U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 88-24

Docket No. 50-293

License No. DPR-35 Priority ___ Category C

Licensee: Boston Edison Company
800 Boylston Street
Boston, Massachusetts 02199

Facility Name: Pilgrim Nuclear Power Station

Inspection At: Plymouth, Massachusetts

Inspection Conducted: May 31 - June 9, 1988

Inspector: C.H. Woodard 7/11/88
C.H. Woodard, Reactor Engineer date

Approved by: C.J. Anderson 7/22/88
C.J. Anderson, Chief, Plant Systems Section date

Inspection Summary: Inspection May 31-June 9, 1988 (Report No. 50-293/88-24)

Areas Inspected: A routine announced inspection was conducted to review the licensee's followup and corrective actions related to several of NRC's previously identified open items.

Results: A number of unresolved items and inspector followup items and one previously identified violation item were closed. No new violations or additional unresolved items were identified during this inspection.

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DETAILS

1.0 Persons Contacted

1.1 Boston Edison Company (BECo)

K. Highfill, Station Director
P. Hamilton, Compliance Division Manager
R. Anderson, Plant Manager
R. Schifone, Quality Assurance
* R. Whetsel, Senior Compliance Engineer
* E. Kraft, Plant Support Manager
B. Lunn, Compliance Engineer
M. Brosee, Outage Manager
R. Sherry, Chief Maintenance Engineer
P. Kahler, Senior Licensing Engineer
R. Atkins, Senior Electrical Engineer

1.2 Nuclear Regulatory Commission (NRC)

* T. Kim, Resident Inspector
J. Lyash, Resident Inspector

* Denotes those present at the exit meeting.

2.0 Licensee's Activities Related to Previously Identified Items

(Closed) Unresolved Item 86-01-05 Loss of Safety Bus B-20

During February 1986 a circuit breaker in safety-related 480 volt motor control center MCC-B-20 failed to trip to clear a load fault which caused the MCC main feeder circuit breaker to trip which de-energized all of the loads being fed from MCC-B-20.

The root cause of the event was a deficiency in 1976 which allowed an uncontrolled temporary modification to MCC-B-20 which consisted of transferring the load side cables from circuit breaker 52-2013B to the load side of spare circuit breaker 52-2106B. The temporary modification in effect became permanent since it was still installed at the time of this event ten years later. The temporary modification was not reflected in the station electrical drawings. As a consequence when electricians began repair work on these cables under Maintenance Request 84-46-512 after opening circuit breaker 52-2013B to de-energize them, they caused an electrical fault which led to this event since the cables were still energized through circuit breaker 52-2016B.

Immediately following this event the licensee proceeded from 100% power to an orderly shutdown of the plant. The consequences of the event were reduced electrical redundancy as a result of the loss of the safety related loads connected to MCC-B-20. No condition not specifically considered in the PNPS Safety Analysis Report resulted from the loss of this electrical bus.

The inspector reviewed the licensee's corrective actions including the following.

- Repairs to the cable were completed and the cables were returned to the load side of circuit breaker 52-2013B as shown on the station drawing.

- The remaining safety-related 480 volt motor control center circuit breakers designated as "spare" were inspected to verify their status on February 11, 1986. No discrepancies were observed.

- A safety meeting was held with maintenance personnel to re-emphasize safety practices in the repair of electrical cables.

- A search for previous events of a similar nature did not identify any previous events.

- Circuit breaker 52-2013B was analysed for EQ as required by 10 CFR 50.49 b.2. However, spare circuit breaker 52-2016B was not covered by EQ Analysis. This event was reported by the licensee as a noncompliance with 10 CFR 50.49 as indicated in NRC Generic Letter 85-15.

- Procedure Number 1.5.9 "Temporary Modifications" and Procedure 3.M.3-36 "Temporary Power" were revised to preclude recurrence.

- A walkdown inspection was made of all of the 480V Motor Control Centers to verify the circuit breakers and connected loads. Discrepancies found were resolved to assure that the drawing and data match the as built installed equipment/cables. These actions were performed by the licensee under ESR 86-549, TP 86-32, and PCAQ NED 86-223.

Based upon the actions taken by the licensee to correct this problem and prevent recurrence and also based upon the findings of NRC inspection of the 480V motor control centers during February 1988 (Inspection 88-08), this item is closed.

<u>(Closed) Unresolved Item 87-46-01 480VAC Bus B6 Automatic Transfer</u>

During this outage while performing maintenance on the safety related electrical systems which included the circuit breakers which feed Bus B6

and effect automatic transfer, the licensee discovered two previously unidentified problems which were caused by not covering the specific situations in the existing maintenance and surveillance procedures.

480VAC Bus B6 is normally fed from Bus A5/B1 through two in series breakers 52-102 and 52-601. Alternate feed to Bus B6 is from Bus A6/B2 through in series breakers 52-202 and 52-602. Breakers 52-102/52-601 are electrically interlocked with breakers 52-202/62-602 to effect automatic transfer from the one side A5 to A6 or vice versa and to prevent simultaneous closure of the feeds from both Bus A5 and A6 to Bus B6. These circuit breakers are GE type AK-2A-50 which have the following typical characteristics.

- When they open, they recharge and store energy to reclose. This takes about seven seconds. If the recharging cycle is interrupted prior to completion for some reason, the breaker will not automatically reclose. It must be manually reset and then either electrically or manually closed.

- Upon receipt of an automatic close (transfer) signal the breaker will close in less than one second (if charged).

Licensee tests have routinely demonstrated that these circuit breakers perform their normal functions to power Bus B6 including automatic transfer in a satisfactory manner.

During outage maintenance Bus B6 was being fed through Bus A5/B1 with Bus A5 being fed from the "A" Emergency Diesel Generator (EDG). The alternate feed to Bus 6 through Bus A6/B2 was de-energized so that if the feed from Bus A5 was lost automatic transfer would not be made to the A6 dead bus. Operator actions was taken to take the "A" EDG out of service and to return the Bus A5 power feed to its normal start-up transformer source. The operators opened the EDG breaker and closed in the start-up transformer breaker to power Bus A5. This transfer required approximately 3 seconds. During this time period the Bus B6 480VAC feeder breakers 52-102 and 52-601 opened; however the three seconds of power interruption was insufficient time to recharge their closing mechanism. Therefore, when power was returned the breakers did not automatically reclose. Operator action was required to reset and close these breakers. During normal operations when both feeders are available to the 480VAC Bus B6, automatic transfer to the alternate bus would occur when performing a de-energization type EDG transfer to the off-site source.

A second problem was discovered in the closing logic circuits for the breakers. Feeder breakers from Bus A5 (52-102 and 52-601) are interlocked with the alternate feeder breakers from Bus A6 (52-202 and 52-602) to effect automatic transfer and to prevent powering Bus B6

simultaneously from Bus A5 and A6. The interlocks and logic are satisfactory when all of the breakers are installed. However, if one of the B6 feeder breakers is removed (for maintenance) its interlock contact which is in the closing circuit of its alternate counterpart breaker on the opposite side feeder is removed. Unless a spare breaker (or temporary jumper) is put in to provide this logic, the alternate breaker is inhibited from its automatic closure.

The inspector confirmed that the licensee has taken the following corrective actions to resolve these problems and prevent their recurrence.

- Procedure 8.M.3-1 Automatic ECCS Load Sequencing of Diesels and Shutdown Transformers with Simulated Loss of Off-Site-Power, Revision 9, dated June 9, 1988, requires the following:

  1. When restoring power to the start-up transformer from the shutdown transformer approximately nine seconds should elapse to prevent Bus B6 automatic transfer problems.

  2. Verification of Bus B6 feeder breakers in their normal positions. All breakers are racked in. Verifications that open breakers reclose springs are charged.

- Tests will be conducted prior to start-up in accordance with revised Procedure 8.M.3-1. Verifications of the revised procedure and its adequacy will be made by the licensee.

Based upon the licensee's evaluations, assessments, corrective actions, and continued verifications, this item is closed.

<u>(Closed) Violation 87-36-01 Motor Operated Valves (MOV) Maintenance Tests Results Accepted When Criteria Not Met</u>

Licensee MOV Procedure 3.M.4-10 "Valve Maintenance," Revision 6, specified 460 volts (no tolerance) as an acceptance criteria when performing post maintenance testing of MOVs with 460 volt motors. On August 27, 1987, the inspectors observed several examples where the recorded test voltage for the MOV motors exceeded the procedure's 460 volts acceptance criteria. Licensee QC inspectors who had reviewed the test data did not identify the discrepancies, and the test results were approved as though the acceptance criteria had been met. As a consequence the licensee was cited for violation of 10 CFR 50, Appendix B, Criterion XI and XVI for failure to evaluate test results to assure that requirements have been satisfied and for failure to establish measures to assure that nonconformances are promptly identified and corrected.

The inspector reviewed the licensee's letter response to the violation dated October 26, 1987, which includes the following:

- The violation was caused by personnel 1) failing to follow procedures and 2) relying upon a previous informal evaluation of voltages. (The procedure should have been either revised to delete voltage as an acceptance criteria or the discrepancy should have been evaluated each time procure 3.M.4-10 was used.

- The test procedure 3.M.4-10 "Valve Maintenance" was not being used to demonstrate valve operability. A separate operating procedure is used for this.

The inspector reviewed licensee corrective actions taken as follows:

- Valve maintenance procedure 3.M.4-10 was revised (Revision 8, dated August 21, 1987) to delete 460 Volts as an acceptance criteria.

- Previous uses of Procedure 3.M.4-10 prior to Revision 8 were reviewed and discrepancies were documented and resolved in Surveillance Inspector Reports 87-1599 and 87-1641 dated October 18 and 23, 1987, respectively.

- Training courses were held for Quality Control and Maintenance personnel to emphasize the importance of procedural adherence and to reinforce their responsibility to question and document discrepancies between applicable acceptance criteria and test data. This training is summarized and reported, including attendance lists, in BECo Department Document GL 87-214/QAD-87-1454 dated October 26, 1987.

- The Nuclear Senior Vice President, Mr. R.G. Bird at an "All Hands" meeting on August 28, 1987 emphasized the importance of procedural adherence. A copy of his presentation was reviewed.

Based upon corrective actions taken, and the fact that full compliance has been achieved, violation 87-36-01 is closed.

<u>(Updated) Unresolved Item 87-36-02 Potential Adverse Effects of Higher Than Normal MOV Maintenance Test Voltages</u>.

This item deals with the acceptance criteria for stroke time. The licensee lacked documented bases to establish the validity of the acceptance value at voltages higher than 460V, the name plate rating of the motor. The licensee's response to the relationship between motor test voltages and valve stroke times were not addressed sufficiently to resolve this unresolved item 87-36-02. High voltages tend to decrease valve stroke times due to the decreased slip from the synchronous speed and the increase in the developed torgue and lower voltages tend to increase valve stroke times. The concern is that tests conducted at higher voltages in which the stroke time is fast enough to meet technical specification requirements may not meet those requirements at lower voltages. Pending further licensee evaluations, this item remains unresolved.

(Closed) Unresolved Item 86-37-02 General Electric Industrial Series CR120A Relays

There are two hundred and twenty of the GE series CR120A industrial relays in service at PNP, thirty four are in safety-related circuits. The failure rates for these relays during their sixteen years of service has ranged from 1.73 to 4.7 times the maximum failure rate derived from IEEE Standard 500. Analysis by PNP has shown direct correlation of the increased failure rates to higher temperature environment, coil-energized, and increasing age. Analysis and evaluations of the CR120A relays was made and reported in BECo Report Document TCH Memo 87-464 dated July 24, 1987. Recommendations in this report include the near term replacement of all of the safety-related relays coils in kind. Long term recommendations are to replace the CR120A relay with another type, better grade, individually mounted relay in a less compact mounting configuration.

The inspector confirmed that the licensee replaced the seven safety related 125VDC relays under PDC No. 87-70 and replaced the twenty-seven safety related A-C relay coils with a higher voltage coil in accordance with TCH Memo 87-464.

The inspector also confirmed that the licensee had taken the action to replace the flammable relay contact arms which were reported by GE in SIL Number 229 and in IE Bulletin 78-01. This work was performed as task number 2508 on Maintenance Request (MR) 080-499, dated February 1980. This item is closed.

(Closed) Inspector Follow Item 85-28-03 Review Causes for Valve Failure to Open

Inspection Report 86-34 updated this item including the licensee identified causes of failure, immediate corrective actions and long term preventive measures taken to prevent recurrence. The contributing causes were identified as a loose valve operator control wire and loose valve yoke to valve operator mounting bolts. Immediate corrective actions were to reterminate the wires and torque then to 12-inch pounds, and to retorque the yoke holddown bolts to 700 foot pounds. Corrective actions were taken to preclude recurrence including revising station procedures 3.M.3-24.3 and 3.M.3-24.5 to include the specific torque values for wire connections and the holddown bolts.

The inspector reviewed additional analysis of the failure made by the licensee including historic data of similar failures at PNPS and a survey of other licensees for similar failures. The data obtained from other licensees included their corrective actions and preventive maintenance practices. The PNPS preventive maintenance program for these valves includes most of the practices used by others with the exceptions of periodic retorquing of control cabinet wire terminations and infrared scanning of wire connections. However, both of these practices are being considered. Based upon the licensee's evaluation and corrective actions taken to preclude recurrence this item is closed.

(Closed) Unresolved Item 87-27-03 General Electric (GE) Type HFA Relays

The licensee has identified 345 safety related GE Type HFA relays in PNPS. All of these relays were evaluated by the licensee because of a relay armature binding problem which had been identified by the licensee and by GE in Service Advise Letter (SAL) 188.1 which was issued in November 1986. Because of the armature problem, the relays were modified/replaced in accordance with SAL 188.1. Modification/replacements are documented by the licensee in NED 87-545 dated June 6, 1987, and in RFO No. 7 New HFA Relay Installation Matrix dated July 6, 1987. This item was tracked as NRC unresolved item 86-40-03 and was closed October 23, 1987, by NRC Inspection Report 87-46. However in addition to the binding problem, the licensee identified a problem during testing in which a significant percentage of the HFA relays were found with pick-up voltages outside an acceptable range. GE Service Information Letter (SIL) Number 44 Supplement 5 dated June 25 addresses this problem and provides supplementary instructions for relay pick-up voltage adjustment. The SIL also emphasizes the importance of periodically testing and adjusting the relay for proper pick-up voltage.

The inspector confirmed that the licensee has revised procedure number 3.M.3-30 "HFA Relays Pre-Installation Testing and Adjustment, Removal/ Installation and Testing, Coil Replacement, Preventive Maintenance," (Revision 2, dated July 1). This revision includes the GE SIL Number 44 supplementary relay calibration instructions. The inspector verified that the HFA relays had been calibrated to the requirements of the revised procedure by reviewing the licensee HFA Relay Summary Matrix dated July 6, 1987, which listed the relays and the maintenance work request under which each relay was calibrated. The inspector confirmed that the licensee has included the required periodic testing adjustment and calibration in the Master Surveillance Tracking Program. This item is closed.

3.0 Unresolved Items

Unresolved items are matters about which more information is needed to determine whether it is acceptable or a violation, unresolved items are discussed in paragraph 2.0.

4.0 Exit Meeting

The inspector met with the licensee's representative (identified in details, paragraph 1.0) at the conclusion of the inspection of June 9, 1988. The inspector summarized the scope of the inspection and inspection findings.

During this inspection, the inspector did not provide any written material to the licensee. The licensee representatives did not indicate that this inspection involved any proprietary information.