

U. S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report Nos.: 50-352/90-26  
50-353/90-25

Docket Nos.: 50-352  
50-353

License Nos.: NPF-39; NPF-85

Licensee: Philadelphia Electric Company  
Correspondence Control Desk  
P. O. Box 195  
Wayne, PA 19087-0195

Facility Name: Limerick Generating Station, Units 1 and 2

Inspection At: Limerick, PA

Inspection Conducted: October 22 - 24, and October 31 - November 1, 1990

Inspector: Donald R. Taylor 12/14/90  
D. Taylor, Reactor Engineer, OPS, DRS Date

Approved by: N. Blumberg 12/18/90  
N. Blumberg, Chief Date  
Operational Programs Section  
Operations Branch, DRS

Inspection Summary: Inspection on October 22 - 24, and October 31 - November 1, 1990 (Combined Inspection Report Nos. 50-352/90-26; 50-353/90-25).

Areas Inspected: Routine announced safety inspection by one region-based inspector to review the status of maintenance program weaknesses identified in the maintenance team inspection (Report Nos. 50-352/89-80; 50-353/89-80).

Results: Seven of the eight maintenance program weaknesses identified during the maintenance team inspection have been addressed adequately and improvements in these areas implemented. One of the weaknesses previously identified by the maintenance team was not completely resolved.

## DETAILS

### 1.0 Persons Contacted

#### Limerick Generating Station, Units 1 and 2

*S. Babyock	Maintenance
*M. McCormick, Jr.	Plant Manager
*D. Neff	Licensing
*J. Phillabaum	Licensing
*J. Spencer	Superintendent - Maintenance/I & C
*L. Yates	Maintenance

#### United States Nuclear Regulatory Commission

\*T. Kenny                      Senior Resident Inspector

During the course of the inspection, the inspector contacted other members of the licensee's Operations, Technical and Quality Assurance staff.

\*Denotes those present at the Exit Meeting on November 1, 1990.

### 2.0 Background

From January 30, 1989, to February 10, 1989, the NRC conducted a Maintenance Team Inspection (MTI) at Limerick Generating Station (LGS). The combined inspection report 50-352/89-80; 50-353/89-80 identified eight maintenance program weaknesses and requested written response regarding those weaknesses. The licensee provided this response in a letter dated May 8, 1989.

This report provides a current status of licensee actions taken or planned to correct those identified weaknesses.

### 3.0 Review at Maintenance Team Inspection Findings

To evaluate the licensee's response to the MTI findings, the inspector reviewed the licensee's response letter dated May 8, 1989, interviewed licensee representatives, and reviewed documentation. The documentation reviewed to verify items described in this report are listed in Attachment A.

### 4.0 Follow-up on Licensee's Actions to Items Previously Identified in the Maintenance Team Inspection (IP 25597)

#### 4.1 Weakness No. 1 - Communications with Offsite Engineering Could Be Improved:

The MTI inspectors noted a pre-existing weakness concerning communications between plant and offsite engineering organizations. The licensee

was aware of this weakness and had already planned actions to improve the interactions between the station and offsite groups. However, during the MTI, corrective actions were relatively new and therefore too early to evaluate effectiveness. Initiatives taken by LGS included:

- implementation of an Engineering Work Request (EWR),
- establishment of monthly engineering support meetings between Nuclear Engineering & Engineering Services Division (NESD) and plant management, and
- establishment of a dedicated Nuclear Engineering Department (NED) site engineering organization.

Prior to the maintenance team inspection, the licensee had implemented an EWR process at Limerick. The purpose of the process was to provide station engineering the necessary tool to request offsite engineering support. To enhance this process, a dedicated NED onsite (site engineering) group was organized. Current staffing for this group consists of a branch head, both a mechanical and electrical working lead engineer and seven additional engineering staff. The primary task performed by this group consists of responding to EWRs. Approximately 80% of this group's effort is spent performing this function which represents a large percentage of the total distribution of EWRs.

The inspector attended the monthly plant/NESD support meeting held November 1, 1990. These meetings are held to provide a method for plant and NESD management to discuss topics of interest or current problem areas. Topics discussed during the November meeting included the design base document program, Generic Letters 89-13 and 89-10, EHC weld failures at Limerick, ESW corrosion and the N<sub>2</sub>H recirculation nozzle issue. Additionally, new items of concern were discussed and assigned to LGS/NED staff for action.

More recently the licensee has implemented a NED/plant system engineer quarterly walkdown program. Although new, the licensee indicated positive response from these walkdowns. The inspector noted that this program provides another method to enhance interactions between plant and off-site engineering.

Based on the above actions, the inspector considers that LGS has adequately addressed this weakness and improvements are adequately implemented.

- 4.2 Weakness No. 2 - The Operability of the HPCI Unit Coolers was a Concern in View of the ESW Piping Corrosion issue and the fact that there were no Periodic Performance Tests for These Coolers:

To address this concern, the licensee developed Routine Tests RT-1-011-251-0, Rev. 2 and RT-1-011-252-0, Rev. 3 to perform ESW loop "A" and loop "B" flow verifications respectively. The purpose of these tests is to verify that ESW is capable of supplying design flow to vital loads. The test monitors ESW components found to have marginal performance observed during a two unit ESW system flow balance test. The test is currently performed monthly on problem components and at least once every six months on components that do not exhibit poor flow indications. The inspector discussed the results of these tests with system engineers and was provided a graph which trended certain problem components for recent test results. Based on these tests and the known corrosion which exists with ESW piping, the licensee was in the process of replacing approximately 130 feet of ESW piping in the supply and return to the Unit 1 HPCI Room Cooler. Additionally, and in response to Generic Letter 89-13 "Service Water Problems Affecting Safety-Related Equipment", a testing program is in the process of being developed to verify the heat transfer capabilities of safety-related heat exchangers cooled by ESW and RHR SW systems. Initial testing is currently scheduled to be completed by April of 1991 for Unit 1, and July of 1991 for Unit 2.

Based on the current and proposed testing, the inspector considered this weakness as being adequately resolved.

4.3 Weakness No. 3 - A Comprehensive Solution to the ESW Piping Corrosion Issue was not Yet Well Defined:

Concerns regarding ESW corrosion and fouling have been a long-standing issue at Limerick. The MTI report reiterated this and provided examples that led to the conclusion that the ESW piping corrosion issue was not yet well defined. The report noted a lack of definition in the scope of the problem and lack of use of industry experience external to PECO.

As indicated in the licensee's response to the weakness, samples of deposits obtained from ESW piping were analyzed and the results indicated that the fouling problem is caused by general iron corrosion products and not from silt/mud deposition, microbiological fouling or microbiological induced corrosion (MIC). Subsequent to that response, in July of 1989 and again on the same day Unit 1 began its third refueling outage, through wall pin hole leaks were discovered in ESW piping. Both leaks were associated with the Unit 1 HPCI Room Cooler. Analysis of the first failure indicated the area directly surrounding the through wall leak to be attacked by an anaerobic bacteria. The failure occurred in the proximity of a weld backing ring. The analysis, prepared by NALCO Chemical Company, stated that it is likely that the crevice between the backing ring and tube surface provided a shielded area in which bacteria could grow. Further analysis indicated the internal surface to be heavily tuberculated with some sections showing 30% occlusion of the internal diameter. The tuberculation is expected to be due to galvanic pitting induced by mill scale. At the time, no bacterial activity was detected beneath the tubercles.

The piping associated with the second through wall failure, along with approximately 120 feet of additional Unit 1 HPCI room cooler ESW piping was in the process of being replaced during the inspection. System engineers indicated approximately 80 feet of this piping would be sent out for analysis and testing, including determining the corrosion mechanism; structural integrity and pressure drop tests; and wall thickness measurements.

To lessen the rate of corrosion in the replacement piping, internals were either pickled or sandblasted to remove mill scale. To prevent further MIC induced failures, backing rings were eliminated.

In discussions held between the inspector and the licensee, the inspector acknowledged actions the licensee has taken to better understand the nature and extent of the problem and better define available options for long term corrective action. These actions include: joining the EPRI service water working group, evaluating piping replacement and chemical cleaning methods, further piping analysis and budgeting resources for next year to evaluate a long term solution. Further, the inspector recognized the concerted effort between plant and corporate engineering groups to provide a long term engineering solution.

Based on the above discussions and the licensee's response to Generic Letter 89-13, the inspector considered the weakness identified during the MTI as being adequately addressed. However, the rate and extent of corrosion in the ESW system is still a concern and maybe subject to further inspection.

#### 4.4 Weakness No. 4 - Deletion of QC Witness Points in Certain Maintenance Procedures Without Specific Guidance:

MTI inspectors identified instances where necessary QC witness points were deleted from maintenance procedures. This occurred when procedures were changed with the intent of deleting unnecessary QC witness points thus placing greater accountability at the worker level. The team determined that no formal guidance had been provided to either Maintenance Department procedure writers or QC support personnel who review procedures.

Corrective actions were initiated prior to the team leaving site. This included a review of all procedures revised without specific guidance for QC witness points. Subsequently, the licensee implemented formal governing procedures for the Maintenance and QA groups. Maintenance Guidance No. 28, Rev. 0, "Identification of Quality Control Witness Points" and NQA-4-S1A, Rev-0, "Determination of QC Action Points" provides the guidance to Maintenance Procedure writers and QC reviewers respectively. Specifically, these procedures provide guidelines for determining whether or not a quality control witness point is required. An appendix to the procedures provides criteria and gives examples of quality control witness point applications to maintenance procedures.

Based on the above actions the inspector considered this weakness as being adequately addressed.

4.5 Weakness No. 5 - Lack of QA/QC Involvement in the ESW Piping Corrosion Issue:

During the MTI the inspector determined that QC inspectors involved in ESW piping modifications advised their supervision of ESW piping corrosion. However, since no specific ESW cleanliness specification existed for iron oxide surface film on carbon steel piping, no nonconforming conditions were identified.

To better address issues such as piping corrosion, the licensee issued NQA-4-SB, Rev-0, "Cleanliness Inspection". This procedure defines internal cleanliness acceptance criteria for plant systems. It is the responsibility of the Quality Control Inspector to inspect internal cleanliness of piping systems/components and evaluate compliance with established criteria. The inspection is implemented when required by applicable maintenance or modifications procedures and instructions. Additionally, NA-03N001, Rev-1, "Control of Nonconformances" was revised to resolve any ambiguity that existed regarding nonconforming conditions.

Based on the above actions, this item is considered adequately resolved.

4.6 Weakness No. 6 - The Lack of Prior Preparation of a Maintenance Procedure to Support Lapping Operations for Diesel Generator Crankshaft Bearings:

During the MTI, an inspector observed work on the D12 emergency diesel generator. The scope of the work was initially a five-year examination and maintenance PM; however, as work progressed, it was noted that several main and journal bearings would have to be replaced and the crankshaft lapped. At the time, no lapping procedure existed. This was perceived as a weakness by the inspector.

The licensee's response to this weakness stated that journal lapping was not expected to be necessary and that incorporation of journal lapping instructions into permanent procedures was determined to be of a lower priority than revision and enhancement of other procedures. Subsequently, to provide instructions for lapping emergency diesel engine upper main and connecting rod bearing journals, the licensee issued Maintenance Work Instruction (WI)-4116. The licensee stated a WI is used instead of incorporating instructions into individual procedures due to the infrequent expected use of the instruction. The WI is initiated upon a maintenance worker notifying his or her Maintenance Supervisor of journal damage or presence of aluminum.

The inspector considered that this weakness was not of generic concern and that issuance of WI-4116 adequately addressed the weakness.

4.7 Weakness No. 7 - Slow Implementation of the PRA into the Prioritization of Maintenance Work:

During the MTI, team members noted that the licensee had developed a comprehensive program to ensure the effective use of PRA in conducting maintenance. However, since implementing procedures were newly issued, insufficient data existed to evaluate implementation.

The licensee provided guidance for assessing risk associated with plant maintenance at LGS by AG-42, Rev.-1, "Probabilistic Risk Assessment Applications in Plant Maintenance". This document provides the maintenance planning group with a general document defining which systems and components are most important from a PRA standpoint. Additionally, AG-43, Rev.-2, "Guidance for the Performance of System Outages," provides guidance for planning system outage windows and ensuring a coordinated effort between various working groups.

The inspector discussed with the maintenance planning group scheduling of MRFs and how risk plays a role in the scheduling. MRFs which are not emergent work are scheduled according to system/component availability. A system/component window is established for emergency systems, with MRFs associated with the system/components scheduled during this window. PRA is one of the factors considered when scheduling the work. Additionally, licensee procedures provide guidance for Q-listed and selected Non-Q listed systems and equipment deemed "Important to Safety."

Based on the above, the inspector considers this item adequately addressed.

4.8 Weakness No. 8 - The Lack of Adherence to an Administrative Procedure Resulted in Traceability Problems of Mechanical Tools:

The MTI identified examples of calibrated tools usage not being recorded on applicable MRFs, Section 5, as required by A-26 "Procedure For Plant Maintenance Using The Maintenance Request Form". The licensee's corrective action for this weakness included training, a review of out of tolerance (OOT) tools, and development of a maintenance guideline for control of calibrated tools.

To evaluate whether licensee's corrective actions were effective, the inspector compared the tool usage sign out log to the MRF Section 5 for recent tools found to be OOT. The inspector noted the usage log for a dial indicator and an inside micrometer, both recently found to be OOT, contained MRF numbers not identified by the OOT tool report. The MRFs in question were associated with non-safety related equipment. The tool usage log is not referred to when identifying what work was performed using the OOT tool. The two tools in question and the associated MRF number not listed on the OOT tool report were brought to the attention of the licensee and identified as a problem needing additional attention. To address the concern of a continued weakness in this area, the licensee conducted a review of 37 MRF packages for M & TE usage in maintenance activities. The review included 186 entries of various M & TE with no discrepancies noted. Additionally, formal training was conducted on November 8 and 9, 1990, using MCTR-1025 "The Importance of Completing the Calibrated Tool Information on the MRF."

The inspector acknowledged the licensee's response to the weakness; however, based on examples identified, this item is still considered a weakness and subject to further review.

#### 5.0 Management Meetings (IP30703)

Licensee management was informed of the purpose and scope of this inspection at an entrance meeting conducted on October 22, 1990. The findings of the inspector were discussed periodically with licensee representatives during the course of the inspection. An exit meeting was held on November 1, 1990, at which time the inspector's findings were presented to station management.

At no time during the inspection did the inspector provide written material to the licensee, nor did the licensee indicate that any of the areas covered in this report contain proprietary information.

ATTACHMENT A

DOCUMENTS REVIEWED

LGS Plant/NESD Engineering Support Meeting Agenda, November 1, 1990 and Meeting Minutes for September 29, 1990

AG-26, Rev. 1, Processing of Engineering Work Request at Limerick Station

RT-1-011-251-0, Rev. 2, ESW Loop "A" Flow Verification

RT-1-011-252-0, Rev. 3, ESW Loop "B" Flow Verification

NESD Approved Project Plan LGS Units 1 & 2 for Implementation of Generic Letter 89-13

Maintenance Guideline No. 28, Rev. 0, Identification of Quality Control Witness Points

NQA-4-S1A, Rev. 0, Determination of QC Action Points

NQA-4-S8, Rev. 1, Cleanliness Inspection

NA-03N001, Rev. 1, Control of Nonconformances

M-020-009, Rev. 2, Diesel Engine Main and Connecting Rod Bearing Examination and Maintenance

WI-4116 Lapping Emergency Diesel Upper Main and Connecting Rod Bearing Journals

AG-42, Rev. 1, Probabilistic Risk Assessment Applications in Plant Maintenance

AG-43, Rev. 2, Guideline for the Performance of System Outages

POST INSPECTION SALP DATA SHEET

1. Facility: Limerick 1/2 2. Inspector: D. Taylor
3. Docket No./Report No.: 50-352/90-26 50-353/90-25 4. Inspection Dates: 10/11-10/24 and 10/31-11/1/90
5. Functional Area: Maintenance 6. Category Rating (1.2 or 3): 1
7. Inspection Hours for this Functional Area: 43
8. Prepare a completed, typed, SALP Input. Start in the space below and continue on a separate sheet if necessary:

Licensee's corrective action taken to address weaknesses noted during the maintenance team inspection were both thorough and complete. Seven of the eight maintenance team identified weaknesses were adequately addressed and corrective actions implemented. Maintenance related communications between plant and offsite engineering showed significant improvement. One weakness previously identified involving the disposition of out-of-tolerance M&TE continues to be a concern.

9. Submitted by Inspector (Sign/date): \_\_\_\_\_
10. Approved by Section Chief (Sign/date): \_\_\_\_\_

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Revised: 2.1987