NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/85

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 5

TITLE (4)

Neutron Monitoring System Spikes Result In Manual And Automatic RPS Actuations

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 4	2 2	8 6	8 6	— 0 0 6	— 0 0	0 5	2 2	8 6		0 5 0 0 0
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THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

OPERATING MODE (9)	5											
POWER LEVEL (10)	0 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)
Paul Russ, Compliance Engineer, ext. 6472	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 April 22 at 1134 and April 25 at 0159, Neutron Monitoring System instrumentation upscale trips resulted in one manual and one automatic Reactor Protection System (RPS) actuation. During the first event, a momentary spike on one Average Power Range Neutron Monitor (APRM) caused an upscale trip which did not result in a full RPS trip (RPS shorting links were removed; non-coincidence mode in effect). The instantaneous spike was not present long enough to fully actuate the non-coincidence logic. Operators as a precautionary measure, manually initiated a full RPS trip. Occurring simultaneously with the manual RPS trip was a single Intermediate Range Neutron Monitor (IRM) upscale spike. On April 25, another IRM upscale spike occurred resulting in a full RPS trip.

The IRM spikes were attributed to electrical noise. The APRM spike was also believed to be caused by noise, however, APRM card vibration is also being evaluated as a contributing factor.

To reduce electrical noise interference, IRM cabling and preamplifier housing grounds are being improved through cable connector maintenance, improved cable shielding and electrical insulation of the IRM preamplifier housings. Ground bus design changes are being implemented to reduce overall ground bus noise.

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NRC Form 366
(9-83)

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 6	— 0 0 6	— 0 0	0 2 OF 0 5

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

On April 22, 1986 at 1134, an instantaneous spike on an Average Power Range Neutron Monitoring (APRM) System instrument [IG] resulted in operators manually initiating a full Reactor Protection System (RPS) actuation. On April 25, at 0159, a noise spike on an Intermediate Range Neutron Monitoring (IRM) instrument also caused a full RPS actuation. At the time of these events, the plant was in Operational Condition 5 (Refuel), core [AC] alterations were in progress, all control rods were fully inserted, the reactor vessel [RPV] and drywell heads were removed, the reactor cavity flooded and the steam dryer storage area/reactor well gate [GATE] removed. Reactor temperature was approximately 75 degrees and pressure was atmospheric.

Prior to the April 22 event, the RPS shorting links had been removed in preparation for core alterations. This placed the neutron monitoring sensors for RPS in the non-coincidence mode. When in the non-coincidence mode, a single neutron monitoring instrument trip will actuate the Reactor Manual Scram Logic resulting in a full RPS actuation.

At 1129, a momentary spike on APRM Channel "D" occurred causing RPS Reactor Scram Trip Channel "D" to actuate and alarm. No appreciable changes in neutron flux were identified on Source Range Neutron Monitors (SRMs). No Local Power Range Monitors (LPRMs) had tripped upscale. At the same time, Reactor Manual Scram Channel "D" tripped because the shorting links were removed. Since the neutron monitoring sensors were in non-coincidence mode, Reactor Manual Scram Channel "C" would also have been expected to trip resulting in a full RPS actuation. Reactor Manual Scram Channel "C" did not actuate. Immediately after tripping, APRM Channel "D" and Reactor Manual Scram Channel "D" automatically reset (these logics contain no "seal in" function). Reactor Scram Trip Channel "D" did not automatically reset because of its' "seal in" logic.

Operators responded to the alarms [ALM], noting that a single APRM Channel tripped upscale. At 1134, RPS Reactor Scram Trip Channel "D" was manually reset. Realizing that a full RPS actuation had not occurred at the time the APRM tripped, the Shift Supervisor, as a precautionary measure, ordered the Supervising Operator to manually initiate a full reactor scram by taking the mode switch [HS] to the "Shutdown" position. At 1136, a full RPS actuation was manually initiated. A momentary upscale spike on IRM Channel "H" occurred simultaneously with the manual RPS actuation. Again, no appreciable changes in neutron flux were identified on SRMs.

At 1143, after returning a fuel bundle to the upper fuel storage pool [DB], core alterations were suspended. At 1145, the Scram Discharge Instrument Volume (SDIV) high level trip was bypassed and the RPS trip reset. At 1154, the SDIV bypass switches were returned to normal.

The IRM spike was attributed to electrical noise. The APRM spike was also

believed to be caused by noise, however, an APRM card may have vibrated slightly and caused a momentary disconnect between the card and its' mating connector. This in turn may have caused the APRM spike. Investigation of the event and troubleshooting of the RPS logic circuitry determined that the extremely short duration noise spike and APRM upscale trip signal were not present for a sufficient length of time to cause the Reactor Manual Scram Channel "C" C71-K15C relay [94] to drop out. Consequently, only Reactor Manual Scram Channel "D" tripped and no full automatic RPS actuation occurred.

APRM Channels (A-H) receive and average input signals from the LPRM channels and provide continuous indication of average reactor power from a few percent to greater than rated reactor power. Any APRM upscale or inoperative trip initiates a Neutron Monitoring System Trip in the RPS.

During initial fuel loading and low power physics testing, the RPS shorting links are removed which results in a unique logic sequence known as "non-coincident protection". This allows any one of the SRM, IRM, or APRM channels to initiate a full scram signal. This unique logic ties into the Reactor Manual Scram logic in RPS. No credit is taken in the safety analysis for the response time of these Reactor Manual Scram Logic channels. Subsequent testing verified that had a valid signal occurred, the Reactor Manual Scram logic would have actuated as designed. Consequently, the single RPS channel trip occurrence had no safety significance.

A similar event occurred on April 25 at 0159, when a momentary spike on IRM Channel "A" caused an upscale trip and full RPS actuation (the RPS shorting links were still removed). Noise spikes of varying degrees also occurred on IRM Channels E, C, D and H. No appreciable changes in neutron flux were identified on SRMs. At 0204, the RPS trip was reset. Core alterations were suspended at 0210.

The IRM spike and upscale trip were again attributed to electrical noise.

IRMs are designed to provide neutron flux information during the reactor startup and heatup operations from the upper portion of the source range to the lower portion of the power range. The IRM system detects conditions that could lead to local fuel damage and provides trip signals which are used to prevent such damage. The system consists of eight identical neutron detection channels (A-H). The noise problem exhibited in the IRMs would not have detracted from its' ability to monitor neutron flux levels and transmit the necessary signals to the required protection and monitoring instrumentation. The problem could, however, cause unnecessary plant scrams during startup evolutions. An RPS trip signal is initiated when the IRM reaches 120/125 of scale for any scale selected. Once the plant enters Mode 1 ("Run") at >5% reactor power, the IRM trip function is bypassed in the RPS circuitry and the problem would not have effected further plant operations. Consequently, the

safety significance of the IRM trips was minimal. The electrical noise spikes experienced on the IRMs have occurred previously (see LER 86-001). No previous events involving APRM spiking were identified.

The following additional corrective actions have been or will be completed to identify the cause of the IRM and APRM noise spikes and prevent recurrence:

1) A check of the IRM cabling was conducted to verify that the IRM signal and multiconductor cables were grounded at the Control Room IRM drawers only. This activity determined that five IRM channels were partially grounded in locations other than the IRM drawer. After cleaning various cable connections, these partial groundings were eliminated.

2) The IRM signal cables were walked down to verify that no discontinuities were present in the metallic conduit. In several locations, ground straps between the flexible conduit and the rigid conduit were not present. These straps have been repaired. The cause of the discontinuities was indeterminate.

3) In locations where little or no cable shielding existed (e.g. inside containment penetration housings) IRM cabling was temporarily shielded to provide added protection from electrical noise. The results of this action will be evaluated to determine if this shielding should be installed permanently.

4) A search through the Control Room Logs was performed to determine if an occurrence common to each event existed. None was identified.

5) Time Domain Reflectometer (TDR) readings have been performed on IRM cabling. Three IRMs were found to have abnormalities in the traces. Two problems were attributed to poor cable connections. These connector problems have been repaired. The third abnormality was evaluated as a cable problem at the containment penetration. A spare cable in the penetration has been utilized in place of the present cabling.

6) Each IRM preamplifier housing will be electrically isolated from its respective cabinet. This should reduce noise introduced at the IRM preamplifiers.

7) An evaluation of the Control Room grounding system is currently underway. To date, several pieces of equipment have been relocated on the ground bus resulting in a significant reduction in ground bus circulating currents.

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 6	— 0 0 6	— 0 0	0 5 OF 0 5

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

If APRM card vibration is determined to be a source of the noise spikes, a design change will be implemented to eliminate vibration to an insignificant magnitude.

Subsequent to the March 22 event, non-coincidence logic Channels "C" and "D" (C71-K15C and K15D relays) were functionally tested and operated satisfactorily. On May 12, after the completion of fuel loading, the K15C relay was response time tested. The response time measured was slightly greater than the manufacturers specifications. Although no response time is specified in Technical Specifications, the C71-K15C relay was subsequently replaced.

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

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

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MURRAY R. EDELMAN
VICE PRESIDENT
NUCLEAR

May 22, 1986
PY-CEI/NRR-0467L

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Perry Nuclear Power Plant
Docket No. 50-440
LER 86-006-0

Dear Sir:

Enclosed is Licensee Event Report 86-006-0 for the Perry Nuclear Power Plant.

Very truly yours,

Murray R. Edelman

Murray R. Edelman
Vice President
Nuclear Group

MRE:njc

Enclosure: LER 86-006-0

cc: Jay Silberg, Esq.
John Stefano (2)
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1/1