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May 14, 2008  
L-08-165

ATTN: Document Control Desk  
United States Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT:**

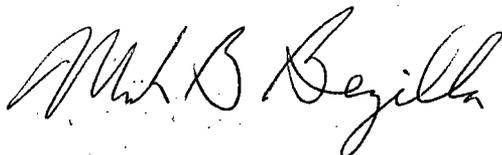
Perry Nuclear Power Plant  
Docket No. 50-440, License No. NPF-58  
Licensee Event Report Submittal

Enclosed is Licensee Event Report (LER) 2007-007, "Reactor Recirculation Pump Failure Results In Manual Reactor Protection System Actuation."

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 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 2007-007

cc: NRC Project Manager  
NRC Resident Inspector  
NRC Region III

IC22  
NRR

<b>1. FACILITY NAME</b> Perry Nuclear Power Plant	<b>2. DOCKET NUMBER</b> 05000 440	<b>3. PAGE</b> 1 OF 4
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**4. TITLE**  
Reactor Recirculation Pump Failure Results In Manual Reactor Protection System Actuation

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
6	22	2007	2007	- 007	- 00	05	14	2008	FACILITY NAME	DOCKET NUMBER

<b>9. OPERATING MODE</b>  1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>										
	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)							
<b>10. POWER LEVEL</b>  23	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(a)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)							
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)							
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)							
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)							
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)							
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)							
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER							
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A							

**12. LICENSEE CONTACT FOR THIS LER**

FACILITY NAME Thomas Stec, Compliance Engineer, Regulatory Compliance	TELEPHONE NUMBER (Include Area Code) (440) 280- 5163
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**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	AD	RLY62	T349	Y					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b>	<b>15. EXPECTED SUBMISSION DATE</b>	MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE).	<input checked="" type="checkbox"/> NO			

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

On June 22, 2007, at approximately 0100 during a planned shutdown, reactor recirculation (RRC) pump B failed to transfer to slow speed and subsequently tripped. On June 22, 2007, at approximately 0329 hours, with the reactor operating at approximately 23 percent of rated thermal power, shutdown of the plant was completed by a manual actuation of the Reactor Protection System (RPS).

The cause of the RRC pump B failure to transfer to slow speed was a malfunction of the low-frequency motor-generator set control and interlock circuit Agastat time-delay relay. This was due to the auxiliary contact failing to open as a result of less than adequate programmatic controls for relay checkout and calibration. A contributing cause of the event was less than adequate implementation of testing controls for installing relays.

The failed Agastat time-delay relay was replaced with a newly calibrated Agastat time-delay relay. The timing relay checkout and calibration process was revised to include visual inspection of switch contact alignment and testing requirements. A training qualification card was developed for the calibration and testing of relays. Lessons learned will be added to maintenance training programs.

This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A) for events resulting in actuation of the RPS.

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**NARRATIVE**

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

**INTRODUCTION**

On June 22, 2007, at approximately 0100 during a planned shutdown, reactor recirculation (RRC) [AD] pump [P] B failed to transfer to slow speed and subsequently tripped. On June 22, 2007, at approximately 0329 hours, with the reactor operating at approximately 23 percent of rated thermal power (RTP), shutdown of the plant was completed by a manual actuation of the Reactor Protection System (RPS) [JC].

This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A) for any event resulting in manual or automatic actuation of the RPS. This LER was not submitted within 60 days from the event date of June 22, 2007 and was not reported as a four-hour non-emergency notification in accordance with 10 CFR 50.72(b)(2)(iv)(B) for manual actuation of the RPS with the reactor critical. NRC Inspection Report, "Perry Nuclear Power Plant NRC Integrated Inspection Report 05000440/2008002-07," dated May 8, 2008, documents resolution of the issue.

**EVENT DESCRIPTION**

On June 21, 2007, a planned plant shutdown was commenced at approximately 2030 hours, with the plant in Mode 1 (i.e., Power Operation) and the reactor operating at approximately 95.5 percent of RTP, with the intent of completing the shutdown by manual reactor scram. The purpose of the shutdown was to troubleshoot the causes of erratic operation of and to make repairs to the RRC flow control valve A. The plant was not in a technical specification required shutdown action statement. In preparation for plant shutdown, power was reduced to 44.4 percent of RTP.

On June 22, 2007, at approximately 0100 hours, with the plant in Mode 1 and the reactor operating at approximately 44 percent of RTP, the RRC pumps A and B were transferred to slow speed per IOI-3. The A pump successfully went to slow speed, but the B pump stopped running. When speed dropped on the recirculation B pump during the attempted transfer, the recirculation B pump transferred to slow speed and then tripped. Several unanticipated automatic restart logic actuations occurred and RRC pump B was subsequently tripped. This placed the plant in single loop operation and the plant entered and completed off normal instruction, "Single Pump Operation." The motor feed pump was started in recirculation mode in preparation for the reactor scram. The reactor pressure vessel water level was raised to 198.5 inches above top of active fuel (TAF) in preparation for the reactor shutdown.

On June 22, 2007, at approximately 0329 hours, with the plant in Mode 1 and the reactor operating at approximately 23 percent of RTP, with level and pressure stable, shutdown of the reactor was completed by a manual RPS actuation in accordance with IOI-8, section 4.3. "Reactor Shutdown."

The reactivity plan included shifting recirculation pumps to slow speed, reduction of reactor power to approximately 20 percent RTP, removal of the main turbine from service, and shutting down of the reactor. Single loop operation was not included in the plan. The main turbine was not removed, as per the plan, prior to manual RPS actuation. Following RPS actuation, reactor water level lowered to below level 3 (actuation scram signal at 177.7 inches above TAF) as expected. The lowest reactor water level reached was 158.4 inches above TAF. When reactor water level lowered to below level 3, containment isolation [JM] signals were appropriately received by the residual heat removal system [BO] valves [ISV]. The valves were already closed due to plant conditions. Level was recovered

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automatically by the feedwater system to greater than 178 inches above TAF in approximately 28 seconds. The turbine and generator tripped as expected. No automatic Emergency Core Cooling System (ECCS), or Reactor Core Isolation Cooling (RCIC) system response was required and no ECCS or RCIC systems were used for level control. Overall level control systems responded as expected and anticipated.

**CAUSE OF EVENT**

The cause of the manual RPS actuation, which occurred at a higher power level than originally planned, was attributed to the RRC pump B failure to transfer to slow speed during the planned shutdown. The cause of the failure to transfer was a malfunction of the B pump low-frequency motor-generator (LFMG) [MG] set control and interlock circuit time-delay relay [RLY62] (Relay 1B33K011B is an Agastat Model 7012X10BL industrial electro-pneumatic timing relay, with external auxiliary contacts as a factory-installed option). The malfunction was due to the auxiliary contact failing to open. The contact failure resulted from less than adequate programmatic controls for timing relay checkout and calibration. These controls are designed to ensure proper installation of reliable Agastat time-delay relays. The timing relay check-out and calibration process specified in Generic Electrical Instruction (GEI)-0114, "Timing Relays Agastat Type 7012/7022, 7014/7024, and 2412/2422 Series," did not provide sufficient detail to detect that the auxiliary switch [EIS] was not adjusted properly prior to its installation. The failed relay had been calibrated in March 2007 and was installed in mid-April 2007, during refueling outage eleven (11).

A contributing cause of the event included less than adequate implementation of testing controls to ensure installation of a reliable relay. Personnel performing testing activities on the time-delay relay missed opportunities to identify the condition in which the auxiliary switch was improperly positioned for reliable operation of the relay.

**EVENT ANALYSIS**

The RRC system provides a forced coolant flow through the core to remove heat from the fuel to allow operation at significantly higher power than would otherwise be possible. The system consists of two recirculation pump loops external to the reactor vessel. A bounding evaluation of the event was performed, assuming a manual reactor scram occurred with all risk significant equipment available. Configurations with a core damage probability (CDP) of less than 1.0E-06 and a large early release probability (LERP) of less than 1.0E-07 are not considered to be risk significant events. CDP of 5.5E-07, being less than 1.0E-06, and a LERP of 8.2E-08, being less than 1.0E-07 is considered to be of low risk significance.

**CORRECTIVE ACTIONS**

The failed Agastat time-delay relay (1B33K0115B) was replaced with a newly calibrated Agastat time-delay relay. The procedure to calibrate timing relays was revised to include a visual inspection of switch location and testing requirements for an auxiliary switch (when installed as part of the relay assembly). These requirements include verification of "switch transfer" when the relay is energized and "switch reset" when the relay is de-energized. Appropriate criteria for adjustment was provided for the switch if it does not properly transfer or reset. Documentation of as-found and as-left conditions were included in the instruction revision.

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Training gap and needs analysis were completed for instrumentation and control (I&C) technicians for check-out and calibration of Agastat 7000 Series Timing Relays. A qualification card was developed for the calibration and testing of relays and was included as part of the I&C technicians' certification. The electrical training curriculum review committee added the condition's lessons learned to the first cycle, 2008, continuing training for electrical maintenance personnel. The enhancements made to the procedure to calibrate timing relays for auxiliary contact configuration were also added to the electrical maintenance initial training program.

**PREVIOUS SIMILAR EVENTS**

A review of Licensee Event Reports and the Corrective Action Program database for the past three years was completed for conditions written for RRC pump failures to transfer to slow speed and improper installation of equipment. LER 2005-001, "Manual reactor scram following unexpected RRC pump trip," describes a condition where the RRC system pumps A and B unexpectedly downshifted from fast to slow speed on January 6, 2005. While operators were inserting control rods, RRC pump A unexpectedly tripped from slow speed to off followed by a manual reactor scram initiated by operations personnel. The pumps downshift was caused by a degraded optical isolator in the RRC logic circuitry. The RRC A tripping from slow speed to off was caused by a failure of an amplifier circuit on the voltage regulator card in the LFMG.

LER 2004-002, "Unplanned automatic oscillation power range monitor scram," describes a condition where both RRC pumps unexpectedly downshifted from fast to slow speed on January 6, 2004. This was followed by a reactor scram due to core oscillations detected by the oscillation power range monitor. The cause was determined to be an optical isolator intermittent failure resulting from an inadequate surge suppression network in the control circuit for the RRC pumps.

A review of corrective action program documents over the last three years found only condition reports associated with this event (LER 2007-007) and the events reported under LER 2005-001 and LER 2004-002. The corrective actions taken for these two previous events could not reasonably be expected to prevent the occurrence of this event.

**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.