NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Perry Nuclear Power Plant, Unit 1	0 5 0 0 0 4 4 0	1 OF 0 3

TITLE (4) Reinsertion of Automatic Flux Control Card Causes Spurious Spike in Recirculation Flow Resulting in Upscale Trip of APRMs and Reactor Scram

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 6	8 8	8 8	— 0 2 4	— 0 0	0 7	1 5	8 8		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	20.402(b)	20.405(c)	X 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, NRC Form 366A)
		20.405(a)(1)(iii)	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
Gregory A. Dunn, Compliance Engineer, Extension 6484	2 1 6 2 5 9 - 3 7 3 7

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 DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

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

On June 16, 1988 at 1432 during troubleshooting to a recirculation system automatic flux controller circuit card, a spurious spike in recirculation flow demand caused increased core flow resulting in an upscale neutron flux trip and subsequent reactor scram. Prior to the event, the flux controller was in manual and the individual loop flow controllers were in automatic.

The cause of the event was the reinsertion of the automatic flux control card into the recirculation flow control circuitry. This action induced a noise spike into the control loop circuitry. The perturbation resulted in an approximately 3% increase in flow control valve position demand from the initial 41%. Subsequent troubleshooting of the circuit on June 17 confirmed this hypothesis as data showed that flow demand signal spikes of varying magnitude and direction will occur upon insertion of the flux control card into the loop circuitry.

To prevent future occurrences, the Hydralic Power Units (HPUs) to the recirculation system flow control valves will be locked up to prevent unexpected transients to the plant prior to subsequent removal and reinstallation of electric circuit boards in the flow control system during power operation. Additionally, the recirculation system will not be operated in automatic flow control until optimum tuning of the system is achieved. Spare flux control cards have been sent to the vendor for independent testing and evaluation.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Perry Nuclear Power Plant, Unit 1	0 5 0 0 0 4 4 0	8 8	— 0 2 4	— 0 0	0 2 OF 0 3

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

On June 16, 1988 at 1432, during troubleshooting to a recirculation system [AD] automatic flux controller [TC] circuit card, a spurious spike in recirculation flow demand caused increased core flow resulting in an upscale neutron flux trip and subsequent reactor scram. The plant had been in Operational Condition 1 (Power Operation) at 100% power with Reactor Vessel [RPV] pressure at approximately 990 psig. Recirculation system flow control valves [FCV] were approximately 41% open.

As a result of previous anomalies observed in the recirculation system automatic flux controller on June 5, 12, and 13, 1988, it was determined that more information was necessary to formulate a definitive conclusion regarding the cause of these occurrences. Prior to commencement of recirculation system troubleshooting on June 16, the flux controller was verified in manual and the individual loop flow controllers in automatic. Operators and engineers reviewed the condition and concluded that the individual loop flow controllers would remain in automatic and flux controller in manual based on information contained in the vendors manual. At approximately 1400 the automatic flux control card, 1B33-K632-3, was removed from its cabinet and bench tested. Subsequent testing of the card was satisfactory and at 1432, the card was reinstalled. During the insertion of the card into the cabinet, a noise spike in recirculation flow demand caused a rapid increase in core flow resulting in an increase in neutron flux. Less than one second later, an upscale neutron flux trip on Average Power Range Monitors (APRMs) [IG] D, F and G caused a full reactor scram. Recirculation flow control valves completed stroking open to approximately 49%. Reactor pressure vessel water level decreased to Level 3 (+ 177.7 inches above top of active fuel) causing a transfer of reactor recirculation pumps to slow speed. All safety systems operated as designed. Operators stabilized the plant using appropriate procedures by 1450. The post scram evaluation was completed and the plant entered Operational Condition 2 (Startup) on June 21 at 1920.

The cause of the event was the reinsertion of the automatic flux control card into the recirculation flow control circuitry. This action induced a noise spike into the control loop circuitry. The noise spike perturbed the manual circuitry resulting in an approximately 8% increase in flow control valve position demand from the initial 41%. This spike was sensed by the flux controller abnormal output signal fault detector [DET] circuit which caused the flow controllers to shift from loop automatic to loop manual clamping the valve position demand at approximately 49%. A technical manual and design drawing review by the engineers, both prior to and following the event, did not reveal the potential for this transient. However, initial contact with the manufacturer, Foxboro, on June 17 did confirm the possibility that reinsertion of the card may cause improper grounding which could induce a noise spike into the circuitry. Subsequent troubleshooting of the circuit on June 17 confirmed this hypothesis as data showed that flow demand signal spikes of varying magnitude and direction will occur upon insertion of the flux control card into the loop circuitry.

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

The reactor recirculation flow control system is designed to provide various levels of manual and automatic recirculation flow and reactor power control. A recirculation flow control failure with increasing flow at full reactor power has been completely analyzed and is discussed in the Updated Safety Analysis Report (USAR) Section 15.4.5. The event which occurred on June 16 was within the envelope of this analysis and was therefore not safety significant. No previous similar events were identified.

In order to prevent future occurrences of similar events, the following steps are being initiated:

1. Prior to subsequent removal and reinstallation of electronic circuit boards in the recirculation flow control system during power operation, the Hydraulic Power Units (HPUs) to the flow control valves will be locked up to prevent unexpected transients to the plant.

2. Spare flux control cards have been sent to the vendor (Foxboro) for independent testing and evaluation.

3. Although a review of the overall system response was considered satisfactory, the control circuitry was not tuned to optimum settings for the needs of the plant. Consequently, the recirculation system will not be operated in automatic flux control until such time that optimum operation and control response is established for existing system needs.

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