

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-353/88-01

Docket No. 50-353

License No. CPDR-107 Category B

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

Facility Name: Limerick Nuclear Generating Station Unit 2

Inspection At: Limerick, Pennsylvania

Inspection Conducted: January 11-15, 1988

Inspector: Leonard Creung for 3/2/88
C. H. Woodard, Reactor Engineer date

Approved by: Leonard Creung for 3/2/88
C. J. Anderson, Chief, Plant Systems date
Section, DRS

Inspection Summary: Inspection on January 11-15, 1988 Inspection Report
50-353/88-01

Areas Inspected: Routine, onsite, unannounced inspection by one region-based inspector of activities pertaining to the safety-related electrical systems and components.

Results: One violation was identified, 10 CFR Appendix B, Criterion II, lack of controls of environmental conditions for activities affecting quality.

Two previously identified items are closed (50-353/87-06-02 and 50-353/87-06-01).

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Details

1.0 Persons Contacted

1.1 Philadelphia Electric Company (PECO)

J. Corcoran, Manager QA
*D. DiPaolo, Branch Manager, QA
*G. Hoke, Engineer, QA
*G. Lauderback, Engineer, QA
*T. Tucker, Engineer, QA
*S. Loofboorow, Engineer, QA
*M. Teller, Engineer, Construction
*S. Bobyock, Engineer, Test
*E. Gibson, Engineer, QA
T. Dey, Engineer, QA

1.2 Bechtel

*D. Sakers, Engineer Project Construction, QC
*G. Kelly, Engineer, Site QA
*J. Howell, Engineer, Electrical
*G. Bell, Project, QA
G. Young, Engineer, QA
J. Smith, Engineer, QA

1.3 General Electric

A. Lileck, Site Manager

1.4 United States Nuclear Regulatory Commission

*R. Gramm, Senior Resident Inspector

*Denotes those present at the exit meeting at Limerick on January 15, 1988.

2.0 Licensee's Action on Previous Inspection Findings

2.1 (Open) Deviation 50-353/87-06-03, Undervoltage in Class 1E Circuits

The licensee had not satisfied an October 21, 1981 letter commitment to the NRC to correct unacceptable undervoltage conditions in certain Class 1E circuits which had been identified under Significant Deficiency Report No. 52 by June 1986.

By letter dated July 14, 1987, the licensee acknowledged the tardiness of their corrective actions. They provided the overall delay in the Unit 2 schedule as the reason for the delay. Based upon the current schedule, the licensee stated that the 10 CFR 50.55 (e) work

associated with correcting the deficiencies in the adequacy of the electrical system will be completed by March 1989.

This item remains open pending completion of the work to correct the undervoltage conditions.

2.2 (Closed) Unresolved Item 50-353/87-06-02, Interim Storage of Pre-Cut Electrical Cables

Inspection 87-06 revealed that a few coils of Class 1E electrical cable which had been pre-cut to length were being stored temporarily outside prior to taking inside for pulling. The coils of cable were laying on the ground and were subject to degradation from contact with groundwater.

The inspector reviewed licensee procedure CP-E-2 Permanent Plant Cable Installation and Termination which included revisions to the requirements to "Assure that cable in the field interim storage/receiving areas pending installation is adequately protected, stored on pallets, wood, etc.." Inspection of both the interim cable storage areas in and around the plant and the cable yard did not reveal any instances of inadequate cable storage.

This item is closed.

2.3 (Closed) Unresolved Item 50-353/87-06-01, Need for Control to Prevent Damage in the Removal of Electrical Cable from Reels at Low Temperature.

Inspection 87-06 revealed that the licensee was removing cable from reels (handling, uncoiling) without regard to the potential degradation that could be caused if the cable temperature was below a value to which the cable had been qualified by the manufacturer.

Following NRC Inspection 87-06, the licensee amended procedures CP-F-2, Receipt Inspection Storage and Withdrawal of Materials and Equipment, and CP-E-2, Permanent Plant Cable Installation and Termination, to include requirements to assure that the temperature of the cable is above +10°F prior to uncoiling handling and pulling.

During this inspection on January 11, 1988, the inspector found cable handlers in the outside cable storage yard pulling (uncoiling) cable off reels in order to pre-cut pull lengths without regard to the cable temperature. Several members of the cable cut crew were interviewed by the inspector regarding temperature control measures during cable handling operation. The crew members stated they were not aware of any temperature controls.

The inspector expressed his concern to the Philadelphia Electric Management and Quality Assurance personnel regarding the lack of control in the implementation of Procedure CP-F-2 temperature requirements to assure the integrity of the cables. This is in violation of 10 CFR 50 Appendix B, Criterion II, which states in part that ".....Activities affecting quality shall be accomplished under suitably controlled conditions. Controlled conditions includesuitable environmental conditions for accomplishing the activities..... The program shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained....." This item is upgraded to a violation (50-353/88-01-02), and item 50-353/87-06-01 is closed.

Subsequently, the licensee took some immediate corrective actions as follows:

- Contacted the cable manufacturer and obtained recommendations which included methods for handling cable at temperatures below +10°F (down to minus 40°F).
- Revised Procedures CP-F-2 with regards to the 10°F temperature limitation to remove a temperature limit on cable handling activities.
- Conducted a training class on January 14, 1988 for eight electrical personnel to emphasize procedural requirements.

3.0 Procedures Review

Selected licensee documents associated with the procurement, storage, installation, inspection, surveillance and maintenance of the class 1E electrical systems components and cabling observed during this inspection were reviewed. The procedures reviewed are listed in Appendix A.

This review was to ascertain whether NRC requirements had been adequately translated into applicable documents and to determine if the construction specifications, drawings procedures, and instructions were of sufficient detail and clarity to perform and control the work. A deficiency was noted regarding the implementation of the cable temperature control provisions of licensee procedure CP-F-2, Procedure for Receipt Inspection Storage and Withdrawal. This problem is discussed in Section 5.4 of this report.

No other deficiencies were identified.

4.0 Record Review

A sample of licensee records, associated with the Class 1E electric systems was reviewed by the inspector. Specifically those documents associated with the emergency diesel generators, electrical cables and the Power Generation Control Complex (PGCC) were addressed. These records are listed in Appendix A.

This review was to determine the adequacy of the licensee's activities for Class 1E electric systems and components including the cabling to assure that they were procured, stored, installed and maintained as required by the procedures of Section 3 of this report in order to perform their safety-related functions.

No deficiencies were observed.

5.0 Electrical Components and Systems - Work Observation

The inspector observed work in progress and completed work to determine whether activities related to safety electrical systems and components are being controlled and accomplished in accordance with NRC requirements, commitments and licensee procedures. Areas inspected included the emergency diesel generators, electrical cables and the PGCC wiring. The following observations were made of the installed Class 1E components and systems:

- The components were properly identified.
- Dust covers were in place over electrical components.
- Components were installed at the correct location with the correct orientation.
- No electrical separation deficiencies were observed.

5.1 Emergency Diesel Generators Oil Leakage Problem

The emergency diesel generators (EDGs) at Limerick (Units 1 and 2) are powered by Fairbanks Morse Model 3800 TD 8 1/8 engines. This model engine has a history of problems at nuclear plants with oil leakage from the exhaust line flanges. This oil comes from pre-lubrication and normal lubrication of the upper crankshaft. Excess oil drains down through the cylinders into the exhaust manifolds and seeps through the gaskets. Such leakage has caused excessive smoking and fires and there is a possibility of the oil causing a hydraulic cylinder lock with consequent engine damage. The excessive oil leakage problem for Unit 1 is reported in a Brookhaven National Laboratories Report dated March 27, 1985 and in NRC Inspection Report 50-352/87-31.

The inspector discussed concerns for the Unit 2 potential leakage problem with the licensee. The licensee stated that they were investigating a solution to this problem on Unit 1. They stated that upon resolution of this issue at Unit 1, they would establish corrective measures for Unit 2. Any corrective measures developed would be applied to Unit 2 prior to plant operation.

5.2 Emergency Diesel Generators Maintenance

Inspection of the four emergency diesel generators indicated a weakness in the licensee's Maintenance Action Plan Inspection which requires inspection of the "in place storage" generators on a quarterly basis. This inspection includes the verification that the generators heaters are on (to protect the windings from moisture).

Inspection disclosed that the heaters were off on two of the generators. There were portable type personnel heaters adjacent to provide for heat. However, one of the heaters had been moved and turned away from the generator (to provide heat to construction personnel). The licensee reported problems with the installed generator heaters for the two units where the portable heaters were used.

In view of the apparent lack of control of the portable heaters being used, and the infrequent (quarterly) inspections, additional licensee actions appear warranted to ensure that proper heating is maintained on the diesel generators windings.

This item is unresolved pending appropriate resolution of the generator problems (50-353/88-01-01).

5.3 Electrical Power Cables Installation

Inspection was made of the three single conductor 750 KCM and one single conductor 250 KCM electrical power cables pulled from the emergency diesel generator power switchboard in the "D" diesel room to the 4kV emergency switchboard cubicle.

The inspection consisted of a review of the cable routing and pulling calculations, E-544 dated September 23, 1987, and a review of the QC record card for the cable installation, QCIR No. 2D6501BB-143 dated December 28, 1987. An independent calculation of the expected cable pulling tension was made to confirm the licensee's calculations.

A walkdown of the cable pull was made to confirm the routing and to inspect the unterminated coiled cable ends in the DG room power switchboard. One of the 750 KCM cables was not pulled all of the

way into the 4KV switchboard cubicle but was tagged with a Non-Conformance Report (NCR) Tag. This tag was traced back to QC records which were found to be in order. The nature of the NCR was cable jacket damage and the NCR was awaiting appropriate disposition to either accept the cable as is, repair/rework, or to replace the cable.

No unsatisfactory conditions were observed.

5.4 Power Generation Control Complex Wiring

A review was made of the licensee's current status in the overall evaluation and correction of wiring problems in the Power Generation Control Complex (PGCC) as originally reported by the IC Inspection Report 87-13 and by licensee 10 CFR Part 50.55 (e) Interim Significant Deficiency Report No. 219-2 dated December 31, 1987. Findings are the following:

1. One hundred percent reinspection of all of the wiring and terminations in the safety related panels has been completed. Deficiencies reported are categorized as follows.
 - Missing, illegible and incorrect labels - Approximately 1300 findings.
 - Damage, including wire insulation and broken lugs - Approximately 20 findings.
 - Design problems, including wires installed but not on design drawings, wires not installed but on the design drawings, more than two wires on a termination point, and wires terminated to the wrong side of a terminal board - Approximately 150 findings.
2. Rework and correction of these deficiencies is approximately 75 percent complete. Completion is planned by mid 1988.
3. The licensee and General Electric are evaluating each design deficiency for its impact on systems operation. Completion of this evaluation is planned by January 31, 1988. The evaluation will include verification of whether pre-operational tests would have detected these deficiencies. A report of the overall safety implications of the deficiencies is scheduled for completion by mid 1988.
4. One hundred percent re-inspection of the balance of plant non-safety related panels is complete. Evaluations and corrections of deficiencies are scheduled for completion by mid 1988.

5. As a consequence of the substantial deficiencies in the PGCC panels at Limerick possibly having generic implications, it was understood from the GE site representative that wiring inspections are being performed on other PGCC panels for other facilities which were wired at the GE NEBO panel facilities at San Jose.

The inspector had no additional comments on this issue.

6.0 Unresolved Item

Unresolved item is matters about which more information is required in order to ascertain whether it is an acceptable item, item of non-compliance or deviations. Unresolved items disclosed during this inspection is discussed in detail in paragraph of this report.

7.0 Exit Interview

The inspector met on site with licensee representative (denoted in Details, Paragraph 1.0) at the conclusion of the inspection on January 15, 1988. The inspector summarized the scope and the inspection findings. At no time during this inspection was written material given to the licensee or his representatives.

Appendix A - Documents Reviewed

The following documents were reviewed by the inspector:

- FSAR Section 8
- Bechtel Drawing E-1412 "Wire and cable Notes and Details"
- Bechtel Construction Procedures (CP) E-2 "Permanent Plant Cable Installation and Termination".
- Bechtel Electrical Computer Program Manual for Cable Tension Calculations - EE-350.
- Bechtel Drawing E-1406, Conduit & Cable Tray Notes Symbols and Details.
- Cable Pulling Tension Calculations E-544, E-587, and E-590.
- Bechtel Construction Procedure (CP) F-2 "Receipt, Inspection, Storage and Withdrawal of Materials and Equipment."
- NRC Inspection Report 50-353/87-13 (PGCC Wiring Problems).
- Brookhaven National Laboratory Technical Review Report of AC and DC Electric Power Systems, March 27, 1985.
- PECO Significant Deficiency Evaluation No. 219-2 of Discrepancies in PGCC Wiring.