

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-352/87-27

Docket No. 50-352

License No. NPF-39 Priority - Category C

Licensee: Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Facility Name: Limerick Generating Station, Unit 1

Inspection At: Limerick, PA

Inspection Conducted: October 20, 1987

Inspectors: *W. Edgerton*
for S. Pullani, Senior Operations Engineer

11-19-87
date

Approved by: *C. J. Anderson*
C. Anderson, Chief, PSS

11/23/87
date

Inspection Summary: Inspection on October 20, 1987 (Report No. 50-352/87-27)

Areas Inspected: On October 5, 1987, the licensee reported over the ENS that an Appendix R postulated fire in the service water pipe tunnel area could potentially disable all 4 EDGs. This inspection was to ascertain the Appendix R compliance in this area. This inspection report also includes the result of an enforcement conference held on October 22, 1987 to discuss this issue and the reportability issue of a related design deficiency identified and brought to the licensee attention in a letter dated September 28, 1987.

Results: One violation was identified.

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DETAILS

1. Persons Contacted

1.1 Philadelphia Electric Company (PECO)

S. Bobyock, Test Engineer
*J. Boyle, Fire Protection Engineer
J. Corcoran, Manager, QA
*D. DiPaoco, QA Engineer
*G. Edwards, Technical Engineer
*R. Hirzel, QA Engineer
*D. Neff, Compliance Engineer
E. Roeder, Field Engineer
J. Tucker, QA Engineer

1.2 Nuclear Regulatory Commission (NRC)

*R. Gramm, Senior Resident Inspector (Limerick-2)
J. Kaucher, Resident Inspector (Limerick-2)

*Denotes those present at the exit meeting.

2. Background

During the Limerick 1 preoperational testing program in June 1984, the licensee identified a potential safety concern associated with unexpected tripping of the EDGs (Class 1E) by a fire suppression (Non-Class 1E) tripping circuit. In September 1987, a potential violation was identified relative to the 10 CFR 50.55e reporting requirements for this unexpected EDG tripping concern identified in 1984.

3. Appendix R Compliance

3.1 Licensee Reporting over the ENS on October 5, 1987 and Immediate Corrective Actions

An engineering evaluation was concluded at 4:15 p.m. on October 2, 1987, that identified an Appendix R postulated fire which, due to the design and installation of the fire suppression (Non-Class 1E) tripping circuit could potentially disable or prevent automatic start of the four emergency diesel engines. Non-safety related flow switches (three per engine) manufactured by Fluid Components Inc. (Model 12-64-4-SA) were found to have logic cable routed in conduits. The conduits traverse the service water pipe tunnel fire area. If a fire were to occur in the area, it could create multiple internal shorts in connections between the flow switches and time delay relays, resulting in trip signals for all four diesel engines. As a short term corrective action, all of the fire suppression flow switch engine trips were disabled at 8:34 p.m. on October 2, 1987.

Subsequent to the licensee report, a permanent modification was completed on October 22, 1987. The modification removed the power to the control circuit and also removed the associated relays. This will remove the possibility of inadvertent tripping of the EDGs for a fire or other reasons.

3.2 Inspection of the Fire Area

The inspector toured the service water pipe tunnel (Fire Area 75) to ascertain compliance with Appendix R. The licensee's fire hazard analysis titled "Limerick Generating Station Fire Protection Evaluation Report" (LGS FPER), Revision 8, Section 5.2.24, describes the fire area and states that shutdown Methods A, B, C, and D (see LGS FPER, Section 5.2.2, for a description of these methods) will be available for a fire in the area. The LGS FPER, Section 5.2.2, indicates that at least 1 or 2 EDGs are required to achieve and maintain hot shutdown. But, a fire in the area could disable all 4 EDGs. The licensee indicated that they have an analysis (not available for inspector review at the time of inspection but will be made available soon) which concludes that hot shutdown can be achieved and maintained up to 3 hours using Reactor Core Isolation Cooling System (RCIC) (i.e., Method A) or High Pressure Coolant Injection System (HPCI) (i.e., Method B) without the use of EDGs. However, hot shutdown cannot be maintained for more than 3 hours (a requirement of Appendix R).

10 CFR Part 50, Appendix R, Section III G.1, requires that fire protection features shall be provided for structures, systems, and components important to safe shutdown. These features shall be capable of limiting fire damage so that one train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage.

Sections III.G.2 and III.G.3 of the Appendix R specify four alternatives that may be implemented outside of primary containment to assure that one redundant train of equipment, cabling and associated circuits necessary to achieve and maintain hot shutdown remains free of fire damage. The alternatives are:

- ° Separation of redundant trains of equipment, cabling and associated circuits by a three-hour rated fire barrier.
- ° Separation of redundant trains of equipment, cabling and associated circuits by a horizontal distance of 20 feet with no intervening combustibles and fire detection and automatic fire suppression systems installed in the area.

- ° Enclosure of redundant trains of equipment, cabling and associated circuits by a one-hour rated fire barrier with fire detection and automatic fire suppression systems installed in the area.
- ° Installation of alternative or dedicated shutdown capability independent of the equipment, cabling and associated circuits under consideration, and installation of fire detection and fixed-fire suppression systems in the area under consideration.

Contrary to the above, as of October 5, 1987, the control cables from the four emergency diesel generators (EDGs) automatic suppression system flow switches (three switches per EDG) routed in conduits located in the service water pipe tunnel area are not provided with any of the four alternatives (only fire protection provided in the area was manual hose station; no detection, automatic suppression, one or three hour barrier, or alternative or dedicated shutdown capability was provided). If a fire were to occur in the area, it could create multiple internal shorts in the connections between the flow switches and associated time delay relays resulting in trip signals of all four EDGs. At least 1 or 2 EDGs are required, depending on the shutdown method used for the fire area (i.e., Methods A, B, C, or D described in the licensee's fire hazard analysis). Therefore, hot shutdown could not have been achieved and maintained for a fire in the area.

This is a violation of Appendix R (50-352/87-27-01).

As stated above, the licensee identified and reported the violation and took prompt corrective actions. Although the probability of a fire in the area is remote because of limited in-situ combustibles in the area and chances of introduction of transient combustibles is low as the area is not normally accessible and multiple hot shorts must occur to disable all four EDGs simultaneously, the basic criterion in Appendix R is to assume such events and to provide one of the four alternatives of protection as stated above. Although unlikely, the safety significance of losing all four EDGs as a result of a fire in the area is quite high.

4. Enforcement Conference on 10 CFR 50.55(e) Reportability and Appendix R Requirements

At an enforcement conference on October 22, 1987 (See Attachment 1 for attendees), relative to potential violations of 10 CFR 50.55(e) reportability and Appendix R requirements by the fire suppression system EDG trip circuitry as designed and installed, the licensee presented the following information:

- A. With respect to the fire suppression system EDG trip circuitry time delay setting deficiency identified by the licensee in 1984, the licensee stated at the October 22, 1987 enforcement conference that this deficiency was not considered to fall within the 10 CFR 50.55(e) reportability criteria. Specifically, the licensee stated that the one second time delay setting deficiency, if left uncorrected, would not have caused the plant to depart from the Final Safety Analysis Report (FSAR) based on the following:
1. The on-site electric power system is in compliance with general design criteria 2, 4, 5, 17, 18 and 50. (FSAR 8.3.1.2.1)
 2. Class 1E electric systems are designed to satisfy the single failure criterion in accordance with IEEE 379-1972. (FSAR 8.1.5.2)
 3. Class 1E AC power systems are designed to ensure that any design basis event, as listed in table 2 of IEEE 308, does not cause either loss of electric power to more than one division, surveillance device, or protection system that could jeopardize the safety of the reactor unit; or transients in the power supplies, which could degrade the performance of any system. (FSAR 8.1.6.1.6)
- B. With respect to the Appendix R violation discussed in paragraph 3.2 of this report, the licensee stated the following at the October 22, 1987 enforcement conference with regard to the reason why this condition had existed until October 1987:
1. Associated circuit analysis was to identify all cables whose failure could disable safe shutdown equipment.
 2. One criterion for exclusion was that if the cables were isolated from the safe shutdown cables via a Class 1E isolation device, then their failure could not propagate back into safe shutdown circuitry and no further analysis was required.
 3. This exclusion criterion was improperly applied to the flow switch cables as a result of the failure to recognize the unique functional association of the Non-Class 1E fire protection flow switches with the diesel generator trip circuit.

The licensee stated at the October 22, 1987 enforcement conference that their reviews of the fire suppression system/EDG tripping circuiting interface in 1984 had been inadequate with respect to the Appendix R requirements.

5. Followup of Previous Inspection Findings

Although the following item relates to Limerick-2, it is related to the issues discussed in Sections 3 and 4 above and is therefore addressed in this report.

(Closed) Unresolved Item (50-353/87-11-05) Need for Failure Modes and Effects Analysis for the Interaction of Non-Safety Related Fire Protection Flow Switches with Safety Related EDGs.

The need for such an analysis does not exist now as the power to the control circuit including the flow switches and associated relays are removed as a permanent corrective action (see Section 3.1 above). This eliminates any interaction of the flow switch and its circuitry with the EDGs. This item is resolved and closed.

6. Unresolved Items

Unresolved items are matters about which more information is required to ascertain whether they are acceptable items, violations or deviations.

7. Exit Interview

The inspector met with licensee management representatives (see Section 1 for attendees) at the conclusion of the inspection on October 20, 1987. The inspector summarized the scope and findings of the inspection at that time.

The inspector and the licensee discussed the contents of this inspection report to ascertain that it did not contain any proprietary information. The licensee agreed that the inspection report may be placed in the Public Document Room without prior licensee review for proprietary information (10 CFR 2.790).

At no time during this inspection was written material provided to the licensee by the inspector.

CALCULATION SHEET

PHILADELPHIA ELECTRIC CO.

Attachment 1

NAME _____

LOCATION King of Prussia, Pa DATE 10/22/87 SHEET NO. 1 of 2SUBJECT NRC Enforcement Meeting JOB/CA NO. _____

Name	Title	Representing
T. J. Tucker	GAE	Phila. Elect Co
G.D. Edwards	LGS-Unit 1 Technical	PHILA ELECT. Co
G.M. Leitch	Manager - Nuclear En Dept	PECo
J. Raucher	Resident Unit 1	NRC
R.A. GRAMM	SR. RES. INSP	NRC
Gene Kelly	SR. Resident Unit 2	NRC
Jim Laville	Project Section Chief	"
Wm. Kane	Director, Div. of Projects	"
Jay Cutler	Regional Counsel	"
Jaque Shur	Chief, Engineering Branch	"
Peter Eselgroth	Chief, Plant Systems Section	"
Seda Pulloni	Fire Protection Engineer	"
Paul B. Lachuston	Licensing - Nuclear Operation	PECo
H.T. Johnston	Engineering - Licensing	PECo
Charles A. Mengers	Senior Eng. - LGS Licensing	PECo
DICK CLARK	Limerick Licensing Project Manager	NRR/NRC
GARY Reid	Sr. Eng. MERR. Engineering	PECo
AW Jones	Engineer - Electrical Engineering	PECo
Edw. C. Wenzinger Sr	Chief Reactor Projects Br 3	NRC RI
JOHN O'ROURKE	SUPV. ENGR/NUC. SERV. BR./M.E.DIV.	PECo
William J. McFarland	Engineer - Mechanical Engineering	PECo
Earl R. Roeder	Field Engr. - Limerick	PECo
John J. Milito	Supv. Engr. - Limerick Fld Engrs	PECo

CALCULATION SHEET

PHILADELPHIA ELECTRIC CO.

NAME _____

LOCATION _____ DATE _____ SHEET NO. 2 of 2

SUBJECT _____ JOB/CA NO. _____

J. M. CORCORAN
S.V. KOWALSKIMGR-QA LOST
V.P. - Engr. & Res.PECO
PELO

10/22/87 NRC / PECO 3pm Entrance Conf Rm 4

(Name)

(Organization)

P. Eselguth

NRC, R1

S.V. PULLANI

"

J.T. Ridd

PECO

P.K. PAVLIDIS

"

W.J. COYLE

PECO