LICENSEE EVENT REPORT (LER)

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SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 2	0 5 0 0 0 3 6 1	1 of 1 0

Title (4)

MIS-ALIGNMENT OF UNIT 2 SALT WATER COOLING PUMP P112 EMERGENCY SEAL WATER SUPPLY ISOLATION VALVE

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 6	1 4	9 2	9 2	0 0 9	0 1				SONGS, UNIT 3	0 5 0 0 0 3 6 2
										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)	___ 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)	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 - 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)

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

Expected Submission Date (15): Month | Day | Year

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

At approximately 2330 on 6/14/92, with Unit 2 in Mode 1 at 100% power, a plant operator identified that Saltwater Cooling (SWC) Pump P112 emergency seal water isolation valve MU019 was "closed," rather than "open" as required. The valve was opened at 0030 on 6/15/92, restoring the emergency seal water supply to P112. At 0220, a SWC system flow path alignment was performed for both Units 2 & 3 SWC pumps to determine if other SWC seal water valves were similarly mis-aligned. No other valves were found mis-aligned.

Although the cause and duration of the mis-alignment of MU019 cannot be definitively determined, SCE has concluded that the mis-alignment most likely occurred during the performance of a quarterly check valve test performed on 5/28/92. This conclusion is based on a review of P112 seal water supply flow data (taken approximately every 2 days) which appears to indicate that MU019 was closed between 5/28/92 and 5/30/92. On 5/28/92, a quarterly check valve test, requiring the repositioning of MU019, was performed. It is believed that MU019 was inadvertently left closed following the check valve test due to a procedural deficiency.

Since the mis-alignment may have existed for a period of time in excess of the 72-hour allowed outage time permitted by Technical Specification (TS) 3.7.4, "Salt Water Cooling System," this event represents a condition prohibited by the TSs.

Subsequent investigation identified that the monthly SWC valve alignment surveillance tests did not include the emergency seal water valves for Units 2 and 3. Inclusion of these valves in the surveillance is considered appropriate. Corrective actions included: 1) Station Management communicating their expectations to appropriate personnel regarding the rigorous control of plant equipment during testing activities and the rigorous enforcement of equipment status controls delineated in Operations Division procedures, 2) modification of appropriate Operations Division surveillance procedures to include these valves, and 3) a review was performed of all mechanical safety system TS surveillance requirements to ensure that no similar deficiencies existed. This event had low safety significance.

Plant: San Onofre Nuclear Generating Station
Units: Two and Three
Reactor Vendor: Combustion Engineering
Event Date: June 14, 1992
Time: 2330

A. CONDITIONS AT TIME OF THE EVENT:

Unit 2 - Mode: 1, Power Operation at 100% Reactor Power

Unit 3 - Mode: 1, Power Operation at 100% Reactor Power

B. BACKGROUND INFORMATION:

1. Saltwater Cooling (SWC) System

The SWC system [BS], an engineered safety feature (ESF) [JE] support system, provides saltwater from the Pacific Ocean to the component cooling water (CCW) [CC] heat exchangers [HX] for cooling ESF components during normal power generation, normal and emergency shutdown and cooldown of the reactor, and during design basis accidents. The SWC system for each unit consists of two 100% capacity trains. Each train contains two 100% capacity pumps [P]; one pump is located in the Unit 2 intake structure and the other is located in the Unit 3 intake structure.

System design interlocks prevent placing both pumps in a train in-service simultaneously. Manual action is required to place the alternate pump in service. Specifically, the alternate pump must first be manually aligned and placed in service before it can satisfy the Technical Specification operability requirements. A single active failure of any portion of a SWC system train will not preclude the supply of sufficient cooling water to the other train of ESFs by the remaining SWC train.

The SWC pump seals [SEAL] and bearings are normally cooled and lubricated by the service water system (domestic water). Seal water flow normally ranges from 7 gpm to 15 gpm. In the event the service water system becomes inoperable, (e.g., due to maintenance or in the unlikely event of a design basis earthquake (DBE) which renders it unavailable), emergency seal water to the SWC pump is automatically provided by the SWC pump discharge (refer to Figure 1). The emergency seal water supply is provided at a pressure lower than that of the service water system, such that loss of service water pressure passively results in the supply of emergency seal water to the operating pump.

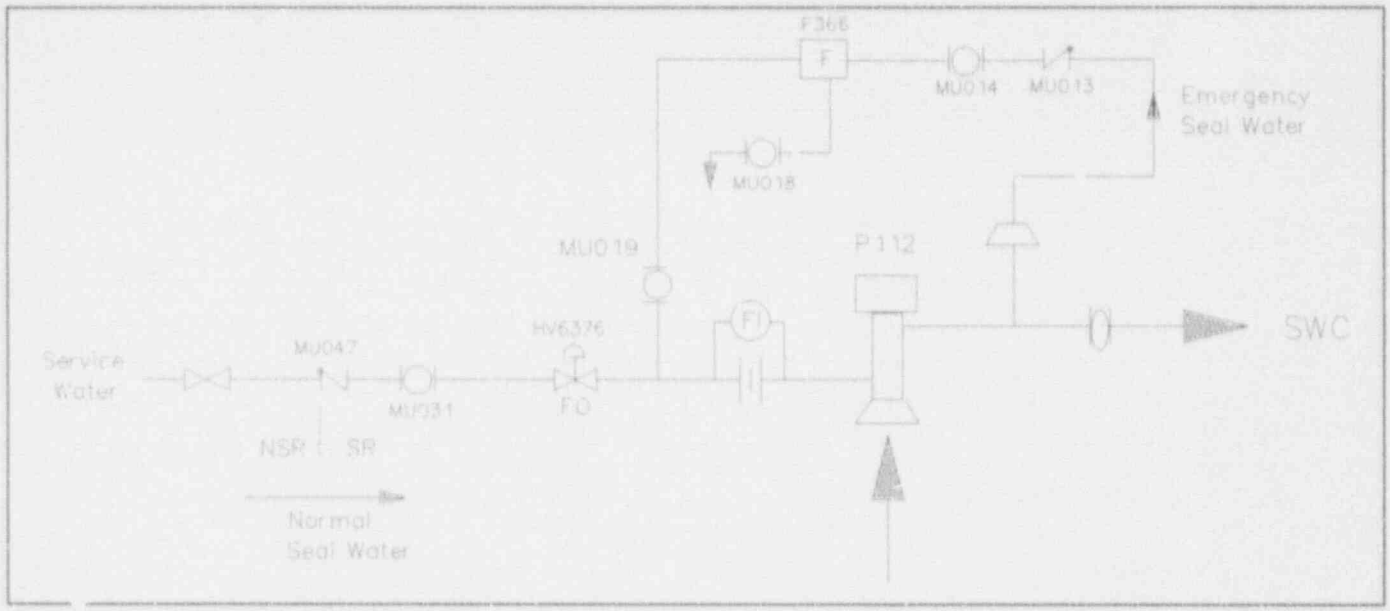

Figure 1 - SWC Pump P112 Seal Water System

2. Technical Specification (TS) Requirements

a. TS 3.7.4, "Salt Water Cooling System," requires that at least two independent SWC loops be Operable in Modes 1-4. The TS Action specifies that with only one SWC loop Operable, restore at least two loops to Operable status within 72 hours or be in at least Hot Standby within the next 6 hours and Cold Shutdown within the following 30 hours.

b. TS 4.7.4, which establishes the SWC system surveillance requirements, specifies in paragraph "a" that at least two SWC loops be demonstrated operable at least once per 31 days by verifying that each valve servicing safety related equipment that is not locked, sealed or otherwise secured in position, is in its correct position.

3. Station Procedures

a. Station Engineering Procedure SO23-V-3.5.4, "Inservice Testing of Check Valves," includes instructions for testing SWC pump bearing emergency seal water check valves. Procedure SO23-V-3.5.4 tests the SWC pump P112 emergency bearing seal water check valve MU013 in the "open" direction as follows: 1) Operations is requested by the test engineer to close isolation valve MU019 (refer to Figure 1), 2) water is then verified to be flowing through normally throttled open valve MU018 to the floor drain, thus verifying that MU013 has opened, and 3) Operations is requested by the test engineer to re-open MU019.

b. Operations Division Procedure SO123-0-20, "Use of Procedures," provides guidelines for the use of and adherence to procedures. SO123-0-20 discusses plant manipulations using procedures which are not within the scope of the Operations Division. SO123-0-20 specifies that an Operations Supervisor (i.e., Senior Reactor Operator) review the procedure prior to its use to ensure it requires the manipulation of plant equipment be documented with a sign-off by the individual performing the manipulation, including independent verification for safety related equipment.

c. Surveillance Operating Instruction SO23-3-3.18, "Component Cooling/Saltwater System Monthly Test," is performed by Operations personnel to satisfy the TS 4.7.4.a surveillance requirements.

d. Operating procedure SO23-2-8, "Saltwater Cooling System Operation," provides the instructions for SWC system alignment and operation.

C. DESCRIPTION OF THE EVENT:

1. Event:

At approximately 2330 on June 14, 1992, with Unit 2 in Mode 1 at 100% power, a plant operator (utility, non-licensed) identified that SWC Pump P112 emergency seal water isolation valve MU019 was in the "closed" position, rather than "open" as required. The operator identified this discrepancy while installing a maintenance order tag on an unrelated piece of equipment in the Unit 2 SWC pump room. The valve was opened at 0030 on June 15, 1992, thus restoring the emergency seal water supply to SWC pump P112. At 0220, a SWC system flow path alignment was performed for both Units 2 & 3 SWC pumps to determine if other SWC seal water valves were similarly mis-aligned. No other valves were found mis-aligned.

Although the cause and duration of the mis-alignment of MU019 cannot be definitively determined, SCE has concluded that the mis-alignment most likely occurred during the performance of the MU013 quarterly check valve test performed on May 28, 1992. This conclusion is based on a review of SWC P112 seal water supply flow data, which is sensitive to the position of valve MU019 (as well as to other seal water system valve and parameter changes). The flow data appears to indicate that MU019 was most likely in the "open" position when the data was taken on May 28, 1992, and may have been in the "closed" position on May 30, 1992. This conclusion is based on a step change increase of 3.5 gpm (from 10 gpm to 13.5 gpm) in the recorded P112 seal water flow between the 28th and the 30th. This step increase in seal water flow was not regarded by Operations as an anomaly since seal water flow typically varies from 2-5 gpm between SWC pumps and P112 seal water flow remained well within the normal limits of 7 gpm to 15 gpm. In hindsight, this step increase is consistent with a mispositioning of MU019 during this time frame.

Since the mis-alignment may have existed for a period of time in excess of the 72-hour allowed outage time permitted by TS 3.7.4, this event is considered to represent a condition prohibited by the TSs.

On July 22, 1992 at 0830, during a review of the TS 4.7.4.a requirements, as a follow-up action to the event described above, it was determined that the SWC pump emergency seal water supply valves were not included in the monthly valve alignment surveillance (i.e., SO23-3-3.18) for Units 2 and 3. Inclusion of these valves in the surveillance is considered appropriate. Although controls were in place to ensure that the valves were properly positioned (i.e., the system was properly aligned in accordance with Operating Instruction SO23-2-8), the requirements of TS 4.7.4.a were not fully satisfied due to the exclusion of the valves from the monthly surveillance.

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

Not applicable.

3. Sequence of Events:

Date	Time	Description
5/28/92		SO23-V-3.5.4 quarterly check valve test was performed on MU013. This test required closing and then re-opening MU019. SWC pump P112 seal water flow readings (taken by Operations approximately every two days) taken prior to the performance of SO23-V-3.5.4 indicates nominal seal water flow of 10 gpm (nominal range is from 7 gpm to 15 gpm).
5/30/92		SWC pump P112 seal water flow reading indicates a step increase of 3.5 gpm (from 10 gpm to 13.5 gpm).
6/14/92	2330	Operator identified the mis-alignment of SWC pump P112 emergency seal water isolation valve MU019.
6/15/92		SWC pump P112 seal water flow reading taken prior to re-opening MU019 indicates a seal water flow of 12.5 gpm.
6/15/92	0030	MU019 was re-opened, thus restoring emergency seal water to P112.
6/15/92	0220	A SWC system flow path alignment was performed for both Units 2 & 3 SWC pumps to detect any additional SWC pump seal water valves out of alignment. No other valves were found mis-aligned.
6/17/92		SWC pump P112 seal water flow reading indicates a step decrease of 3.7 gpm (from 12.5 gpm to 8.8 gpm).
7/22/92	0830	Follow-up review of procedure SO23-3-3.18 revealed that SWC pump emergency seal water valves were not included in SO23-3-3.18.

Date	Time	Description
7/22/92	1155	Revised SO23-3-3.18 to include valve position verification of the SWC emergency seal water valves.
7/22/92	1615	Completed Unit 2 SWC System valve position verification.
7/22/92	1620	Completed Unit 3 SWC System valve position verification.

4. Method of Discovery:

a. Valve Misalignment:

The mis-alignment of MU019 was identified by an operator (utility, non-licensed) while installing a maintenance order tag on an unrelated piece of equipment in the Unit 2 SWC pump room.

b. Surveillance Procedure SO23-3-3.18 Deficiency

The Surveillance Procedure deficiency was found during a review of TS 4.7.4.a, as a follow-up corrective action to the valve mispositioning event. (Performance of this surveillance, with the emergency seal water supply valves included, would not have detected the above described misalignment until June 18, 1992.)

5. Personnel Actions and Analysis of Actions:

Not applicable.

6. Safety System Responses:

Not applicable.

D. CAUSE OF THE EVENT:

1. Cause of Valve Misalignment:

Although the cause and duration of the mis-alignment of MU019 cannot be definitively determined, SCE has concluded based on our investigation, that the valve mis-alignment most likely occurred on May 28, 1992 during the performance of MU013 quarterly check valve test. A thorough investigation of this incident was performed which considered three possible causes; unauthorized manipulation, inadvertent repositioning of the valve (e.g., accidental bumping which was not recognized), and possible failure to reclose the valve after opening it for an authorized work activity.

Intentional, unauthorized manipulation of the valve was not considered likely since no other components in the area were manipulated and there has been no recent history of such activities at SONGS. Inadvertent repositioning of the valve is considered unlikely since the work activities in the Unit 2 SWC pump room between May 28, 1992 and May 30, 1992 were such that inadvertent contact with MU019, which is located away from the main passageway, would not be likely and it appeared unlikely that inadvertent manipulation would result in positioning the valve fully closed.

The most likely scenario appears to be that the valve was left in the closed position following the check valve test performed on May 28, 1992. The investigation included reviewing past work activities associated with the Units 2 and 3 SWC pumps, interviewing Operations and Engineering personnel, and reviewing round sheets in which the local seal water supply flow rates are recorded approximately once every 2 days. A review of Operations round sheets indicate that on May 30, 1992, seal water supply flow was approximately 3.5 gpm above that previously recorded on May 28, 1992. This increase is consistent with the closure of MU019, since the portion of the normal seal water flow which is diverted to flush filter F366 and then to the floor drain would be supplied to the pump and would be indicated on the flow meter. Additional seal water supply flow data was reviewed to further substantiate this conclusion. This information did not change the conclusions provided in Revision 0 of this report.

As discussed above, MU019 was closed on May 28, 1992 for the purpose of testing check valve MU013. Engineering Procedure SO23-V-3.5.4, used to perform the quarterly check valve test, was signed by the test engineer indicating that he requested Operations to open MU019. Additionally, the test engineer recalls that MU019 was opened by the operator as requested. Notwithstanding this, as previously discussed, flow data taken by Operations suggests that MU019 may have been inadvertently left closed following the check valve test. Operations personnel did not recognize that Engineering Procedure SO23-V-3.5.4 did not comply with the requirements specified in Operations Procedure SO123-0-20 prior to authorizing the test engineer to perform the check valve test. Specifically, the requirements for an Operations sign-off and independent verification of a plant manipulation were not contained in the Engineering procedure. Therefore, the likely cause of this event is considered to be a procedural deficiency of the Engineering procedure and the improper implementation of the requirements specified in SO123-0-20.

2. Cause of Surveillance Procedure SO23-3-3.18 Deficiency

The SWC pump emergency seal water manual isolation valves were excluded from the surveillance procedure due to a misinterpretation of the scope of the equipment governed by TS 4.7.4.a. Previously, only those valves in the main process flow path were considered to be to be governed by TS 4.7.4.a. Upon further review, it has been determined that the safety function of the seal water valves is such that the surveillance requirements should be applied to these valves.

E. CORRECTIVE ACTIONS:

1. Corrective Actions Taken:

a. Once identified, MU019 was re-opened, restoring emergency seal water supply to SWC Pump P112 such that all of its operability requirements were satisfied.

b. Engineering Procedure SO23-V-3.5.4 was enhanced as follows; 1) the check valve testing valve alignment was modified such that it will not be necessary to remove the emergency seal water supply from service (i.e., rather than closing MU019, the enhancement requires the closing of the normal seal water supply system isolation valve (MU031) for the purpose of testing the check valve), 2) a sign-off step was provided for the operator manipulating the valve during the testing, and 3) an independent verification sign-off step was added to ensure that MU031 was re-opened following the test.

c. This event was reviewed by appropriate Engineering personnel for lessons learned.

d. The Operations Manager has issued a memorandum to all licensed operators conveying management's expectations regarding rigorous enforcement of the equipment status controls delineated in SO123-0-20.

e. Surveillance procedure SO23-3-3.18 was revised and performed after the inclusion of the emergency seal water supply valves.

f. A review of all mechanical safety system TS surveillance requirements was performed to ensure that no similar deficiencies existed.

2. Planned Corrective Actions:

A review will be performed of appropriate station procedures to ensure that they are in compliance with the requirements specified in Operations Division Procedure SO123-0-20 for the manipulation of plant equipment. Enhancements will be incorporated as appropriate.

F. SAFETY SIGNIFICANCE OF THE EVENT:

This event is considered to be of low safety significance since P112 remained fully functional during the period in question. The emergency seal water supply would only be required in the remote event of a loss of service water. Additionally, Train "B" was available during the majority of time that the emergency seal water was isolated to P112. A probabilistic risk assessment (PRA) was performed indicating that there was a low increase in core damage frequency.

During the 17-day period in which the emergency seal water supply system was estimated to have been isolated, the normal seal water supply system continued to provide the flow necessary for proper pump operation. The emergency system was expected to perform its function only in those remote circumstances in which the non safety related service water system would have been unavailable, such as in a seismic event. In all circumstances when the normal seal water supply is available, the pump remained capable of performing its function. This was the case during the period when it was postulated that the emergency seal water was isolated.

If, in the unlikely event that the normal seal water supply were to become unavailable, a salt water cooling pump bearing seal water flow low alarm would have annunciated in the control room. An operator would have been dispatched locally to the affected pump to investigate the low seal water flow. It is possible that the operator would have recognized that the emergency seal water valve was closed and would have quickly restored emergency seal water flow to the affected pump by opening the valve. If it was not recognized that the emergency seal water valve was closed, or if action was not taken before the affected pump suffered damage, action would have been initiated to align the alternate train pump. It is estimated that this action would have taken less than one hour.

During the period that the emergency seal water supply was postulated to be unavailable, the alternate Train "B" SWC system remained operable and capable of satisfying the plant heat removal requirements except for three occasions (the longest being 45 minutes) required for testing or transferring Train "B" pumps. However, during these evolutions, Train "B" could have been quickly restored in the event of a loss of SWC pump P112. Other Train "B" systems that experienced brief periods of inoperability include 1) the containment spray system, which underwent pump and valve testing, 2) the fuel handling building post accident cleanup unit for associated testing, and 3) the diesel generator for hand-barring prior to a diesel start.

A PRA was performed to determine the increased likelihood of core damage resulting from the inoperability of Train "A" SWC pump P112 during the 17 days between May 28, 1992 and June 14, 1992. The PRA results indicate an increase in core damage frequency of approximately 8E-7 due to P112 inoperability. The PRA results were not substantially affected by the above Train "B" equipment outages since, in each case, the affected component could have been restored to service in a short period of time.

In conclusion, this event is considered to be of low safety significance since; 1) the emergency seal water supply would only be required in the remote event of a loss of service water, 2) Train "B" was available during the majority of time that the emergency seal water was isolated to P112, and 3) there was a low increase in core damage frequency as indicated by the PRA.

G. ADDITIONAL INFORMATION:

1. Component Failure Information:

Not applicable.

2. Previous LERs for Similar Events:

There have not been any previous LERs concerning a mis-alignment of a SWC pump seal water isolation valve as a result of performing check valve testing (which is considered the most likely cause of the event being reported here).