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L-08-0280

10 CFR 50.73

ATTN: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

SUBJECT:
Perry Nuclear Power Plant
Docket No. 50-440, License No. NPF-58
Supplemental Licensee Event Report Submittal

Enclosed is Licensee Event Report (LER) Supplement 2008-003-01, "Inoperable High Pressure Core Spray System Results in Loss of Safety Function." This supplement is being submitted to update the cause analysis and corrective actions associated with this event.

There are no regulatory commitments contained in this letter or its enclosure. Any actions discussed in this document that represent intended or planned actions are described for the NRC's information, and are not regulatory commitments.

If you have questions or require additional information, please contact Mr. Jeffrey J. Lausberg, Manager – Regulatory Compliance, at (440) 280-5940.

Sincerely,

Mark B. Bezilla

Enclosure:
LER 2008-003-01

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III

IE22
NRR

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 8/31/2010

LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Perry Nuclear Power Plant	05000440	1 OF 5

4. TITLE

Inoperable High Pressure Core Spray System Results in Loss of Safety Function

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	28	2008	2008 -	003 -	01	09	26	2008	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE: 1

10. POWER LEVEL: 100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(a)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER Specify in Abstract below or in NRC Form 366A
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☒ 50.73(a)(2)(v)(D)	

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Perry Nuclear Power Plant, John Pelcic, Compliance Engineer	(440) 280-5824

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	BI	V	C630	Y	B	BI	V	T302	Y

14. SUPPLEMENTAL REPORT EXPECTED		15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete EXPECTED SUBMISSION DATE).*	☒ NO				

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

On May 28, 2008, at 1730 hours, with the reactor operating at 100 percent of rated thermal power, plant operators determined that the High Pressure Core Spray (HPCS) system was inoperable. The HPCS system was inoperable due to the Emergency Service Water (ESW) C loop inability to maintain required keep-fill pressure in the event of a loss of offsite power.

The cause of the event was excessive leakage through the ESW C system discharge check and discharge valves. The leakage was due to inadequate testing and setup of the discharge valve motor operator during maintenance performed in July 2007. The organization failed to recognize the significance of verifying the discharge valve maintains an acceptable leakage rate. The design basis for the valves was not clearly defined by the Architect Engineer at the time of original installation of the ESW keepfill system in 1985.

The discharge check valve was rebuilt with new internal parts. The closed limit switch of the motor operator for the ESW C discharge valve was reset. The butterfly disc was readjusted approximately four degrees into the seat compared to the previous as-found condition. The ESW C system was retested and passed its draindown test. The valves' design basis will be documented in an engineering calculation. This event is reported in accordance with 10 CFR 50.73 (a)(2)(v)(D) as a condition that could have prevented the fulfillment of the safety function of a system needed to mitigate the consequences of an accident.

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Energy Industry Identification System Codes are identified in the text as [XX].

INTRODUCTION

On May 28, 2008, at 1730 hours, with the plant in Mode 1 (i.e., Power Operation) and the reactor operating at 100 percent of rated thermal power, the High Pressure Core Spray (HPCS) [BG] system was declared inoperable based on inability of the Emergency Service Water (ESW) C [BI] loop to maintain required keep-fill pressure. Operability of the HPCS system was determined not met due to possible failure of the system to perform its intended safety function following a loss of offsite power (LOOP). The resulting, unplanned inoperability of the HPCS system represents a condition that could have prevented the fulfillment of the safety function of a system needed to mitigate the consequences of an accident. Therefore, at 2203 hours, notification was made to the NRC Operations Center (ENS Number 44245) in accordance with 10 CFR 50.72(b)(3)(v)(D), Event or condition that could have prevented fulfillment of the safety function of a system needed to mitigate the consequences of an accident. This event is being reported in accordance with 10 CFR 50.73(a)(2)(v)(D) as a condition that could have prevented the fulfillment of the safety function of a system needed to mitigate the consequences of an accident.

EVENT DESCRIPTION

On May 26, 2008, plant operators attempted to perform the ESW C loop draindown portion of quarterly surveillance test, SVI-P45-T2003, "HPCS ESW Pump and Valve Operability Test." The ESW C pump [P] was secured in preparation for the draindown test. A pressure drop below the surveillance minimum and an inconsistency in pressure readings were noted. A new test gauge was installed and the keep-fill standpipe pressure was measured to be 6.75 pounds per square inch gauge (psig) which is below the allowable limit of 7.5 psig, at the test gauge location. The ESW C pump was started at 2258 hours since the operators still suspected the measured pressure to be incorrect. A troubleshooting work order was generated to investigate the cause for not maintaining adequate keep-fill pressure in the system piping.

On May 28, 2008, at 1248 hours, the operators attempted to perform the ESW C loop draindown test in support of the troubleshooting work order. The operators secured the ESW C pump. Keep-fill standpipe pressure decreased from 26 psig to 7.0 psig at the gauge location in approximately 20 seconds. The system pressure stabilized at 7.5 psig. The test was stopped and the pump was again restarted.

Engineering and Operations proceeded to review the test results and existing condition of the ESW C system. Based on that review, the control room operators determined that the configuration of the system would not allow it to maintain adequate keep-fill pressure in the event of a LOOP. The ESW C system was subsequently declared inoperable on May 28, 2008 at 1730 hours. Technical Specification (TS) Limiting Condition for Operation (LCO) 3.7.2, Action A was entered which requires that the HPCS system (a single train safety system) be declared inoperable immediately when the ESW C system is inoperable. TS LCO 3.5.1, Actions B.1 and B.2 were entered which require the RCIC system be verified operable within one hour and the HPCS system be restored to operable status within 14 days. Up to the time of declaration, all emergency core cooling systems (ECCS) and divisional emergency diesel generators were operable.

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On June 1, 2008, at 0121 hours, the HPCS and ESW C systems were declared operable following repairs to ESW C valves and successful retesting of the system. The plant exited TS LCOs 3.5.1 and 3.7.2 at that time.

CAUSE OF EVENT

The HPCS system was declared inoperable to comply with Technical Specifications when the ESW C system was declared inoperable.

The cause for the ESW C system inability to pass its draindown test and maintain keep-fill pressure was determined to be leakage past the pump discharge check (TRW Mission duo-check) valve and the motor operated discharge (Contromatics butterfly) valve [V]. This test had been successfully completed on a quarterly basis since July 2007, when the ESW C system last required repair of the discharge valve.

The discharge check valve was removed from the piping system for inspection as part of the troubleshooting work order. The valve showed no obvious damage or degradation. It is postulated that the check valve stuck open intermittently, to some degree, during the May 28, 2008, draindown test.

During removal of the discharge check valve, water leakage past the downstream discharge valve was observed and measured at approximately 20 gallons per minute (gpm). After about 15 minutes, the leakage slowed to 5 gpm. An Operator in the field manually closed the discharge valve to the optimum closed position and the leakage stopped. Since an open flow path through both valves existed, leakage was experienced during the draindown test.

The investigation performed for this event concluded that the leakage past the discharge valve was due to a less than adequate testing process which did not ensure that the valve motor operator and butterfly disc were set up correctly in the closed position to maintain acceptable leakage levels. The discharge valve was not re-tested for leak tightness after the valve was replaced in July 2007.

The organization failed to recognize the significance of verifying that the ESW C pump discharge valve maintains an acceptable leakage rate. The design basis for the discharge valve and discharge check valve was not clearly defined by the Architect Engineer at the time of ESW keepfill system installation in 1985.

The ESW keepfill system was originally installed in 1985 under the design control of the Architect Engineer. Changes to the keepfill system were implemented in 1990 and 1996 under the plant's Design Change Processes that were in effect at the time. In all of these instances, the design basis function of the discharge check valve and discharge valve were essentially the same as they were before the keepfill installation. However, there were missed opportunities to formally document the design basis function and appropriate leakage criteria for the pump discharge valves in all three loops of ESW during the keepfill modifications. Without the formal documentation, the design basis and appropriate leakage criteria for the valves were unclear.

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EVENT ANALYSIS

The ESW C system is a once through flow system which takes suction from the ultimate heat sink, Lake Erie, directs cooling water to the HPCS Room Cooler and the HPCS Diesel Generator Heat Exchanger, and discharges back into the lake. ESW C is a support system to the safety-related HPCS system. The ability of the ESW C system to provide adequate cooling to the HPCS system is an implicit assumption for the safety analyses evaluated in the Updated Safety Analysis Report (USAR) Chapter 6, "Engineered Safety Features," and Chapter 15, "Accident Analysis." Following a design basis accident or transient, the ESW C system will operate automatically and without operator action.

The HPCS system is a single train, ECCS system that performs a safety function to mitigate the consequences of a loss of coolant accident (LOCA). The function of HPCS is credited for several operational transients or analyzed accidents described in the USAR, Chapter 15. The HPCS system is designed to provide core cooling over a wide range of reactor pressure. Upon receipt of an initiation signal, the HPCS pump will automatically start after AC power is available and valves in the flow path begin to open.

The inability of ESW C to maintain adequate keep-fill pressure was identified during quarterly surveillance testing. After the pump was secured during a draindown test, water would drain past the valves to the suction source in excess of surveillance test criteria. Normally, the system would be placed in operation to maintain operability per Technical Specifications. However, in this case, the operators determined that a condition existed that would not allow the system to maintain keep-fill pressure in the event of a LOOP. In addition, the operators did not have complete knowledge of the condition of the discharge check and discharge valves.

A bounding probabilistic risk assessment (PRA) was performed for the time period ESW C was unavailable (approximately 43.5 hours). The PRA calculated the incremental conditional core damage probability (ICCDP) in this case to be 7.4E-08. The Incremental Large Early Release Probability (ICLERP), by definition, cannot be greater that the ICCDP. Therefore, ICLERP is less than 7.4E-08. Configurations with an ICCDP of less than 1.0E-06 and an ICLERP of less than 1.0E-07 are not considered to be significant risk events. Based on the PRA results, this event is considered to be of very low safety significance.

CORRECTIVE ACTIONS

The ESW C discharge check valve was removed from the system piping on May 29, 2008, for inspection. The check valve was rebuilt with new internal parts and reinstalled. The valve body was re-used.

The closed limit switch of the motor operator for the ESW C discharge valve was reset. The butterfly disc was readjusted approximately four degrees into the seat compared to the previous as-found condition. Results of the subsequent motor operated valve (MOV) static test were acceptable.

After repairs to the discharge check and discharge valves were completed, the ESW C system draindown test was re-performed per section 5.1.4 of SVI P45-T2003. The ESW C system passed

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the draindown test.

A preventive maintenance task was established to inspect the ESW C discharge check valve and replace the internals on an eight year frequency.

The following are planned actions to ensure proper function of the ESW C discharge valve:

- Determine an acceptable leak rate for the ESW C discharge valve.
- Develop a leak test for the ESW C discharge valve using the designated criteria and require the test be performed after MOV testing, limit switch replacement, or adjustment work on the valve's motor operator.
- Perform MOV testing and leak testing on the ESW C discharge valve during the next refueling outage.

The design basis function and associated leakage criteria for the ESW C discharge valve and discharge check valve will be documented in engineering Calculation P45-044, Keepfill Check Valve Leak Rate/Standpipe Draindown Level.

PREVIOUS SIMILAR EVENTS

A review of Perry LERs and the corrective action program database for the past three years found one instance where the ESW C system failed a draindown test. On June 30, 2007, with the plant in Mode 3, Hot Shutdown, the ESW C loop failed Section 5.1.4 "HPCS ESW Draindown Test" in SVI-P45-T2003. The draindown time experienced during the test was less than the minimum amount of time required in the surveillance instruction. The draindown test was re-performed on July 2, 2007, without acceptable results as conditions to enter the test could not be established. In both instances, the ESW C pump was re-started to maintain system operability.

The ESW C discharge check valve and discharge valve were removed from the system for inspection. The inspection found heavily corroded valve internals on the discharge valve. This corrosion allowed leakage across the valve seat, which provided a draindown flow path through the ESW C pump. The discharge check valve was found to be in good condition with no parts requiring replacement. The discharge valve was replaced with a new Contromatics butterfly valve of original design and on July 21, 2007, the system tested satisfactory with a successful draindown test per SVI-P45-T2003. The new discharge valve, however, was not tested for leak tightness after installation and MOV adjustment. This established latent conditions for inability to maintain keep-fill on May 28, 2008.

COMMITMENTS

There are no regulatory commitments contained in this report. Actions described in this document represent intended or planned actions, are described for the NRC's information, and are not regulatory commitments.