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MAY 8 1984

Mr. Thomas E. Murley, Director
United States Nuclear Regulatory Commission
Office of Inspection and Enforcement, Region 1
631 Park Avenue
King of Prussia, PA 19406

SUBJECT: Significant Deficiency Report #107
Final Report on Defective Agastat Relays
Limerick Generating Station Units 1 and 2
NRC Construction Permits Nos. CPPR-106 & 107

REFERENCES: (1) Telecon of November 29, 1983
P. K. Pavlides (PECO) to Walter Baunack (USNRC)

(2) Significant Deficiency Report #107,
Interim Report of December 28, 1983

(3) Significant Deficiency Report #107,
Interim Report of March 30, 1984

FILES: QUAL 2-10-2 (SDR #107)

Dear Mr. Murley:

The enclosure to this letter is provided as a final report concerning defective Agastat GP relays at the Limerick Generatirg Station (LGS). Previous information was forwarded to the USNRC via the references.

Sincerely,

John S. Kemper

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Attachment
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Copy to: Director of Inspection and Enforcement
United States Nuclear Regulatory Commission
Washington, DC 20555

S. K. Chaudhary, Resident NRC Inspector (Limerick)
J. Wiggins, Resident NRC Inspector (Limerick)

Limerick Generating Station Units 1 and 2
Significant Deficiency Report #107
Defective Agastat Relays
Final Report

May 2, 1984

1.0 Introduction

This is the final report concerning defective Agastat GP relays at the Limerick Generating Station (LGS).

The USNRC was previously notified of this 10 CFR 50.55(e) reportable condition in two interim reports, dated December 28, 1983 and March 30, 1984.

2.0 Description of Problem

Several Agastat GP relays in the Core Spray, Residual Heat Removal, and Reactor Protection systems misoperated during pre-operational testing. The normally closed contacts of these relays failed to close when the relay was de-energized. During further testing, it was discovered that the relay contact failure is intermittent. The defective relays were utilized in normally energized applications. This failure has occurred in 40 relays out of several hundred tested. The failed relays were all manufactured prior to August, 1977.

3.0 Analysis of Relay Failure

A number of the defective Agastat GP relays were tested and inspected to determine: (1) the exact cause of relay misoperation; (2) if the relay is defective or improperly adjusted; and (3) if all of the Agastat GP relays at LGS have the potential for this problem.

Our investigation indicates that the failure is limited to normally closed contacts on relays which are normally energized. The failures occur predominantly on relays with 24 vDC coils which operate at higher temperatures than the 125v DC and 120v AC coil relays. In many cases, the failed contacts were actually closed but did not provide electrical continuity. We have determined that this condition results from two causes: (1) inadequate spring tension on the movable contact arm, and (2) corrosion build up on the contact surfaces. Cause (1) can be the result of either improper factory adjustment or relaxation of spring tension due to heat. As this problem has become more severe the longer the relays are energized, we believe the spring tension is relaxing as the relay ages. As for cause (2) corrosion begins naturally on the contact surface. Because the failed relays were in storage for approximately seven years, we believe that the contact surface corrosion has had ample time to develop. In addition, we believe this corrosion is accelerated in the normally energized relays because of the heat generated by the coil. The relay design also contributes to this condition by failing to provide any significant wiping action for the normally closed contacts.

4.0 Safety Implications

The defective Agastat GP relays were discovered during pre-operational testing of the RHR, RPS, and Core Spray systems at LGS. A defective relay could adversely affect the operation of safety related equipment in these systems and other systems in which Agastat GP relays are provided.

5.0 Corrective Action

Based on the results of this investigation, the Philadelphia Electric Co. (PECO) decided on a short term and a long term solution to the Agastat relay problem. The short term solution involves the replacement of all Agastat GP relays with Agastat EGP relays in all safety-related panels. The Agastat EGP relays are qualified for nuclear use and have a qualified life of 4.5 years in normally energized applications. In addition, PECO will monitor several Agastat EGP relays in our laboratory with a test program designed to determine the degradation these relays experience during natural aging under normally energized conditions.

The long term solution involves the possible eventual replacement of these Agastat EGP relays with a different relay manufacturer. PECO is currently pursuing nuclear qualification of a Struthers Dunn relay.

The short term course of corrective action will be completed prior to fuel load. The long term solution will be determined after a suitable replacement for the Agastat EGP relay is determined and the results of the Agastat natural aging testing are reviewed.

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