Southern California Edison Company

SAN ONOFRE NUCLEAR GENERATING STATION

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October 18, 1989

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

Subject: Docket No. 50-206
30-Day Report
Licensee Event Report No. 89-023
San Onofre Nuclear Generating Station, Unit 1

Pursuant to 10 CFR 50.73(d), this submittal provides the required 30-day written Licensee Event Report (LER) for an event that resulted in a manual reactor protection system actuation. Neither the health and safety of plant personnel or the public was affected by this occurrence.

If you require any additional information, please so advise.

Sincerely,

HEMorg

Enclosure: LER No. 89-023

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)
SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1	0 5 0 0 0 2 0 6	1 of 0 6

Title (4)

MANUAL REACTOR TRIP FOLLOWING DROPPED SHUTDOWN BANK RODS DUE TO FAILED CONTACTOR COIL AND BLOWN FUSE

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)
0 9	1 8	8 9	8 9	--- 0 2 3	---	0 0	1 0	1 8	8 9	NONE	0 5 0 0 0
											0 5 0 0 0

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

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
H. E. Morgan, Station Manager	7 1 4 3 6 8 - 6 2 4 1

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	A A	C L	W 1 2 0	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

XX Yes (If yes, complete EXPECTED SUBMISSION DATE) ___ NO

Expected Submission Date (15)	Month	Day	Year
	0 3	3 1	9 0

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

At 1921 on 9/18/89, with Unit 1 in Mode 1 at 91% power, 4 Control Rods (CRs) from Shutdown Bank 2 dropped into the core. Approximately 23 seconds later, the remaining 12 Shutdown Bank CRs (4 from Shutdown Bank 2 and 8 from Shutdown Bank 1) dropped into the core. Operations personnel promptly responded by manually tripping the reactor, verifying that all systems responded normally to the trip, and completing the requirements of the Reactor Trip Response procedure. At 1942, the plant was stabilized in Mode 3 (Hot Standby) and the Reactor Trip Response procedure was exited.

Investigation into the cause of the dropped CRs revealed that: 1) Shutdown Bank 2 contactor coil 2MS1 failed, resulting in the de-energization of 4 moveable gripper coils and subsequent drop of the initial 4 CRs; and 2) as the fault from 2MS1 progressed, current passing through the (+) 125 VDC fuse to both Shutdown Bank 1 and 2 contactor coils increased to the point at which the fuse blew, thus de-energizing the moveable gripper coils for the remaining 12 CRs and causing the CRs to drop into the core.

The failed contactor coil and fuse were replaced with in-kind parts. The insulation resistance of all Shutdown Bank and Control Bank contactor coils was checked and determined to be satisfactory. A thermographic inspection was also performed and no anomalous conditions were identified.

The root cause of the contactor coil 2MS1 failure is unknown at this time. The coil has been sent to an offsite independent laboratory for failure mode analysis. Additional long term corrective action, if required, will be determined based on the results of the failure mode analysis. Upon completion of this analysis, a supplemental LER will be submitted.

Plant: San Onofre Nuclear Generating Station
Unit: One
Reactor Vendor: Westinghouse
Event Date: 09-18-89
Time: 1922

A. CONDITIONS AT TIME OF THE EVENT:

Mode: 1, 91% Power Operation

B. BACKGROUND INFORMATION:

The San Onofre Unit 1 rod control system [AA] controls the proper sequencing of DC power to the Control Rod Drive Mechanisms (CRDMs) [DRIV]. The CRDMs translate the electrical signal from the rod control system into a mechanical force to raise, lower, or hold the Control Rods (CRs) in a stationary position. Operation of each CRDM is controlled by sequencing the moveable (hold) gripper coil [CL], the stationary gripper coil, and the lift coil, which are located at the reactor head. The CRs are held in a stationary position by maintaining the moveable gripper coil energized.

The rod control system is divided into two Shutdown Banks and two Control Banks. Shutdown Bank 1 and Shutdown Bank 2 each contain eight CRDMs. Control Bank 1 contains twelve CRDMs. Control Bank 2 contains seventeen CRDMs.

Each Shutdown Bank consists of three sets of two electromechanical contactors [CNTR], and their associated contactor coils [CL], of which each set is used to energize their respective moveable gripper coils, stationary gripper coils, and lift coils. Therefore, each contactor (and coil) is used to energize the gripper/lift coils of four of the eight CRDMs in that Shutdown Bank. The Shutdown Bank 1 moveable gripper contactors are labeled 1MS1 and 1MS2, and the Shutdown Bank 2 moveable gripper contactors are labeled 2MS1 and 2MS2. De-energization of one of these contactor coils results in the de-energization of four moveable gripper coils, and in turn, results in the associated four CRs being released into the core.

C. DESCRIPTION OF THE EVENT:

1. Event:

At 1921 on 9/18/89, with Unit 1 in Mode 1 at 91% power, 4 of the 8 Shutdown Bank 2 CRs dropped into the core. Appropriate control room alarms were received and operators began confirming negative reactivity insertion per procedures. Approximately 23 seconds later, the remaining 12 Shutdown Bank CRs (4 from Shutdown Bank 2 and 8 from Shutdown Bank 1) dropped into the core. Operators properly responded (within 14 seconds) by manually tripping the reactor. All systems responded normally to the trip. At 1942, the Reactor Trip Response procedure was exited with the plant stabilized in Mode 3.

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

None.

3. Sequence of Events on September 18, 1989:

TIME	ACTION
1921	4 Shutdown Bank 2 CRs dropped into the core. Rod bottom lights illuminated and alarms received.
1922	The remaining Shutdown Bank CRs (12) dropped into the core, and reactor was manually tripped. Reactor Trip Response procedure entered.
1942	Unit stabilized in Mode 3, Reactor Trip Response procedure exited.

4. Method of Discovery:

As described in the above sequence of events.

5. Personnel Actions and Analysis of Actions:

Operators responded properly to the dropped CRs by manually tripping the reactor in a timely manner. In addition, Operators responded properly to the reactor trip by verifying proper safety system responses and stabilizing plant conditions in accordance with procedures.

6. Safety System Responses:

The Reactor Protection System (RPS) [JC] performed as required by the design. Following the trip, the Auxiliary Feedwater System (AFW) [BA], which actuated due to Steam Generator (SG) [SG] water level shrinkage, performed as required by design.

D. CAUSE OF THE EVENT:

1. Immediate Cause:

The reactor trip was manually initiated by Operations personnel upon identification that Shutdown Bank CRs had dropped into the core.

2. Intermediate Cause:

Investigation into the cause of the initial drop of 4 CRs from Shutdown Bank 2 has revealed that Shutdown Bank 2 contactor 2MS1 dropped-out due to a coil fault condition. This caused the associated 4 moveable gripper coils to de-energize and drop the CRs into the core.

Investigation into the cause of the remaining 12 Shutdown Bank CRs dropping identified that fuse FU3 had blown. Fuse FU3 provides (+) 125 VDC power to contactor coils for both Shutdown Bank 1 and Shutdown Bank 2 contactors 1MS1, 1MS2, 2MS1 and 2MS2. It is believed that as the fault from 2MS1 contactor coil progressed, the current passing through the fuse increased to the point that the fuse blew. This resulted in the simultaneous de-energization of the three remaining Shutdown Bank contactors, thus dropping the 4 remaining CRs from Shutdown Bank 2 along with the 8 CRs from Shutdown Bank 1 into the core.

3. Root Cause:

The root cause of the contactor coil failure is unknown at this time. Visual inspection of the contactor coil revealed severe heat damage.

The contactor coil has been sent to an offsite independent laboratory for failure mode analysis. Damage to the coil was too extensive for the performance of external (non-destructive) testing of the coil. Destructive testing is currently underway. An LER revision will be submitted to describe in more detail the coil failure mechanism when the results of the laboratory analysis are available.

E. CORRECTIVE ACTIONS:

1. Corrective Actions Taken:

   a. The failed contactor coil and fuse FU3 were replaced with in-kind parts.

   b. With the Shutdown Bank 2 CRs maintained stationary with their moveable (hold) gripper coils energized, the cabinet and contactor coils were thermally surveyed. No anomalous conditions were noted.

   c. All Shutdown Bank and Control Bank contactor coils were meggered at 500 VDC and the coil resistance of each contactor was measured. All readings were normal.

   d. Thermographic inspection of Shutdown Bank 1 and both Control Banks contactor coils did not reveal any unusual or abnormal conditions.

2. Planned Corrective Actions:

   Additional long term corrective action, if required, will be determined based on the results of the failure mode analysis of contactor coil 2MS1.

F. SAFETY SIGNIFICANCE OF THE EVENT:

There was no safety significance to the manual reactor trip since all safety systems responded in conformance with their design.

As a result of investigation into this event, it was identified that Unit 1 had not been previously analyzed for the condition described herein in which both Shutdown Banks dropped into the core prior to receipt of a manual or automatic trip. Existing analyses only addressed the dropping of a single CR, multiple CRs associated with one contactor coil, or all CRs from one Bank (Shutdown or Control). Upon this discovery, analyses were performed covering the conditions of this event, as well as the conditions of both Shutdown Banks dropping simultaneously. These analyses showed that no safety limits were exceeded, nor would they have been exceeded had such an event occurred at any time during the current core cycle. Additional analyses performed by Westinghouse have confirmed these results. The effect of this condition (CRs dropping from both Shutdown Banks) on previous core cycles is being addressed and will be reported, as appropriate, in a supplement to this LER. Finally, future reload analyses will also include an acceptability verification of these scenarios.

G. ADDITIONAL INFORMATION:

1. Component Failure Information:

The faulted contactor coil 2MS1, model number MM310, was manufactured by the Westinghouse Electric Corporation.

2. Previous LERs for Similar Events:

None.

3. Results of NPRDS Search:

The NPRDS search did not identify any failures of Westinghouse Electric Corporation, model number MM310 contactor coils.