

U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report Nos. 50-277/89-29  
50-278/89-29

Docket Nos. 50-277  
50-278

License Nos. DPR-44  
DPR-56

Licensee: Philadelphia Electric Company  
P.O. Box 7520  
Philadelphia, PA 19101

Facility Name: Peach Bottom Atomic Power Station, Units 2 & 3

Inspection At: Delta, Pennsylvania and Corporate Offices in  
Chesterbrook, Pennsylvania

Inspection Conducted: December 12-22, 1989

Inspector: *A. L. Della Greca*  
A. L. Della Greca, Reactor Engineer, Plant  
Systems Section, EB, DRS

1/31/90  
date

Approved by: *C. J. Anderson*  
C. J. Anderson, Chief, Plant Systems Section,  
Engineering Branch, DRS

2/2/90  
date

Inspection Summary: Inspection on December 12 - 19, 1989 (Inspection Report  
Nos. 50-277/89-29 and 50-278/89-29)

Areas Inspected: Announced inspection by region personnel to review the status of previously identified open items and to determine the adequacy of the licensee's actions to resolve them.

Results: The inspector determined that the licensee adequately addressed 13 of the 14 issues reviewed. Resolution of one issue regarding the plant's management control of deficient equipment (Unresolved Item Nos. 50-277/89-07-08 and 50-278/89-07-08) is incomplete and will be reviewed at a later date. In addition, a calculation addressing the accuracy of the High Range Radiation Monitor was found to be inadequate to support its conclusions.

No new violations were identified.

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## DETAILS

### 1.0 Persons Contacted

#### 1.1 Philadelphia Electric Company (PECO)

- \* W. J. Boyer, Manager, Electrical Plant Section
- \* W. J. Clune, Equipment Qualification Engineer
- \* J. W. Cornell, Supervisor Electrical Equipment and Instruction
- \* W. J. Coyle, Manager, Engineering Development Section
- L. Ferrero, Nuclear Quality Assurance Engineer
- \* L. C. Fletcher, Supervisor, Electrical Engineering
- D. Helker, Engineering Supervisor, Licensing
- D. C. Hitchens, Lead Mechanical Engineer
- \* M. C. Kray, Licensing Engineer
- \* F. J. Michaels, Equipment Qualification Engineer
- \* W. J. Mindick, Supervisor Power Engineering
- \* L. B. Pyrih, Manager, Nuclear Engineering Division
- B. E. Raftovich, Special Projects Analyst
- J. Stanley, Supervisor, Maintenance Services
- D. Thomas, Preventive Maintenance
- \* D. J. Thompson, Jr., Supervisor, Engineering Development
- \* R. C. Webster, Supervisor, Electrical Systems
- M. Younker, Equipment Qualification Maintenance

#### 1.2 Contractors

- H. Birch, Supervisor, Procurement
- \* G. P. Chew, Equipment Qualification Engineer
- D. B. Hamel, Procurement Engineer
- A. Hartman, Project Electrical Engineer
- H. Marandy, Procurement Engineer
- \* P. M. Silverberg, Equipment Qualification Engineer
- B. L. Skwirut, Consultant

\* Denotes personnel present at the exit meeting of December 22, 1989.

### 2.0 Purpose

The purpose of the inspection was to review the status of previously identified items and to determine the adequacy of the licensee's corrective actions in resolving each issue.

### 3.0 Status of Previously Identified Items

#### 3.1 (Closed) Unresolved Items No. 50-277/87-18-02 & 50-278/87-18-02 pertaining to the inadequate control of site procurement activities.

During the June 1987 Equipment Qualification inspection, the NRC inspector observed that information available to the procurement department at the site does not identify the qualification requirements of the component being purchased. Therefore, a concern was raised regarding the possibility that safety related equipment may be procured without the necessary review for upgrading the equipment to the requirements of NUREG-0588, Category I.

The licensee's evaluation of past procurement activities at the Peach Bottom Station concluded that such activities had been correctly executed and that all past purchases received adequate documentation. To ensure that the equipment qualification (EQ) group maintained adequate control on future purchase orders, the licensee revised the applicable procedure. The current procedure, No. A-129-2, Revision 2, which replaced the old procedure A-27, provides clear guidance in establishing procurement requirements and, under paragraph 7.2.3, specifies that qualification documents be reviewed by the site EQ Engineer. In addition, the procedure requires that the completed Replacement Part Evaluation Form be evaluated by the corporate Nuclear Engineering group for those items previously qualified to NUREG-0588, Category II requirements. The site EQ group consists of two experienced contract engineers.

Review of four different purchase orders, three requests for evaluation, and the documented evidence of the completed licensee's evaluation of previous procurement activities revealed no procurement deficiency.

On the basis of the above, these items are closed.

#### 3.2 (Closed) Unresolved Items No. 50-277/87-18-04 & 50-278/87-18-04 regarding the inadequacy of guidelines for controlling the content of EQ files.

Evaluation of the contents of the Peach Bottom EQ packages, during the NRC's EQ inspection of June 1987, revealed the existence of several deficiencies, such as: (1) inadequate and or missing performance/acceptance criteria; (2) missing identification of applicable qualification requirements; (3) no positive statement that the component/equipment was qualified; (4) inadequate references to qualification documents. This was primarily the result of inadequate guidelines for controlling the contents of the files.

In response to the inspector's concerns, the licensee revised its procedure for controlling the contents of the EQ packages and reassembled each file. Evaluation of the current procedure, No. UPD-NE-6.2, Revision 6, showed that the licensee adequately addressed the NRC's concerns. Review of three sample packages revealed consistency of content and compliance with the procedure requirements. However, the files are still incomplete in that they lack the procurement specification and the identification of applicable IE Bulletins and Information Notices. Under the applicable sections the missing information is

identified as "LATER". Further discussions with the licensee indicate that an effort to finalize the packages is ongoing and that the work is scheduled for completion during the following year. With regard to the IE Bulletins and Information Notices, they presently are controlled, distributed, and tracked separately with an "alert list" identifying concerns relative to equipment and suppliers. The list is updated and distributed on a regular basis.

In view of the above, the present mechanism for controlling the documentation for safety related equipment is found to be adequate and the items are closed.

3.3 (Closed) Unresolved Items No. 50-277/87-18-06 & 50-278/87-18-06 regarding the accuracy of the General Atomic's High Range Radiation Monitor.

During the EQ inspection of June 1987, review of qualification file No. 27 identified a potential deficiency in the post accident accuracy of the General Atomic's High Range Radiation Monitor. The source of concern was the drop in insulation resistance displayed by the Rockbestos coaxial cable when exposed to the high temperature of a LOCA environment. An analysis performed by the licensee during that inspection revealed that the expected accuracy may not meet the Regulatory Guide 1.97 guidance.

Following the inspection, the licensee performed a detailed analysis taking into account the Peach Bottom postulated LOCA profile and the thermal lag of the cable. The results of this analysis demonstrated that the calculated accuracy of the monitor would remain within Regulatory Guide 1.97 guidance.

Based upon the results of the licensee's analysis this item is closed. However, some discrepancies were found in the analysis. This issue is addressed in Section 4.0.

3.4 (Closed) Unresolved Items No. 50-277/87-18-08 & 50-278/87-18-08 pertaining to management approval of EQ packages.

During the June 1987 review of the EQ packages, the NRC inspector observed that the files contained no evidence that they had been reviewed and approved by licensee authorized personnel. In addition, the inspector noted that the audits performed by QA/QC did not include a review of the training of personnel associated with the preparation and control of the EQ packages, nor did they address procedural requirements for establishing approval authority for such packages.

In response to the NRC observations, the licensee revised the procedure which controls the contents of the the EQ files, Procedure No. UDP-NE-6.2. Under Section 4.0, this procedure describes not only the review and approval responsibilities, but also the responsibilities of the various groups which use and input to the files. In addition Quality Assurance revised its procedure, No. NQA-21, to address deficiencies observed by the NRC inspector and to improve the methods and scope of its audits.

In view of the above, these items are closed.

3.5 (Closed) Violations No. 50-277/88-38-03 & 50-278/88-38-03 relative to the lack of qualification documentation for the Ideal wirenuts identified by the licensee.

In response to Information Notice 86-53 the licensee initiated a cable splice inspection. In the course of the plant walkdown, the licensee determined that the connection of the Atkomatic solenoid valves to the field wires had used Ideal wirenuts. Although qualifiable, no documentation existed to demonstrate the qualification of the device. As a result of its finding, the licensee decided to replace the wirenuts with qualified equivalent Raychem splices.

Review of the documentation associated with Modification No. 2355 shows that the work associated with the replacement of the Unit 3 wirenuts had been completed. Completion of the work for Unit 2 was verified during the September 1988 inspection. These items are closed.

3.6 (Closed) Violations No. 50-277/88-38-04 & 50-278/88-38-04 regarding inadequate qualification documentation for the Amp butt splices.

In response to Information Notice 86-53 the licensee initiated a cable splice inspection. While performing the plant walkdown the licensee determined that some Amp butt splices had been used for control and instrumentation applications. Although qualifiable, no documentation existed to demonstrate that the anomalies experienced during the qualification test had been adequately addressed. As a result of its finding, the licensee decided to replace the Amp butt splices with qualified Raychem splices.

Review of the documentation associated with Modification No. 2355 shows that the work associated with the replacement of the Unit 3 butt splices had been completed. Completion of the work for Unit 2 was verified during the September 1988 inspection. These items are closed.

3.7 (Closed) Violations No. 50-277/89-07-02 & 50-278/89-07-02 pertaining to the inadequate control of plant documents.

In order to verify the accuracy of motor loads identified on single line diagram E-26 the NRC inspection team randomly checked the horse power rating of six valve motor operators. This verification revealed that five of the six ratings were incorrectly identified on the single line diagram. Single line diagrams are used in design calculations.

As a result of the above finding and of several other drawing discrepancies identified, the licensee conducted a plant walkdown which ultimately resulted in the revision of the single line diagrams affected. The licensee attributed the discrepancies to human error and to the fact that fractional horsepower motor ratings, in general, are not closely tracked by the industry because of the minimal impact on loadings. The licensee's analysis of the discrepancies confirmed that the discrepancies did not adversely affect the safe operation of the plant. Nonetheless, recognizing the need for using as-built data in its load calculations and plant design, the licensee updated the drawings in

question. In addition, the licensee issued an Interim Guidance procedure, IG 3.17-1, to control electrical load changes at the Peach Bottom plants.

The corrective actions taken by the licensee adequately address the control of plant electrical diagrams and the items are closed.

3.8 (Closed) Unresolved Item No. 50-278/89-07-03 relative to the capacity margin for batteries.

During the NRC Electrical Team Inspection 89-07, the team raised a question regarding the capacity of batteries 2BD001 and 2DD01 and their capability to support the electrical demand during a LOCA.

Following the inspection, the licensee developed a new calculation to reevaluate the margin between the rated capacities of the batteries and the design load profile. The new calculation takes into account the load changes resulting from plant modifications and the additional inrush current due to the removal of starting resistors in DC motor operated valves. In addition, the licensee included a 5% load margin to the existing profile to account for uncertainty in the magnitude of individual loads presently not confirmed by plant walk-downs. On the basis of a survey among Region I licensees and the statement contained in section 8.7.2.1 of the FSAR, the evaluation of the batteries was performed for a two hour duty cycle.

The calculation for Unit 2 was reviewed during the April 5, 1989 electrical inspection and the item was closed. During the subject inspection calculation PE-004, which evaluates the battery load profile of Unit 3 and uses the same methodology used for Unit 2, was reviewed. Results indicate a 29% margin for battery 3BD01 and 35% for battery 3DD01.

On the basis of the calculation PE-004 results, the open item regarding battery capacity margin for Unit 3 is also closed.

3.9 (Closed) Violations No. 50-277/89-07-04 & 50-278/89-07-04 regarding the use of under rated fuses.

During the 89-07 Electrical Team Inspection it was determined that TR-R type fuses, manufactured by Gould, were installed in circuit 29-1100. The fuses, rated 200VDC according to the manufacturer's literature, were installed in a 250VDC circuit. The deficiency had been identified in calculation 18247-008-E6, but it had not been corrected.

In response to the violation, the licensee issued two Nonconformance Reports, for Units 2 & 3, respectively, which were dispositioned to replace all the Gould-Shawmut TR-R100 fuses with equivalent TR-S100 fuses rated 600VDC. Field walk-downs revealed other underrated fuses which were similarly replaced. To prevent recurrence, the licensee issued an engineering memorandum to clarify the significance of AC and DC voltage ratings of DC components. In addition,

the licensee issued a Nuclear Group Administrative Procedure, NA-03N001, to prevent recurrence of the lack of prompt corrective action. This procedure requires that any person who identifies a hardware deficiency must report it to the appropriate supervision for dispositioning, assessment of its safety significance, and determination of corrective actions.

The corrective actions taken by the licensee to resolve the issue are considered adequate and the items are closed.

3.10 (Closed) Unresolved Items No. 50-277/89-07-05 & 50-278/89-07-05 pertaining to the undersized bolted connections.

During the physical inspection of DC fuse box 2BD17, the NRC found a bolted connection, between the 1200A fuse and the bus, to contain a washer which was too small for the application.

To correct the unsatisfactory condition, the licensee issued MRF No. 2-57B-89009935. In addition, the licensee reviewed all bolted connections, thus identifying additional unsatisfactory conditions in the 1200A fuse connections. The licensee's evaluation could not determine the root cause of the anomalous design. However, based upon vendor recommendations, the licensee revised the design to use 1/2" bolts with shim plates. The design was evaluated under NCR No. P89-170-311.

The licensee's resolution of the finding is acceptable and the items are closed.

3.11 (Closed) Unresolved Items No. 50-277/89-07-09 & 50-278/89-07-09 relative to the thermal overloads in 480V MCCs.

During the February 1989 electrical inspection, the NRC team observed in Motor Control Center 20B37 some overload heater elements installed upside down. The overload heater elements in question are the dual range type and their rating depends upon the installed direction. In each case the rating did not agree with the one identified on single line diagram 6280-E-1616.

As result of the finding, the licensee conducted a plant walkdown to assess the extent of the problem. The walkdown identified a total of 23 thermal overload discrepancies for Units 2 & 3 which were appropriately documented and resolved by means of NCRs and various MRFs. Upon evaluation, the licensee attributed the source of the problem to inadequate procedures during the construction period and to its failure to update the plant drawings to reflect as built conditions. Maintenance Procedure No. M56.1 was revised in 1984 to include the requirement for thermal overload verification during routine maintenance of the MCCs. However, the MCCs involved did not undergo maintenance following the issuance of the revised procedure.

Review of the NCR and applicable MFRs indicates that the work to correct the thermal overload installed configuration was completed and that revision of the single line diagrams was also done. This issue is closed.

3.12 (Closed) Unresolved Items No. 50-277/89-07-11 & 50-278/89-07-11 regarding the identification of loose terminal blocks in the 480V MCCs.

While conducting the physical inspection of 480V MCCs, the NRC electrical team inspection noted that terminal block mounting screws in several cells were loose or missing.

In response to the NRC concern the licensee conducted an extensive review of the MCCs and found 62 brackets with the top terminal block screw missing and six brackets with the bottom screw missing. The licensee also performed an analysis of the installation and determined that the screws were required to maintain the seismic qualification of the equipment. The root cause analysis performed by the licensee revealed that the problem was due to oversight by craft personnel and inadequate supervision by QC. However, the maintenance procedures existing at the time of the finding did not specifically require that the screws which hold together the movable and stationary portions of the terminal blocks be properly tightened. To prevent recurrence of the problem, the licensee revised Procedure M-56.1 to require that the captive portion of the screws be checked for tightness and they revised procedure S.8.3.0 to add an additional step requiring installation of the slotted screws to secure the field terminal blocks. The first of the two procedures requires QC witnessing; the second requires independent verification. Since the screws were not available at the time of the problem resolution the licensee performed an additional analysis and determined that tefzel Ty-Raps were an acceptable interim substitute, while waiting for the ordered screws. This evaluation is addressed in Engineering Work Request No. 50869 and NCR No. P89-163-312.

In view of the licensee's corrective actions taken, these items are closed.

3.13 (Closed) Unresolved Items No. 50-277/89-07-12 & 50-278/89-07-12 pertaining to the separation between HPCI steam line isolation valve swing bus power sources.

The high pressure coolant injection steam line isolation valve receives its power source from a mechanically interlocked transfer switch. The switch is, in turn, connected to two normally closed circuit breakers powered by redundant channels. Review of the physical installation of the switch revealed that no barriers had been used to separate the redundant power sources entering the switch compartment.

In response to the NRC concern the licensee performed an analysis of the installation. In this analysis the licensee considered the alternate supply to the motor starter as non-safety related, even though it had been derived from safeguard Channel B. Its position is based upon the fact that the alternate supply is only required for 10 CFR 50 Appendix R requirements. Accordingly, the routing of the cable was non-safety related, fire stops were appropriately provided to prevent propagation of fire to the safety related portion of the circuit, and the isolation device (the circuit breaker) was furnished Class 1E.



An evaluation of the circuit indicates that the feeder cables are #10 AWG and that the protective breakers have 25A trip coils with ample margin for trip coordination with the two upstream supply breakers which have trip setting at 480A and 300A, respectively.

In consideration of the above, a single failure within the switch compartment affecting both safety related motor control centers is considered to be a non credible event. Therefore the issue is closed.

3.14 (Open) Unresolved Items No. 50-277/89-07-08 and 50-278/89-07-08 relative to an inadequate management control for deficient equipment.

The inspector reviewed the licensee's actions to improve management control for deficient equipment. He noted that the corrective actions for this concern were incomplete at the time of this inspection. Therefore, these items remain open and will be reviewed during a future NRC review.

4.0 Accuracy of High Range Radiation Monitor

In response to an NRC concern regarding the expected accuracy of the High Range Radiation Monitor used at Peach Bottom, the licensee prepared calculation EE-11. The purpose of this analysis was to show that the insulation resistance (IR) of the Rockbestos coaxial cable would not degrade sufficiently during the high temperature and humidity conditions of a LOCA to reduce the instrument's accuracy to below that stated in Regulatory Guide 1.97. Since the IR of the cable is inversely proportional to the temperature to which it is exposed, the licensee used the actual postulated LOCA profile at Peach Bottom and the material characteristics of the cable to calculate the maximum expected temperature of the cable insulation. This temperature was then used to predict the lowest value of cable IR.

The inspector had no questions regarding the heat transfer calculation and the methodology used to determine the cable temperature and instrument accuracy. However, the following items, which ultimately impact the results of the calculation, were not specifically addressed by the licensee:

- a. Based upon Sorrento Electronics' letter of April 16, 1987 to The Rockbestos Company, "the insulation resistance of the interconnecting cable between the in-containment detector and the electronics had to be kept above 5E8 ohms for the required monitor accuracy to be maintained." Accordingly, the licensee used 5E8 ohms as the target IR for the cable. However, the calculation did not consider the IR of other interposing components, such as the cable termination at the containment penetration.
- b. Page 10 of 10 of Attachment 8 to Calculation No. EE-11 shows a graph of IR versus Temperature provided by Rockbestos with its letter of June 4, 1987. The graph, which was drawn using an equation "developed from actual test data...on file at the Rockbestos office", also shows three actual measurements taken during a test of cable RSS-6-104. One such point (at 250 degrees F) was observed to be well below the line and consistent with measurements taken by the Sorrento Electronics' test (at 227 degrees F)

when thermal lag could have no effect on the IR of the cable. The licensee calculated the IR of the cable at maximum expected temperature using the non conservative theoretical regression line and provided no justification for ignoring the test data.

In view of the above, the acceptability of the results could not be verified. This item is unresolved pending further review and justification of the calculation results by the licensee. (50-277/89-29-01, 50-278/89-29-01)

#### 5.0 Unresolved Items

Unresolved Items are matters about which additional information is necessary in order to determine whether they are acceptable or they constitute a violation. One unresolved item is discussed in details under Section 4.0

#### 6.0 Exit Meeting

The inspector met with the licensee's personnel denoted in Section 1.0 of this report at the conclusion of the inspection on December 22, 1989. At that time, the scope of the inspection and the inspection results were summarized. At no time, during the inspection, was written material given to the licensee.

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