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) Blown Fuse in RPS During Surveillance Causes Reactor Scram of Group 3 Control Rods Resulting in Reactor Vessel Low Level 3 and Full 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 5 0 0 0
0 5	0 6	8 8	8 8	0 1 7	0 1	0 6	2 3	8 9		0 5 0 0 0

OPERATING MODE (9): 1

POWER LEVEL (10): 1 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

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	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	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 May 6, 1988 at 1436, during the performance of a monthly Reactor Protection System (RPS) channel functional test, an unexpected scram of Group 3 control rods (approximately one quarter of total) caused reactor vessel level to decrease to low level 3 (+177.7 inches above top of active fuel) resulting in a full reactor scram. The surveillance trips one (A) of two RPS trip systems causing a half RPS trip. Coincident with the half RPS trip a blown fuse to the RPS Trip System B Group 3B control rods caused a complete deenergization of all Group 3 control rod scram solenoids. The ensuing Group 3 control rod scram caused a rapid power decrease and void collapse resulting in a reactor vessel low level 3 and full RPS scram. Operators responded in accordance with plant procedures and all systems operated as designed.

The cause of the blown fuse could not be readily identified. The fuse was replaced, and current and voltage monitored while performing pertinent steps of the monthly RPS surveillance test. No abnormalities were identified. Additional temperature and current monitoring determined that the circuit configuration upstream of this fuse causes slightly elevated temperatures adjacent to the fuse. The fuse was sent to the vendor to perform a failure analysis. This analysis indicated that the fuse did in fact open on a over load condition. Continuous monitoring from July, 1988 to September 1988 showed no occurrences in which the current was high enough to cause fuse opening. As a result of this testing and analysis a design change has been approved to increase the size of the fuse from 15 amps to 20 amps.

NRC Form 366A (9-83)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
Perry Nuclear Power Plant, Unit 1	0 5 0 0 0 4 4 0	8 8	— 0 1 7	— 0 1	0 2 OF 0 3

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

On May 6, 1988 at 1436, during the performance of a monthly Reactor Protection System (RPS) [JC] channel functional test, an unexpected scram of Group 3 control rods [ROD] caused reactor vessel [RPV] level to decrease to low level 3 (+177.7 inches above top of active fuel) resulting in a full reactor scram. Prior to the event, the plant was in Operational Condition 1 (Power Operation) with reactor power at approximately 100% and reactor pressure was approximately 1000 psig.

On May 6, 1988 at 1412, technicians commenced routine surveillance test SVI-B21-T0032A, "Reactor Vessel Steam Dome Pressure and Reactor Vessel Pressure (RHR Cut-In Permissive) Channel A Functional for 1B21-N678A." No other tests involving RPS were ongoing at the time. At 1436, as part of the surveillance test, a trip of one (A) of two RPS trip systems was initiated. However, in addition to the expected half RPS trip, all Group 3 control rods (45 rods; approximately one quarter of the total) inserted unexpectedly. Reactor power (as measured by APRM flux) rapidly decreased to approximately 10% along with reactor pressure which decreased to approximately 935 psig. The rapid void collapse caused a sudden decrease in reactor vessel water level. Approximately 4 seconds after the initiating event, reactor water level reached the low level 3 setpoint initiating a full RPS scram and reactor recirculation pump [AD] downshift to slow speed. All control rods inserted as designed. At approximately 1453, operators stabilized the plant in accordance with plant procedures. Initiation of Emergency Core Cooling Systems (ECCS) was not required and all systems responded to the event as designed. Following reset of the RPS circuitry, a blown fuse (1C71-F18D-1) [FU] was discovered in the power supply feeder to the RPS Trip System B Group 3B scram solenoids [SOL].

As designed, when the planned trip of RPS Trip System A was initiated, all Trip System A scram solenoids (Groups 1-4) deenergized. Normally, the RPS Trip System B scram solenoids remain energized, thus preventing a full RPS trip. Additionally, prior to inserting the half RPS trip, operators verified that all scram solenoids (Trip Systems A and B) were energized and that no other RPS scram signal was present. However, between the time of this verification and the time the trip was inserted (less than one minute), a fuse (1C71-F18D-1) in the power supply feeder to the RPS Trip System B Group 3B scram solenoids blew resulting in a deenergization of all Group 3 control rod scram solenoids. These rods subsequently scrammed initiating the event. The post scram evaluation was completed and the plant entered Operational Condition 2 (Startup) on May 7 at 0735.

The fuse (FNM 15) opened in a manner indicative of an overload condition, although no overload conditon was observed at the time of the fuse opening, or in the circuit monitoring that has taken place since the fuse opening. The fuse was a dual element type with time delay and instantaneous components. After disassembly and inspection, it was determined that the time delay element had operated.

Additional temperature and current monitoring of this circuit determined that the wiring configuration immediately upstream of this fuse is such that temperatures adjacent to the fuse are slightly higher than panel ambient (approximately 94°F verses 81°F). This elevated temperature was not enough to

*U.S.GPO:1986-0-624-538/455

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
Perry Nuclear Power Plant, Unit 1	0 5 0 0 0 4 4 0	8 8	— 0 1 7	— 0 1	0 3 OF 0 3

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

have affected the fuse life. Previous problems occurred with fuses in this circuit in early 1987 when electrical currents through 16 AWG wire (originally in this circuit downstream of another fuse, F18D) were generating excess heat and contributing to increased localized temperatures. These higher temperatures were believed to cause shortened fuse life and premature opening (although no previous scrams caused by premature fuse operation were identified). The wiring was changed to 12 AWG to reduce the heat generated by the circuit. Subsequent to design change implementation, no other events involving premature opening of either fuse in this circuit (F18D and F18D-1) were identified.

The scram of Group 3 control rods inserted approximately 25% of all control rods. These rods are symmetrically arranged throughout the reactor core. No abnormal power distributions or flux tilts resulted from this transient. The subsequent reactor vessel water level transient resulted in a full scram at Level 3, 4 seconds into the event and a minimum water level of 146 inches approximately 17 seconds later. The low level 2 setpoint of +129.8 inches above top of active fuel was never reached, and thus no system isolations occurred. Reactor vessel water level was restored using the feedwater system [SJ] and pressure control was maintained by the main turbine steam bypass system [TG]. The Updated Safety Analysis Report (USAR) Chapter 15A evaluates inadvertent scrams and concludes that in all operating states, the safety criteria are met through the design basis of plant systems. Additionally, this transient (a full scram) is considered an Anticipated Operational Transient by the USAR. If the fuse (1C71-F18D-1) would have blown at some other time (e.g. when no surveillance activity was in progress) no scram would have occurred. Control room panel indicating lights would have alerted operators and necessary corrective actions taken. It is therefore concluded that the event had no safety significance. No previous similar events were identified.

On May 6 at 1655, the fuse was replaced. While monitoring current and voltage at the fuse, pertinent steps of the monthly RPS surveillance test were reperformed satisfactorily. No abnormalities were identified and currents were within the range of the fuse size. The blown fuse was sent to the vendor for analysis. Additional temperature and current monitoring of this circuit was performed and identified slightly higher than ambient temperatures at a terminal point near the subject fuse. No abnormal current readings were measured. The vendor failure analysis concluded that the fuse has opened on an overload condition. However, continuous monitoring of the circuit from July 1988 to September 1988 did not identify any occurrences in which an overload condition existed. A Design Change has been approved to install a 20 amp fuse versus the 15 amp fuse which existed at the time of the fuse opening. The fuse which opened has already been replaced with a 20 amp fuse under the Lifted Leads, Jumpers, Temporary Electrical Devices, and Mechanical Foreign Items program. All fuses supplying power to the group scram solenoids will be replaced per the design change under the normal quarterly maintenance schedule.

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

*U.S. GPO 1986-0-624-538/455