NAC Form 366 (9-83)

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U.S. NUCLEAR REGULATORY COMMISSION

.

LICENSEE EVENT REPORT (LER)

APPROVED OM8 NO. 3150-0104 EXPIRES: 8/31/88

MONTH DAY YEAR YEAR 1	Automatic Flux scale Trip of R NUMBER (6) SEQUENTIAL REVISION NUMBER 0 2 4 0 0 IS SUBMITTED PURSUANT	Contro APRMs an REPOR MONTH 0 0 7 1			Spurious	ACILITIES INVO	1014 Reci	edia	1 OF	103 103
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Gregory A. Dunn, Cor	mpliance Engin	eer, Ex	ktension	6484		21116	2151	9 5 1	3 7	317
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On June 16, 1988 automatic flux c demand caused in subsequent react manual and the i The cause of the into the recircu spike into the c approximately i initial 41%. Su this hypothesis magnitude and di the loop circuit To prevent futur recirculation sy unexpected trans reinstallation o power operation. in automatic flo Spare flux contr and evaluation.	at 1432 duri controller cir acreased core or scram. Pr individual loo e event was th lation flow c control loop c increase in absequent trou as data showe trection will try. The occurrences stem flow con sients to the of electric ci Additionall ow control unt	ng trou cuit ca flow re ior to p flow e reins ontrol ircuitr flow co bleshoo d that occur u , the H troi va plant p rcuit b y, the il opti been s	bleshoot and, a sp sulting the even controll ertion of circuitry by. The pontrol va oting of flow dem pon inse lydralic alves wil prior to poards in e recircu mum tuni	urious in an t, the ers we the rs the ci and si rtion Power l be l subsec the f lation	s spike in upscale r flux con re in au automation is action bation re sition do reuit on gnal spil of the f. Units (H) ocked up uent remained low control system t	n recircu neutron f ntroller tomatic. c flux con n induced esulted i emand fro June 17 kes of va lux contr PUs) to t to preve oval and rol syste will not	latio lux t was i ntrol a no n an om the confi cying ol ca he nt t be op ieved	n flo rip a n card ise rmed rd in ing erate	and i i i i i i	

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED 0M8 NO. 3150-0104 EXPIRES: 8/31/88

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)	
	1012.022	YEAR SEQUENTIAL REVISION NUMBER		
Perty Nuclear Power Plant, Unit 1	0 15 10 10 10 14 14 10	8 8 - 0 2 4 - 0 0	0 2 OF 01 3	

On June 16, 1908 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 uperate 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 anonalies observed in the recirculation system automatic flux controller on Jone 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 inicial 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.

RC Form 366A

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U.S. NUCLEAR REGULATORY COMMISSION APPROVED OMB NO. 1150-0104

EXPIRES: 8/31/88

FACILITY NAME (1)	OOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)	
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Perry Nuclear Power Plant, Unit 1	0 5 0 0 0 4 4	0 8 18 - 0 2 4 - 0 10	0 13 OF 0 13	

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

- 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.
- 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].

AC Form 386.A