



FirstEnergy Nuclear Operating Company

Perry Nuclear Power Plant  
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August 2, 2012  
L-12-240

10 CFR 50.73(a)(2)(v)(D)

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

SUBJECT:  
Perry Nuclear Power Plant, Unit 1  
Docket No. 50-440, License No. NPF-58  
Licensee Event Report Submittal

Enclosed is Licensee Event Report (LER) 2012-002, Inoperable High Pressure Core Spray System Results in Loss of Safety Function. There are no regulatory commitments contained in this submittal.

If there are any questions or if additional information is required, please contact Mr. Robert Coad, Manager – Regulatory Compliance, at (440) 280-5328.

Sincerely,

Vito A. Kaminskas

Enclosure:  
LER 2012-002

cc: NRC Project Manager  
NRC Resident Inspector  
NRC Region III

IEZZ  
NRR

<b>NRC FORM 366</b> (10-2010)		<b>U.S. NUCLEAR REGULATORY COMMISSION</b>			APPROVED BY OMB NO. 3150-0104		EXPIRES 10/31/2013			
<b>LICENSEE EVENT REPORT (LER)</b> (See reverse for required number of digits/characters for each block)										
<b>1. FACILITY NAME</b> Perry Nuclear Power Plant					<b>2. DOCKET NUMBER</b> 05000-440		<b>3. PAGE</b> 1 OF 4			
<b>4. TITLE</b> Inoperable High Pressure Core Spray System Results in Loss of Safety Function										
<b>5. EVENT DATE</b>			<b>6. LER NUMBER</b>			<b>7. REPORT DATE</b>			<b>8. OTHER FACILITIES INVOLVED</b>	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
06	11	2012	2012	- 002	- 00	08	02	2012	FACILITY NAME	DOCKET NUMBER
										05000
										05000
<b>9. OPERATING MODE</b>  <div style="text-align: center; font-size: 24px;">1</div>		<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>								
		<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"><input type="checkbox"/> 20.2201(b)</div> <div style="width: 50%;"><input type="checkbox"/> 20.2203(a)(3)(i)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(i)(C)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(vii)</div> <div style="width: 50%;"><input type="checkbox"/> 20.2201(d)</div> <div style="width: 50%;"><input type="checkbox"/> 20.2203(a)(3)(ii)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(ii)(A)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(viii)(A)</div> <div style="width: 50%;"><input type="checkbox"/> 20.2203(a)(1)</div> <div style="width: 50%;"><input type="checkbox"/> 20.2203(a)(4)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(ii)(B)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(viii)(B)</div> <div style="width: 50%;"><input type="checkbox"/> 20.2203(a)(2)(i)</div> <div style="width: 50%;"><input type="checkbox"/> 50.36(c)(1)(i)(A)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(iii)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(ix)(A)</div> <div style="width: 50%;"><input type="checkbox"/> 20.2203(a)(2)(ii)</div> <div style="width: 50%;"><input type="checkbox"/> 50.36(c)(1)(ii)(A)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(iv)(A)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(x)</div> <div style="width: 50%;"><input type="checkbox"/> 20.2203(a)(2)(iii)</div> <div style="width: 50%;"><input type="checkbox"/> 50.36(c)(2)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(v)(A)</div> <div style="width: 50%;"><input type="checkbox"/> 73.71(a)(4)</div> <div style="width: 50%;"><input type="checkbox"/> 20.2203(a)(2)(iv)</div> <div style="width: 50%;"><input type="checkbox"/> 50.46(a)(3)(ii)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(v)(B)</div> <div style="width: 50%;"><input type="checkbox"/> 73.71(a)(5)</div> <div style="width: 50%;"><input type="checkbox"/> 20.2203(a)(2)(v)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(i)(A)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(v)(C)</div> <div style="width: 50%;"><input type="checkbox"/> OTHER</div> <div style="width: 50%;"><input type="checkbox"/> 20.2203(a)(2)(vi)</div> <div style="width: 50%;"><input type="checkbox"/> 50.73(a)(2)(i)(B)</div> <div style="width: 50%;"><input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)</div> </div>								
<b>10. POWER LEVEL</b>  <div style="text-align: center; font-size: 24px;">073</div>		Specify in Abstract below or in NRC Form 366A								
<b>12. LICENSEE CONTACT FOR THIS LER</b>										
FACILITY NAME Robert Swartz, Compliance Engineer, Regulatory Compliance, Perry Nuclear Power Plant								TELEPHONE NUMBER (Include Area Code) (440) 280-7664		
<b>13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT</b>										
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	
B	ED	ECBD	X999	Y						
<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE). <input checked="" type="checkbox"/> NO						<b>15. EXPECTED SUBMISSION DATE</b>				
						MONTH   DAY   YEAR				
<b>ABSTRACT</b> (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)										
<p>On June 11, 2012, at 0852 hours, with the plant in Mode 1 and the reactor operating at 73 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 Division 3 DC Electrical Power Subsystem being declared inoperable at 0852 hours.</p> <p>The cause of the event was the failure of a High Voltage Shut Down (HVSD) board in the Unit 1 Division 3 Normal Battery Charger. The Division 3 DC Electrical Power Subsystem was declared inoperable as a result of this failure. The HPCS system was subsequently declared inoperable in accordance with Technical Specifications.</p> <p>The Division 3 Reserve Charger was placed in service. The Division 3 DC Electrical Power Subsystem and the HPCS system were declared operable at 1245 hours. The HVSD boards in the Unit 1 Division 3 and Unit 2 Division 3 Normal Battery Chargers will be replaced with boards that are not susceptible to the identified failure mode. The safety significance of this event is considered to be small.</p> <p>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.</p>										

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**NARRATIVE**

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

**INTRODUCTION**

On June 11, 2012, at 0852 hours, with the plant in Mode 1 and the reactor operating at 73 percent of rated thermal power, the High Pressure Core Spray (HPCS) [BG] system was declared inoperable. The Division 3 DC Electrical Power Subsystem [EJ] had been declared inoperable at 0852 hours and as a result, Technical Specifications (TS) required the HPCS system be declared inoperable immediately. The 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 1441 hours, notification was made to the NRC Operations Center (ENS Number 48013) in accordance with 10 CFR 50.72(b)(3)(v)(D), event or condition that could have prevented the 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 June 11, 2012, at 0845 hours, the control room received unexpected Division 3 Diesel Generator Trouble and Division 3 Battery DC System Trouble alarms. Division 3 battery voltage was observed to be 130 VDC and lowering and it was determined that the Unit 1 Division 3 Normal Battery Charger had failed. The Division 3 DC Electrical Power Subsystem was declared inoperable due to not meeting TS Surveillance Requirement (SR) 3.8.4.1 which verifies battery terminal voltage to be  $\geq 129$  volts and SR 3.8.7.1 which verifies correct breaker alignment and voltage to the required electrical power distribution systems. The plant entered TS Limiting Condition for Operation (LCO) 3.8.4, DC Sources-Operating, Condition B and TS LCO 3.8.7, Distribution Systems-Operating, Condition D. TS LCO 3.8.4 Required Action B.1 and TS LCO 3.8.7 Required Action D.1 require the HPCS system to be declared inoperable immediately. TS LCO 3.5.1, ECCS-Operating, Actions B.1 and B.2 were entered which require the Reactor Core Isolation Cooling (RCIC) [BN] system be verified operable within one hour and the HPCS system be restored to operable status within 14 days.

The Division 3 Reserve Charger was placed in service at 0858 hours and battery voltage was restored to normal. After successful completion of required surveillances, the Division 3 DC Electrical Power Subsystem and the HPCS system were declared operable at 1245 hours. TS LCOs were exited at this time.

**CAUSE OF EVENT**

The as found condition of the Unit 1 Division 3 Normal Battery Charger included observations that the charger AC and DC breakers were closed and the High Voltage Shut Down (HVSD) board high voltage trip relay was in the tripped state. The HVSD trip relay actuates on a sensed high voltage of 140 VDC after a time delay of approximately ten seconds. The HVSD board is designed to pick up on a high voltage in the charger. When a high voltage is sensed, the unit disconnects the auxiliary voltage transformer which results in no control power for the charger. With no power for the control circuit, the charger shuts down.

Discussions with the original equipment manufacturer (OEM) identified that the HVSD board trip relay design was the cause of the battery charger failure. The mechanical latching trip relay is vulnerable to creep and/or mechanical agitation activation. The FENOC BETA Laboratory subjected the HVSD board that was installed during the event to mechanical agitation and was able to repeatedly trip the relay with minor agitation.

The failure mechanism for the Unit 1 Division 3 Normal Charger is a mechanical latching relay on the HVSD board that is susceptible to changing states when exposed to mechanical agitation. The apparent cause is less than adequate OEM design.

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**NARRATIVE****EVENT ANALYSIS**

The HPCS system is a single train, Emergency Core Cooling System (ECCS) 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 Chapter 15 of the Updated Safety Analysis Report (USAR). 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 Division 3 DC Electrical Power Subsystem ensures the availability of DC electrical power for the systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated design basis accident (DBA). With one or more Division 3 DC Electrical Power Subsystems inoperable, the Division 3 powered systems are not capable of performing their intended functions. Immediately declaring the HPCS system inoperable allows the Actions of LCO 3.5.1, "ECCS Operating," to apply appropriate limitations on continued reactor operation.

A Probabilistic Risk Assessment (PRA) evaluation was performed for the Division 3 DC Electrical Power Subsystem being declared inoperable and the subsequent loss of safety function classification. In order to characterize the significance of the impact on core damage frequency, this evaluation utilized the approach contained in NRC Inspection Manual (IM) Chapters 0308, 0309 and 0609. A delta core damage frequency ( $\Delta$ CDF) of  $3.6E-10$  was calculated based on an exposure time of 13 minutes (0845 when the Division 3 Normal Battery Charger failed to 0858 when the Division 3 Reserve Battery Charger was placed into service) for the event. Using the logic as discussed in IM 0609, the results indicate that  $\Delta$ CDF is below  $1E-06$ , signifying a small quantitative impact. Based on this analysis, the event is below the threshold for being risk significant, and the risk of this event is therefore considered to have small safety significance in accordance with the regulatory guidance.

**CORRECTIVE ACTIONS**

The following corrective actions are planned as a result of this event:

- The Unit 1 Division 3 Normal Battery Charger HVSD board will be replaced. The new board will have a magnetically latching relay that is not susceptible to tripping due to mechanical agitation.
- The Unit 2 Division 3 Normal Battery Charger HVSD board will be replaced. This charger is currently functioning but is of similar design that may be susceptible to falsely tripping due to mechanical agitation.

**PREVIOUS SIMILAR EVENTS**

A review of Licensee Event Reports and the corrective action database for the past three years determined that no similar events had occurred.

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## **NARRATIVE**

### **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.