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June 26, 1997  
PY-CEI/NRR-2175L

United States Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555

Perry Nuclear Power Plant  
Docket No. 50-440  
LER 97-004

Ladies and Gentlemen:

Enclosed is Licensee Event Report (LER) 97-004, "Invalid High Suppression Pool Level Signal Results in Engineered Safety Feature Actuation"

If you have questions or require additional information, please contact Mr. Henry L. Hegrat, Manager - Regulatory Affairs, at (216) 280-5606.

Very truly yours,

Enclosure: LER 97-004

cc: NRC Region III Administrator  
NRC Resident Inspector  
NRC Project Manager

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**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TITLE (4)  
Invalid High Suppression Pool Level Signal Results in Engineered Safety Feature Actuation

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 NAME	DOCKET NUMBER
05	16	97	97	004	00	06	26	97	FACILITY NAME	DOCKET NUMBER
										05000
										05000

OPERATING MODE (9) 1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)										
POWER LEVEL (10) 100	20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)			50.73(a)(2)(viii)	
	20.2203(a)(1)			20.2203(a)(3)(i)			50.73(a)(2)(ii)			50.73(a)(2)(x)	
	20.2203(a)(2)(i)			20.2203(a)(3)(ii)			50.73(a)(2)(iii)			73.71	
	20.2203(a)(2)(ii)			20.2203(a)(4)			x 50.73(a)(2)(iv)			OTHER	
	20.2203(a)(2)(iii)			50.36(c)(1)			50.73(a)(2)(v)			Specify in Abstract below or in NRC Form 366A	
20.2203(a)(2)(iv)			50.36(c)(2)			50.73(a)(2)(vii)					

LICENSEE CONTACT FOR THIS LER (12)

NAME Todd A. Henderson, Supervisor-Compliance	TELEPHONE NUMBER (Include Area Code) (216) 280-5889
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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	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO						

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On May 16, 1997, with the plant in Mode 1 at 100 percent of rated thermal power during a scheduled Division 3 High Pressure Core Spray (HPCS) system maintenance outage, a test instruction was being performed to collect and analyze motor operated valve test data with the HPCS system operating in the Condensate Storage Tank (CST) to CST test mode. The manual containment isolation valves associated with the HPCS Suppression Pool Water Level-High transmitters were tagged closed to accommodate other Division 3 outage activities. At 2219 hours, after approximately 8 minutes of HPCS pump operation, the HPCS pump suction path automatically realigned from the CST to the suppression pool. HPCS Suppression Pool Water Level-High instrumentation indicated tripped on high water level although the actual suppression pool level was not high.

The cause of the event is a procedural weakness. The tagout guidance is not adequate to ensure that when instrument loops are mechanically isolated, the electrical logic functions associated with the equipment are also verified, reviewed, and defeated if required. Ambient temperature increase due to heat from the pump motor operation resulted in a small pressure increase within the isolated high pressure sensing line of the transmitters. The small pressure increase was sufficient to trip the instrumentation and initiate the suction transfer. Appropriate administrative guidance will be revised to address potential problems when instrument loops are isolated during operation of associated system equipment.

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

I. Introduction

On May 27, 1997, at approximately 1600 hours, it was determined that an event that occurred on May 16, 1997, and resulted in an unexpected High Pressure Core Spray [BG](HPCS) pump suction path transfer from the condensate storage tank [KA](CST) to the suppression pool [NH], was reportable as an Engineered Safety Feature (ESF) actuation. Notification was made to the NRC via the Emergency Notification System at 1659 hours (ENF No. 32397), in accordance with the requirements of 10CFR50.72(b)(2)(ii). This event is being reported in accordance with 10CFR50.73(a)(2)(iv) as an event that resulted in an automatic actuation of an ESF.

At the time of the event, the plant was in Mode 1 at 100 percent of rated thermal power. The reactor pressure vessel pressure was at approximately 1024 psig with reactor coolant at saturated conditions.

II. Event Description

On May 16, 1997, with the plant in Mode 1 at 100 percent of rated thermal power during a scheduled Division 3 (HPCS) maintenance outage, a Periodic Test Instruction (PTI)-E22-P0010, "Dynamic Diagnostic Testing of HPCS Valves," was being performed to collect and analyze motor operated valve test data with the HPCS system operating in the CST to CST test mode. The manual containment isolation valves [ISV] associated with the HPCS Suppression Pool Water Level-High transmitters [PDT] (1E22-N0055C and 1E22-N0055G) were tagged closed to accommodate other Division 3 outage activities. The electrical signals from these transmitters were not disabled; however, with the isolation valves to the transmitters closed, neither the transmitters nor their associated trip units [LIS](1E22-N0655C and 1E22-N0655G) could sense or respond to changes in suppression pool level.

On May 16, 1997, at 1950 hours, as part of the prerequisites for PTI-E22-P0010, the suppression pool water level was lowered approximately three inches to accommodate the testing. At 2037 hours, the HPCS pump suction path was shifted from the suppression pool to the CST as required. At 2211 hours, the HPCS pump was started in full flow CST to CST test mode. At 2219 hours, the "HPCS SUPR POOL SUCT VLV OPEN CST/SUPR PL LVL" annunciator was received by the control room and the HPCS pump suction path automatically realigned from the CST to the suppression pool. The HPCS pump discharge valves to the CST automatically closed, and the discharge path was to the suppression pool through the minimum-flow valve. Both 1E22-N0655C and 1E22-N0655G were tripped and indicated readings above the instrument setpoints. Actual suppression pool level was within the normal expected operating band. At 2229 hours, the HPCS pump was shutdown and PTI-E22-P0010 was suspended. At 2232 hours, the "HPCS SUPR POOL SUCT VLV OPEN CST/SUPR PL LVL" annunciator cleared and the trip units indicated a decreasing level. The control room shift supervisor (senior reactor operator) consulted the reporting guidance in Plant Administrative Procedure (PAP)-1604, "Reports Management," to determine the reporting requirements of the event. The reporting guidance specifically addressed "HPCS suction shift due to high suppression pool level" and stated that such an event was not reportable.

On May 16, 1997, at 2310 hours, the manual containment isolation valves for 1E22-N0055C and 1E22-N0055G were opened and the instrument loops were returned to service. On May 17, 1997, the PTI-E22-P0010 testing was continued with no further incidents.

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During the reportability evaluation of the event, conducted in accordance with the corrective action program, it was determined that incorrect guidance (developed in 1988 with limited information) was contained in PAP-1604 for the reportability of a HPCS suction shift due to high suppression pool level. On May 27, 1997, at 1659 hours, notification of the event was made to the NRC.

III. Cause of Event

The cause of the event is a procedural weakness. The tagout guidance is not adequate to ensure that when instrument loops are mechanically isolated, the electrical logic functions associated with the instrument are also verified, reviewed, and defeated if required. With the manual containment isolation valves closed, isolating the suppression pool level transmitters, pressure is trapped in both sides of the differential pressure transmitter sensing lines (containment air in the low pressure side and suppression pool water in the high pressure side). Engineering investigation identified that the instrument sensing lines are located in close proximity to the HPCS pump motor. Ambient temperature increased due to heat from the pump motor operation. This temperature increase resulted in a small pressure increase within the high pressure sensing line of the transmitters as the isolated volume temperature increased due to the ambient temperature change. This small pressure increase (inches of water column) was sufficient to cause the associated trip units to exceed their setpoints and initiate the suction transfer. This interaction was not anticipated by the operating crew or the engineers performing the PTI-E22-P0010.

IV. Safety Analysis

The HPCS system pumps water through a peripheral spray ring sparger mounted above the reactor core. Coolant is supplied over the entire range of system operation pressures. The primary purpose of HPCS is to maintain reactor vessel inventory after small breaks which do not depressurize the reactor. HPCS also provides spray cooling heat transfer during breaks in which core uncover is calculated.

The HPCS system consists of a single motor-driven centrifugal pump located outside the primary containment, a spray sparger in the reactor vessel located above the core and associated system piping, valves, controls, and instrumentation. The system is designed to operate from normal offsite auxiliary power or from a standby diesel generator supply if offsite power is not available.

The principal active HPCS equipment is located outside the primary containment. Suction piping is provided from the CST and the suppression pool. In the event that condensate storage water becomes exhausted or unavailable, automatic switchover to the suppression pool water source will ensure a closed cooling water supply for continuous operation of the HPCS system. HPCS pump suction is also automatically transferred to the suppression pool if the suppression pool water level exceeds a prescribed value.

Suppression Pool Water Level-High signals are initiated from two level transmitters. The logic is arranged such that either transmitter and associated trip unit can cause the suppression pool suction valve to open and the CST suction valve to close. The Allowable Value for the Suppression Pool Water Level-High Function is chosen to ensure that HPCS will be aligned for suction from the suppression pool before the water level reaches the point at which suppression pool design loads would be exceeded.

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Excessively high suppression pool level could result in the loads on the suppression pool exceeding design values should there be a blowdown of the reactor through the Safety Relief valves. Therefore, signals indicating high suppression pool water level are used to transfer the suction source of HPCS from the CST to the suppression pool to eliminate the possibility of HPCS continuing to provide water from a source outside containment. To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valve must be open before the CST suction valve automatically closes. This function is implicitly assumed in the accident and transient analyses (which take credit for HPCS) since the analyses assume that the HPCS suction source is the suppression pool.

During the HPCS pump suction transfer event, the associated equipment responded as designed to the invalid high suppression pool level signal. The HPCS system had been declared inoperable for the Division 3 maintenance outage, and plant operators were monitoring suppression pool level as part of PTI-E22-P0010, as well as for regular Technical Specification compliance purposes in Mode 1. The transfer of the HPCS pump suction path from the CST to the suppression pool did not adversely affect safe operation of the plant; therefore this event is considered to have minimal safety significance.

The HPCS Suppression Pool Water Level - High instrumentation setpoint (Allowable Value  $\leq 18$  feet 6 inches) is set within the Technical Specification LCO 3.6.2.2 required operating band ( $\geq 17$  feet 9.5 inches and  $\leq 18$  feet 6 inches) for suppression pool water level. Because the HPCS pump suction path transfer on high suppression pool level was previously not considered to be reportable as an ESF actuation, operations impacting suppression pool level were not conducted with avoidance of this actuation as a major concern; therefore, documentation of past occurrences was not initiated. A review of the impact of these past practices on equipment reliability indicates that reliability of the associated equipment and the HPCS system has not been adversely affected.

V. Similar Events

On January 27, 1988, at 1250 hours and 1600 hours, events occurred in which the HPCS pump suction path transferred from the CST to the suppression pool due to invalid signals from the suppression pool level instrumentation. Notification was made to the NRC via the Emergency Notification System at 1613 hours in accordance with the requirements of 10CFR50.72(b)(2)(ii). During the event evaluation, it was concluded that the HPCS suction shift on high suppression pool level function was not considered to be an ESF actuation, and no LER was written for the event. Subsequently, reportability guidance was developed and proceduralized for this specific function. Modifications to transmitter sensing lines and calibration procedure enhancements were made to address the invalid suppression pool high water level signals.

Based on previous operating practices concerning suppression pool water level operating band and instrumentation setpoints, and on the previous consideration that the HPCS suction shift on high suppression pool level was not an ESF, there is a potential for previous occurrences of this actuation.

VI. Corrective Actions

The following corrective actions have been taken or are in progress:

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1. On May 28, 1997, at 1630 hours, operations management issued a standing instruction as an interim action to ensure operators are aware of the change in reportability guidance until PAP-1604 can be revised.
2. On June 3, 1997, operations management provided additional guidance to the operators to ensure that future evolutions with a potential to cause a high suppression pool water level would be preplanned evolutions.
3. The 10CFR 50.72/73 reportability guidance contained in PAP-1604 was reviewed for appropriateness. No additional issues were identified.
4. PAP-1604 is being revised to correct the inappropriate guidance in regards to reportability of a HPCS pump suction shift due to high suppression pool level. Revision to the procedure will be completed by August 1, 1997.
5. Appropriate administrative guidance will be revised to address potential problems when instrument loops are isolated during operation of associated system equipment. The guidance will be revised by September 1, 1997.
6. As part of the established requalification training program, plant licensed operators will be instructed on the lessons learned from this event.

Energy Industry Identification System (EIIIS) codes are identified in the text as [XX].

The following table identifies those actions which are considered to be regulatory commitments. Any other actions discussed in this document represent intended or planned actions, are described for the NRC's information, and are not regulatory commitments. Please notify the Manager - Regulatory Affairs at the Perry Nuclear Power Plant of any questions regarding this document or any associated regulatory commitments.

Commitments

1. PAP-1604 is being revised to correct the inappropriate guidance in regards to reportability of a HPCS pump suction shift due to high suppression pool level. Revision to the procedure will be completed by August 1, 1997.
2. Appropriate administrative guidance will be revised to address potential problems when instrument loops are isolated during operation of associated system equipment. The guidance will be revised by September 1, 1997.