NRC FORM 366 (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Perry Nuclear Power Plant, Unit 1	0 5 0 0 0 4 4 10	1 OF 0 4

TITLE (4): Previously Unidentified System Interaction Results in Control Rod Scram Accumulator Level Switch Inoperability and Technical Specification Violation.

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
1 2	0 7	9 0	9 0	0 3 6	0 0	0 1	0 7	9 1		0 5 0 0 0

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
4		20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)	0 0 0	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)	X 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
Henry L. Hegrat, Compliance Engineer, Extension 6855	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 December 7, 1990, at 0055, it was concluded that improper servicing resulted in as many as 54 Control Rod Scram Accumulator level switches potentially being inoperable throughout the second fuel cycle in violation of Technical Specification 3.1.3.3. On November 9, 1990, surveillance testing revealed the failure of 54 (out of 177) Control Rod Scram Accumulator level switches. Additional testing was performed, due to the unexpectedly high failure rate, to determine a cause of the failure. On December 7, 1990, the Instrumentation and Controls (I&C) Engineer determined that the methodology for charging the Control Rod Scram Accumulators was causing the level switches to become inoperable and that firm evidence existed that the 54 failed level switches were potentially inoperable prior to or during the second fuel cycle.

The cause of this event was a previously unidentified system interaction. It was not recognized that using the Nitrogen Supply system to service accumulators could result in level switch damage. Excessive flow, while servicing the accumulator caused the level switch float, to rotate which caused the bias spring to unravel, tangle and thus, prevent operation of the level switch.

To prevent recurrence, a System Operating Instruction is being revised to ensure proper level switch operation after accumulator servicing. All level switches have been retested to ensure operability after accumulator servicing. A surveillance instruction is being revised to ensure that each level switch is tested only after the accumulator is serviced. Additionally, a design change is being considered to make an improved servicing rig a permanent part of the Nitrogen Supply system.

On December 7, 1990, at 0055, it was concluded that improper servicing resulted in as many as 54 Control Rod [AA] Scram Accumulator [ACC] level switches [LS] potentially being inoperable throughout the second fuel cycle in violation of Technical Specification 3.1.3.3. At the time of discovery, the plant was in Operational Condition 4 (Cold Shutdown). Reactor coolant temperature was approximately 140 degrees Fahrenheit with reactor vessel [RPV] pressure at zero psig.

On November 9, 1990 Condition Report 90-374 documented the failure of 54 (out of 177) Control Rod Scram Accumulator level switches during the performance of Surveillance Instruction (SVI-C11-T0009), "Control Rod Scram Accumulator Pressure/Leak Detection Functional/Calibration for 1C11-R(XX-YY), 1C11-N(XX-YY)B and 1C11-N(XX-YY)A (XX-YY represents HCU coordinates for 177 accumulators)." It was assumed that the failures occurred at the time of testing.

Additional testing was performed, due to the unexpectedly high failure rate, to determine a cause of the failure. On December 6, 1990, a random sample of twenty Control Rod Scram accumulator level switches were tested. These accumulators had all been recently charged in accordance with the approved procedure, and all level switches had been proven operable by the performance of SVI-C11-T0009 in November, 1990. Three of the twenty switches failed the functional test and required replacement. On December 7, 1990, the Instrumentation and Controls (I&C) Engineer determined that the methodology for charging the Control Rod Scram Accumulators was causing the level switches to become inoperable and that firm evidence existed that as many as 54 failed level switches were potentially inoperable prior to or during the second fuel cycle.

The cause of this event was a previously unidentified system interaction. It was not recognized that using the Nitrogen Supply system [SK] to service Control Rod Scram Accumulators would cause a problem with the level switches; however, the pressure/volume capabilities of the Nitrogen Supply system are much greater than those of the alternate method of using a nitrogen bottle for servicing. This greater pressure/volume capability allowed excessive flow through the instrument block to the accumulator which in turn rotated the level switch float, unraveled and tangled the bias spring, and prevented operation of the level switch.

The unraveling and tangling of the bias springs had been verified when the switches were replaced. Because the switches were damaged by accumulator servicing after the SVI-C11-T0009 performance of May 1989, there would have been no way to identify that the switches were inoperable unless the accumulator failed and the absence of the alarm had been noticed. However, no failures of this type occurred during the second fuel cycle. Because these accumulators are subject to servicing and draining within the fuel cycle and because such servicing does not always result in a failed level switch, it is not possible to determine precisely when any of the level switches failed.

Each Control Rod Scram accumulator stores sufficient energy to fully insert a control rod at any vessel pressure. The accumulator is a hydraulic cylinder with a free-floating piston. The piston separates the water on top from the nitrogen below. A check valve in the accumulator charging line prevents loss of water pressure in the event supply pressure is lost. During normal operation, the accumulator piston is seated at the bottom of its cylinder. Loss of nitrogen decreases the nitrogen pressure, which actuates a pressure switch and sounds an alarm in the control room. To ensure the accumulator is always able to produce a scram, it is continuously monitored for water leakage. A float type level switch actuates an alarm if water leaks past the piston barrier and collects in the accumulator instrumentation block.

In this event, as many as 54 Control Rod Scram Accumulator Level Switches have potentially been inoperable during power operation. This inability to monitor internal accumulator water leakage resulted in the inoperability of the 54 control rod scram accumulators in accordance with Technical Specification 4.1.3.3 and the requirement to declare the 54 associated control rods inoperable in accordance with Technical Specification 3.1.3.1 Action a.2

Because it is not possible to determine the exact time of failure for each switch, the conservative approach is being taken to declare the failed level switches inoperable throughout the last fuel cycle. During the time of the accumulator/control rod inoperability due to this event, there was no internal accumulator leakage that would have rendered the accumulators unable to perform their intended function. Additionally during the entire period of inoperability of the 54 control rods in power operation, a control rod drive pump was operating. Based on the availability of control rod hydraulic pressure, availability of the scram accumulators if needed, and satisfaction of the remaining Technical Specification action requirements, this event is not considered to be safety significant.

No other previous events involving scram accumulator/control rod inoperability due to Control Rod Scram Accumulator Level Switch malfunction have been reported. From 1985 to the present, some level switch failures due to excessive nitrogen flow have been experienced while performing SVI-C11-T0009 testing. Procedural precautions and development of a nitrogen throttling rig were the responses to the previous switch failures which were believed to have occurred at the time of testing. These previous switch failures were lesser in number than the December 7, 1990 event, and past operability requirements had not been brought into question.

To prevent recurrence, System Operating Instruction (SOI-C11 (CRDH)) "Control Rod Drive Hydraulic System (Unit 1)" is being revised to specifically require the use of an improved nitrogen servicing rig that utilizes a high pressure regulator in series with a metering valve to allow better control of the nitrogen flow when servicing Control Rod Scram Accumulators. SOI-C11 (CRDH) is also being revised to require testing of the level switches after accumulator servicing until

sufficient data has been evaluated to ensure that the new method of accumulator servicing does not damage the level switches. All Control Rod Scram Accumulator level switches were retested after accumulator servicing to ensure operability. SVI-C11-T0009 is being revised to ensure that testing of each level switch is performed only after the accumulator is serviced. Additionally, a design change is being considered to make the charging rig a permanent part of the Nitrogen Supply system. As part of the established requalification training program, all plant licensed and non-licensed operators will be instructed on the lessons learned from this event.

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