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

Subject: Docket No. 50-361
30-Day Report
Licensee Event Report No. 91-007
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 a manual reactor trip. 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,

H E Morgan

AHGershkoff

Enclosure: LER No. 91-007

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) SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 2												Docket Number (2) 0 5 0 0 0 3 6 1				Page (3) 1 of 0 5	
Title (4) UNIT 2 MANUAL REACTOR TRIP DUE TO LOSS OF REACTOR COOLANT PUMP P004 CONTROLLED BLEEDOFF FLT																	
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 4	1 0	9 1	9 1	0 0 0 7	0 0	1 0	9 1	NONE			0 5 0 0 0 1						
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)														
POWER LEVEL (10) 1 0 0			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)			20.405(a)(1)(ii)			50.36(c)(2)			50.73(a)(2)(vi)			Other (Specify in Abstract below and in text)					
			20.405(a)(1)(iii)			50.73(a)(2)(i)			50.73(a)(2)(vii)(A)								
20.405(a)(1)(iv)			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)(i-1)			50.73(a)(2)(x)								
20.405(a)(1)(v)			20.405(a)(1)(v)			50.73(a)(2)(i-1)			50.73(a)(2)(x)								
			20.405(a)(1)(v)			50.73(a)(2)(i-1)			50.73(a)(2)(x)								
LICENSEE CONTACT FOR THIS LER (12)																	
Name R. W. Krieger, Station Manager												TELEPHONE NUMBER AREA CODE 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 NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC								
X	A	B	P	B 5 9 0													
SUPPLEMENTAL REPORT EXPECTED (14)																	
Yes (If yes, complete EXPECTED SUBMISSION DATE) XX NO																	
ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)																	

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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Plant: San Onofre Nuclear Generating Station
Unit: Two
Reactor Vendor: Combustion Engineering
Event Date: 04-10-91
Time: 1606

A. CONDITIONS AT TIME OF THE EVENT:

Mode: 1, Power Operation (100% power)

B. BACKGROUND INFORMATION:

Reactor Coolant Pump (RCP) [AB,P] controlled bleedoff (CBO) flow provides cooling and lubrication for the RCP seals [SEAL]. CBO is reactor coolant which flows up the RCP shaft and past a baffle [BAF] (a rotating element of a labyrinth) which is attached to the RCP shaft. CBO water is cooled by a heat exchanger (a stationary element of a labyrinth), and then flows through the RCP seals. CBO flow ensures long term integrity of the RCP seals during RCP operation. When conditions indicate that a complete loss of CBO flow has occurred, control room operators (utility, licensed) are directed by procedure to manually trip the reactor [AC], and then stop the affected RCP.

C. DESCRIPTION OF THE EVENT:

1. Event:

At 1606 on April 10, 1991, the Unit 2 reactor was manually tripped on indication of a complete loss of CBO flow from RCP P004. P004 was stopped following the trip, and the plant was stabilized in Mode 3 at 1621. A shutdown to Mode 5 (Cold Shutdown) was initiated to repair the RCP seal.

Emergency feedwater actuation system (EFAS) signals were generated for both steam generators (SGs) due to the expected SG level "shrink" following the trip. All EFAS components actuated as designed.

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

None.

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3. Sequence of Events:

<u>TIME</u>	<u>ACTION</u>
1606	The reactor was manually tripped on indication of a complete loss of CBO flow from RCP P004. P004 was stopped following reactor trip.
1621	The plant was stabilized in Mode 3.

4. Method of Discovery:

Control room indications and alarms alerted the control room operators to the loss of CBO flow from P004.

5. Personnel Actions and Analysis of Actions:

Control room operators properly responded in accordance with an approved procedure to manually trip the reactor on indication of total loss of CBO flow to P004.

Control room operators responded properly to the reactor trip, implementing the Emergency Operating Instructions to stabilize the plant in Mode 3.

Control room operators also properly verified correct system response to the EFAS actuations.

6. Safety System Responses:

The reactor protection system (RPS) and EFAS components actuated as designed.

D. CAUSE OF THE EVENT:

RCP P004 seal and rotating baffle were removed and inspected externally; some wear from rubbing was observed on both the baffle and adjacent components. The six bolts which attach the rotating baffle to the P004 shaft were found to have fractured. It is postulated that when the last baffle bolt fractured, the baffle shifted and rubbed against adjacent components, resulting in blockage of CBO flow to the seal. The seal will be further evaluated to verify this cause assessment.

Inspection of the baffle bolts indicates the failure mode to be high cycle fatigue. Two of the bolts appear to have failed due to high cycle fatigue at the bolt heads. It is likely that the remaining four bolts failed soon after the initial two failures due to the resultant stresses from a rocking vibration of the rotating baffle following failure of the first two bolts. The cyclic stress level of the last four bolts was estimated to be equal to their yield strength.

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An inspection of the RCP shaft shoulder surface where it mates with the baffle revealed the presence of high spots. This condition could have caused improper mating of these surfaces, which may have resulted in reduction or loss of bolt preload. In addition, slight machining imperfections in the bolt threads may have resulted in non-uniform thread engagement, leading to thread embedment relaxation and reduction or loss of bolt preload. Without sufficient preload, the bolts would have been subject to fatigue cycling.

The root cause evaluation of the failed bolts is continuing. If results of this cause assessment are significantly different than previously mentioned, a revision to this LER will be submitted.

E. CORRECTIVE ACTIONS:

1. Corrective Actions Taken:

The P004 baffle was inspected and repaired. The high spots were removed from the shaft shoulder surface where it mates with the baffle, ensuring the surfaces were flush and flat. The baffle was then re-installed using new bolts. The P004 seal assembly was replaced with an in-kind part.

The other three RCP CBO baffles were inspected for loose or damaged bolts. Three (of six) baffle bolts on RCP P001 were found to have slightly loosened; no other deficiencies were identified on P001 or the other two RCPs. However, the baffle bolts for these three RCPs were also replaced with new bolts.

The technique by which the baffle bolts were installed on the RCPs was improved. The bolts were alternately tightened and loosened to provide assurance of effective bolt thread engagement and to prevent embedment relaxation.

2. Planned Corrective Actions:

As mentioned in Section D, the root cause evaluation of the P004 baffle bolt failures is continuing. This evaluation will also address the cause of the loosening of the P001 baffle bolts. In addition, the P004 seal will be further inspected and evaluated to verify the preliminary cause assessment for the loss of CBO flow. Based on these evaluations, appropriate additional corrective actions will be implemented, including the possible enhancement of the baffle bolt design.

An inspection of at least one RCP baffle will be performed during the next Unit 2 refueling outage to ensure degradation of the baffle bolts has not occurred. Also, an inspection will be made of the Unit 3 RCP baffle bolts during the next outage of sufficient duration.

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The procedure which directs operators to manually trip the reactor in response to a loss of CBO flow was based upon the original RCP seal design. The loss of CBO flow was thought to be an indication of imminent seal failure. The seal design was changed in 1986. The current RCP seal vendor (Bingham) performed a test involving approximately 500 continuous hours of RCP operation with no CBO flow; seal integrity was maintained during this test. Based on these results, the procedure for total loss of CBO flow to an RCP will be amended to direct operators to perform a controlled plant shutdown in response to that condition.

F. SAFETY SIGNIFICANCE OF THE EVENT:

There is no safety significance to this event since all RPS and EFAS components actuated in accordance with design.

G. ADDITIONAL INFORMATION:

1. Component Failure Information:

The reactor coolant pumps were manufactured by Byron Jackson.

2. Previous LERs for Similar Events:

None.