actuation requires that selective two-out-of-four trip paths be actuated; therefore, testing one trip path at a time will not result in an ESF actuation unless one of the other trip paths is also actuated (via valid signals or test). PPS matrix testing is performed at least once every 31-days pursuant to Technical Specification (TS) Surveillance Requirement 4.3.2.1, "ESF Actuations System Instrumentation."

Containment Spray System:

The CSS is an ESF system which injects borated water into containment following a Loss of Coolant Accident (LOCA) or a Main Steam Line Break (MSLB). The CSS is designed to remove thermal energy from the containment atmosphere, thereby limiting the pressure rise inside containment to less than design pressure following a LOCA or MSLB.

Upon initiation of the CSS, borated water from the refueling water storage tanks [BP, TK] (and later from the containment emergency sump) flows to the suction of each of the two containment spray pumps [BE, P]. Each containment spray pump discharges through a flow element [BE, FM], a shutdown cooling heat exchanger [BP, HX], a containment spray isolation valve [BE, ISV] and into the containment spray headers. Containment spray in each spray header flows to spray nozzles [BE, NZL] and discharges into the containment atmosphere. The spray droplets fall to the containment floor and drain to the containment normal and emergency sumps and remain there until manually pumped or recirculation from the containment emergency sump is initiated.

3. Technical Specifications (TS):

TS 3.0.3 requires that when a Limiting Condition for Operation is not met, except as provided in the associated Action requirements, within one hour action shall be initiated to place the unit in a Mode in which the Specification does not apply.

C. DESCRIPTION OF THE EVENT:

1. Event:

At 0946 on 11/20/90, with Unit 2 in Mode 1 at 100% power, an Instrumentation and Control (I&C) technician (utility, non-licensed) inadvertently actuated the SIS, CCS, and CSS (which are tested simultaneously) during the performance of surveillance procedure, SO23-II-1.1.5, "Reactor Plant Protection System Logic Matrix Functional Test, (31-Day interval)". All systems functioned as designed (including automatic actuation alarm annunciation of the SIS at the State Office of Emergency Services). Reactor Coolant System (RCS) pressure remained above the shutoff head of the High Pressure Safety Injection (HPSI) pumps [BQ,P], and as such, HPSI injection did not occur. Control room personnel (utility, licensed) verified that plant operating parameters were normal and that the ESF actuations were spurious. Charging and boration to the RCS were immediately secured in accordance with SO23-13-17, "Recovery from Inadvertent Safety Injection/Containment Isolation" (this preplanned procedural action placed the Unit into TS 3.0.3 from 0946 to 1020, since the safety injection signal to various charging and boration

components was overridden). At approximately 0947, control room personnel (utility, licensed) secured the CSS pumps for trains "A" and "B", and closed the containment spray header isolation valves. During the one minute period that containment spray was initiated, approximately 4800 gallons of borated water from the refueling water storage tanks (RWST) were sprayed into containment. At 1020, SIS and CCS were reset and at 1029, CSS was reset in accordance with appropriate operating procedures terminating the event.

Based on SCE's prior experience following containment spray actuation at power (reference LER 84-016, Docket No. 50-361), SCE initially maintained the unit in stable power operation while conducting inspections and tests to determine if the spray had adversely affected any systems or equipment. This was done in a sequence which assigned the highest priority to safety systems.

Although no safety systems were affected by the containment spray, a ground alarm [ALM] was received on the Non-1E Uninterruptible Power Supply (UPS) [EE, UJX]. This alarm was cleared by opening the circuit breaker [52] supplying power to the movable incore detectors [IG, DET] (since the movable incore detectors are not required and are not normally in use, it was unnecessary to further pursue the source of the ground at that time). In addition, degraded electrical conditions were identified for a portion of the power supply to the Control Element Drive Mechanisms (CEDM) [AA]. On November 23, 1990, Unit 2 was shut down in order to correct the degraded CEDM electrical conditions.

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

   Not applicable.

3. Sequence of Events:

TIME	ACTION
0946	SIS, CCS, and CSS spuriously actuated during the performance of SO23-II-1.1.5. T.S. 3.0.3 entered.
0947	Containment spray pumps secured and containment spray header isolation valves closed.
1020	SIS and CCS reset. T.S. 3.0.3 exited.
1029	CSS reset.

4. Method of Discovery:

   Control Room indications and alarms alerted the operators to the SIS, CCS, and CSS actuations.

5. Personnel Actions and Analysis of Actions:

Operators (utility, licensed) verified proper operation of actuated systems and components. In accordance with procedures, operators verified that plant operating parameters were normal and that the ESF actuations were spurious. Actuated systems and components were then realigned to their normal standby configuration.

6. Safety System Responses:

All SIS, CCS, and CSS components and the PPS actuated in accordance with design.

Although no safety systems were affected by the containment spray, while performing monitoring of critical plant equipment which is considered to be a trip hazard, degraded resistance was detected on the output of the CEDM motor generator sets. Unit 2 was shutdown on November 23, 1990 to enable further troubleshooting and repair.

The investigation found degraded resistance on the five CEDM circuits associated with containment electrical penetration 94 and two CEDM circuits associated with penetration 97. The degraded resistance was found in multi-pin connectors (non-environmentally qualified located inside containment) which connect the containment penetration conductors to the remainder of the in-containment CEDM circuitry. These connectors were all exposed to direct impingement of containment spray since they are mounted at the top of the penetration assembly cabinet with the wiring from the CEDM entering the top of the connector. Inspection of the internals of these connectors identified moisture intrusion and pre-existing corrosion. An analysis performed on a sample of the corrosion indicated the presence of organic compounds, copper, silver, and boron. Due to the materials present in the connectors and the composition of the spray water, all of these constituents were expected to be found. As such, the analysis could not specifically identify the mechanism which caused the pre-existing corrosion. The moisture combined with the corrosion led to the degraded resistance. All of the top mounted connectors for the CEDM system were disassembled, cleaned, and verified to be fully operable prior to returning the Unit to service on November 28, 1990.

D. CAUSE OF THE EVENT:

1. Root Cause:

The root cause of this event is personnel error. During the performance of the section of SO23-II-1.1.5 in which the Number 1 trip path logic is actuated by test, I&C personnel (utility, non-licensed) inadvertently bypassed the procedure steps which would

have reset the actuated trip path for SIS, CCS, and CSS. I&C personnel then actuated the Number 2 trip path. Once the Number 2 trip path was activated, with the Number 1 trip path not reset, the selective 2 of 4 trip path logic was satisfied and SIS, CCS, and CSS actuated.

2. Contributing Causes:

a. Task Pacing

The I&C technicians performing the surveillance had set a goal to complete the testing prior to attending training which was scheduled for the afternoon of November 20, 1990. This self-imposed goal was based on their desire to complete the surveillance instead of turning the work over to the oncoming shift which had reduced manning. Contributing to this goal was the desire by the technicians to complete the surveillance prior to the end of the 31-day surveillance interval, which would have ended on November 23, 1990.

The technicians were clear in their statements to event evaluators that any perceived pressure to complete the task was self-generated, and not the result of undue pressure exerted by supervision. The technicians appeared to have set themselves a goal to complete the surveillance in a time frame which would meet TS requirements, and which would not adversely affect their co-workers.

b. Independent Verification

PPS/ESFAS matrix testing is accomplished by one I&C technician reading the procedure and directing other I&C technicians who manipulate required switches and observe actuation, reset, and status indications. The I&C technician reading the procedure positioned himself in such a manner that he was not directly observing the PPS/ESFAS cabinet or the technicians performing the switch manipulations. Consequently, the I&C technician reading the procedure and directing the test activity could not readily verify the various ESFAS indications (e.g., alarms, status lights, etc.). Proper attention to these indications may have alerted the technician to the bypassed steps, thus averting the actuation.

E. CORRECTIVE ACTIONS:

1. Corrective Actions Taken:

a. I&C personnel involved in the event received appropriate disciplinary action for failing to fully adhere to procedural requirements while performing surveillance activities.

b. This event was reviewed with appropriate I&C personnel, stressing the importance of procedural compliance and attention to detail while performing surveillance activities.

c. To ascertain the impact on plant systems/components as a result of the inadvertent containment spray actuation, an action plan was developed and implemented which included, in part: 1) an inspection of all accessible areas inside containment (which included examination of spray effects on valves, reactor coolant pumps, the reactor vessel head area, safety injection tanks, sections of uninsulated piping, the CEDM coolers, the normal and emergency containment coolers, and snubbers), 2) a walkdown of ESF piping and mechanical equipment outside of containment, 3) operation of a substantial sample of components and instrumentation located inside containment, 4) verification that trisodium phosphate used for recirculation flow pH control was not affected by the spray, and 5) review of our Redundant Instrumentation Monitoring System (which provides a database to permit the trending of the output of selected instruments) to detect any deleterious effects on operational instrumentation. With the exception of the ground indication on the non-1E UPS (as discussed in Section C.1 above) and the ground and observed corrosion in the CEDM circuits, the spray has been determined to have had no detrimental effects on equipment.

Additional information concerning this topic was provided in SCE's letter to the NRC dated November 27, 1990.

d. The I&C Department has developed and implemented detailed guidelines governing the planning and execution of surveillance testing of PPS/ESFAS and other critical plant components. These guidelines enhance the existing surveillance testing methodology by formalizing: 1) the roles and responsibilities of the technicians involved in the test, 2) communications between those involved in the test, and 3) the requirement for technicians to monitor their pace during testing and to notify supervision to modify the pace when required.

2. Planned Corrective Actions:

a. The procedure that controls the performance of the PPS/ESFAS surveillance testing will be reviewed for human factors enhancements. Based on the review, enhancements will be implemented, if appropriate.

b. This event will be included in lessons learned during annual retraining for appropriate maintenance personnel.

c. During the next refueling outage: 1) All mechanical snubbers which may have been sprayed or show evidence of moisture, and which are oriented such that they could collect moisture in their inertia mass housings, will be manually stroked; and 2) A sample of carbon steel piping will be inspected for indications of deterioration resulting from residual boric acid.

d. A review will be performed of industry experience with containment spray actuations. SCE will follow-up with plants having experienced containment spray to determine if there were any long term effects. A review will be conducted of industry information and NSSS suppliers to determine any other long term corrosion problems which may need to be addressed. Corrective actions will be modified, if appropriate, based on this prior experience.

e. SCE will evaluate design features that would prevent a trip path from being tested unless other trip paths had been reset. Based on the results of this evaluation, corrective actions will be implemented if appropriate.

f. A Human Performance Enhancement System (HPES) investigation has been performed. Preliminary results regarding cause and corrective actions have been incorporated in this submittal. Upon finalization of the event evaluation report, additional corrective actions will be implemented as appropriate.

F. SAFETY SIGNIFICANCE OF THE EVENT:

There was no safety significance to this event since all SIS, CCS, and CSS components and the PPS actuated in accordance with design. Since all safety systems performed as required, there was no impact on the health and safety of plant personnel or the public as a result of this event

In addition, based on the inspections and testing performed, it is concluded that there were no deleterious effects of the containment spr on safety-related equipment. The degraded electrical conditions on the CEDM circuits would not have affected the ability to safely shut down the unit, although it did have the potential for one or more dropped control element assemblies.

G. ADDITIONAL INFORMATION:

1. Component Failure Information:

Not applicable.

2. Previous LERs for Similar Events:

LER 84-016 (Docket No. 50-361), reported inadvertent Safety Injection, Containment Cooling, and Containment Spray Actuations due to a technician improperly performing a 31-Day surveillance on the Plant Protection System. As a corrective action, appropriate procedural changes were made to require independent verification of certain restoration steps. This corrective action did not prevent reoccurrence for this particular event because the procedure steps containing the independent verifications were inadvertently bypassed by the I&C technicians performing the surveillance.