

JAN 28 1992

Docket No. 50-293

Boston Edison Company  
ATTN: Mr. Roy A. Anderson  
Senior Vice President-Nuclear  
Pilgrim Nuclear Power Station  
RFD #1 Rocky Hill Road  
Plymouth, Massachusetts 02360

Dear Mr. Anderson:

Subject: Inspection 50-293/91-80

This refers to your letter dated November 25, 1991, in response to our letter dated October 18, 1991.

Thank you for informing us of the corrective and preventive actions documented in your letter and also the commitment dates for the resolution of unresolved issues and observations identified in the inspection report. These actions will be examined during a future inspection of your licensed program.

We expect that the above actions will enhance the functionality of the electrical distribution system for the Pilgrim Nuclear Power Station.

Your cooperation with us is appreciated.

Sincerely,

Original Signed by  
Jacque P. Durr

Jacque P. Durr, Chief  
Engineering Branch  
Division of Reactor Safety

*JED*

JAN 22 1992

Boston Edison Company

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cc:

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JAN 22 1992

Boston Edison Company

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*RM*  
RI:DRS  
Mathew

12/30/91

*c/a*  
RI:DRS  
Anderson

1/10/92

*[Signature]*  
RI:DRS  
Durr

1/21/92

OFFICIAL RECORD COPY  
C:R50293.RM

## PILGRIM SERVICE LIST

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**BOSTON EDISON**

Pilgrim Nuclear Power Station  
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George W. Davis  
Senior Vice President - Nuclear

November 25, 1991  
BECo Ltr. 91- 999

U.S. Nuclear Regulatory Commission  
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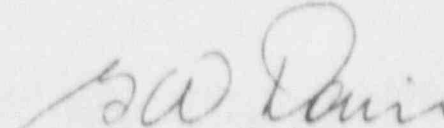
Docket No. 50-293  
License No. DPR-35

SUBJECT: REPLY TO NOTICE OF VIOLATION, UNRESOLVED ITEMS AND OBSERVATIONS IDENTIFIED DURING THE ELECTRICAL DISTRIBUTION SYSTEM FUNCTIONAL INSPECTION (EDSFI) (REFERENCE NRC REGION I INSPECTION REPORT NO. 50-293/91-80)

Dear Sir:

Enclosed is Boston Edison Company's reply to the Notice of Violation contained in the subject inspection report. Also included is our reply to the Unresolved Items and Observations identified during the July 22 - 26, 1991 EDSFI.

Please do not hesitate to contact me if there are any questions regarding the enclosed reply.

  
G. W. Davis

TFM/bal

Enclosures: 1. Reply to Notice of Violation  
2. Reply to Unresolved Items  
3. Reply to Observations

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BECo Ltr. 91-

cc: Mr. Thomas T. Martin  
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Sr. NRC Resident Inspector - Pilgrim Station

Standard BECo Distribution

ENCLOSURE 1

REPLY TO NOTICE OF VIOLATION

Boston Edison Company  
Pilgrim Nuclear Power Station

Docket No. 50-293  
License No. DPR-35

As a result of the inspection conducted on July 22 through 26, 1991, and in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," 10 CFR Part 2, Appendix C (Enforcement Policy) (1991), the following violation was identified:

NOTICE OF VIOLATION

10 CFR 50, Appendix B, Criterion XVI, requires, in part, that measures shall be established to assure that conditions adverse to quality such as failures, deficiencies and malfunctions are promptly identified and corrected and, in the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition.

Contrary to the above, on July 26, 1991, the root cause analysis and corrective action for the RCIC/HPCI inverter trip, as documented in the PNPS Failure and Malfunction Report (F&MR) No. 91-103 dated March 26, 1991, and as described in Licensee Event Report (LER) 91-006, "High Pressure Coolant Injection and Reactor Core Isolation Cooling Systems Became Inoperable Due to Tripped Inverters" did not assure that the cause of the condition was determined and corrective action taken to preclude repetition. The licensee had not evaluated the inverter failure mode for a loss of coolant accident/loss of offsite power (LOCA/LOOP) scenario and had not evaluated the response characteristics of the battery chargers. The consequences of this lack of evaluation were such that during a LOCA/LOOP, the RCIC inverter would have tripped, thereby disabling one high pressure injection system during an accident.

This is a Severity Level IV Violation (Supplement I).

REASON FOR THE VIOLATION

The problem concerning the root cause analysis and corrective action for the HPCI/RCIC inverter trip was due to failure to follow procedures. F&MR 91-103 was classified as "significant" which requires a formal root cause analysis in accordance with Nuclear Organization Procedure 83A9, "Management Corrective Action Process". The Technical Section was assigned the responsibility to perform a root cause analysis in accordance with Procedure 1.3.102 "Root Cause Analysis and Corrective Measures Evaluation". Instead, the Technical Section wrote an Engineering Service Request (ESR) to the Nuclear Engineering Department (NED) to investigate adjustment to the inverter trip setpoints; recommend hardware changes to install improved inverters; install zener diodes and resistors to address voltage spikes. The ESR also requested NED to address transients in the 480 VAC distribution system. NED prepared a Plant Design Change (PDC) to raise the inverter overvoltage trip setpoint from 140 VDC to 150 VDC. However, since a formal root cause analysis was not completed, the NED evaluation performed as part of the PDC did not consider the battery charger response characteristics or voltage transient scenarios caused by large motor starts other than the starting of a recirculation pump. The NED evaluation was focused on the specific items requested in the ESR rather than the overall problem resolution.

CORRECTIVE ACTION TAKEN AND RESULTS ACHIEVED

On October 30, 1991 the RCIC inverter tripped when the input voltage reached 152.5 VDC. The inverter tripped as Residual Heat Removal (RHR) pump was manually started following RCIC System initiation during a Loss of Offsite Power event. The Emergency Diesel Generators (EDGs) were supplying power to the emergency 416C V Buses when the RHR pump was started. A Multidisciplinary Analysis Team (MDAT) was formed to review this event. A special management team supplemented the MDAT for this issue. A formal root cause analysis was completed. The root cause of the October 30, 1991 RCIC inverter trip, as well as the March 26, 1991 RCIC and HPCI inverter trips was determined to be the 125 VDC battery chargers were not designed to regulate DC output when subjected to an AC input voltage transient outside the specified input voltage range of  $\pm 10$  percent of nominal input voltage. The AC input transient and resulting DC output were not specified as design criteria for these chargers in the original purchase specification. The RCIC and HPCI inverters were replaced with the new inverters that have a higher trip setpoint (160 VDC) and an automatic reset function. A 125 VDC end device review was also completed to verify that observed voltage transients would not prevent these devices from performing their safety function.

Additionally, appropriate personnel received root cause analysis training in September 1991 to improve the quality of root cause analyses.

CORRECTIVE STEPS PLANNED TO PREVENT RECURRENCE

The root cause analysis and evaluation procedures will be revised to improve the quality of root cause analyses. The revisions will ensure a more structured uniform approach, clearly state the expectations regarding the adequacy of the reviews, and provide clear requirements for the documentation of the evaluation.

A critique is ongoing to identify areas of improvement regarding the overall organizational response to this issue. A detailed critique was deemed necessary since the failure to follow the normal root cause analysis process occurred in various areas of the organization. Appropriate corrective actions will be taken based on the results of this critique.

Additionally, to improve the root cause/corrective action quality, Kepner-Tregoe training for appropriate personnel will be completed by April 1992.

DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED

Full compliance was achieved on November 19, 1991 when the formal root cause evaluation for the HPCI/RCIC System inverter trips was completed.



ENCLOSURE 2

REPLY TO UNRESOLVED ITEMS

Boston Edison Company  
Pilgrim Nuclear Power Station

Docket No. 50-293  
License No. DPR-35

Discussed below is BECo's response to the Unresolved Items (UNRs) identified during the EDSFI conducted July 22 - 26, 1991. Included is our action to address the switchgear and battery room HVAC concern, as requested in your cover letter transmitting Inspection Report No. 50-233/91-80.

UNR 91-80-01. ADEQUACY OF THE KVA RATING OF TRANSFORMERS X21 AND X22

CONCERN

The Class 1E transformers supplying power to 480V Buses B1 and B2 are rated as 1000 KVA (base rating) and 1333 KVA (Forced Air rating). The Forced Air rating is obtained by the transformer fans that are powered from a Class 1E power source; however, they are not qualified as Class 1E devices. The team noted that the base rating of the transformers is exceeded during a turbine trip/LOCA scenario. Failure of the fans during this scenario could cause excessive transformer winding temperature. This item is unresolved until the adequacy of the KVA rating of transformers X21 and X22 under postulated transformer fan failure is established.

RESPONSE

As discussed during the EDSFI, this condition would result in a small transformer life reduction due to the limited time the transformer would be subjected to this overload condition. The need to qualify or replace the transformer fans to achieve a higher rating is being evaluated. This evaluation will be completed by December 31, 1992.

UNR 91-80-02. ADEQUACY OF DEGRADED VOLTAGE SETPOINT AND STUDY

CONCERN

The licensee was in the process of reviewing the load flow and voltage drop studies prepared by Stone and Webster Engineering. The degraded voltage relay setpoints will be reevaluated based on this review. This item remains unresolved pending the completion of the load flow and voltage drop studies and determining the adequacy of degraded voltage setpoints.

RESPONSE

The review of the load flow and voltage drop studies was completed. This review indicated sufficient voltage may not be available to selected loads at the 480V and 120V systems with the existing degraded voltage relay setpoints. Therefore, compensatory measures were established as described in BECo letter 91-102. These measures will remain in effect until plant modifications are completed. BECo is currently evaluating the electrical system for abnormal system alignments. This evaluation is scheduled for completion by June, 1992. Additionally, modifications are being considered for implementation during Refueling Outage 9 to eliminate the need for compensatory measures. Possible modifications include:

- Replace 4 fixed tapped 480 - 120/240 volt transformers with 4 regulating transformers.
- Replace approximately 35 control power transformers in safety related motor control centers B14, B15, B17, B18 and B20.

- Replace power cables and miscellaneous end devices to:
  - Standby Gas Treatment System fans and heaters
  - Control Room High Efficiency Air Filtration (CRHEAF) heaters
  - "C" Salt Service Water pump
  - Residual Heat Removal (RHR) injection valve MO 1001-29B
  - 250 V Battery Charger

UNR 91-80-03, ADEQUACY OF INTERRUPTING RATING OF BREAKERS AND BASIC INSULATION LEVEL (BIL) RATING OF TRANSFORMERS AND SWITCHGEAR

CONCERN

The existing ac fault analysis calculation did not evaluate the adequacy of the interrupting rating of Class 1E circuit breakers. The licensee was in the process of reviewing the short circuit calculations recently completed by Stone and Webster Engineering. Additionally, there was no insulation coordination study done to support the selection of the BIL for the transformers and the switchgear. The adequacy of the interrupting rating of the breakers and the BIL rating of transformer and switchgear is unresolved pending completion of the analysis and review by the NRC.

RESPONSE

Preliminary review of the Stone and Webster AC fault analysis calculation (PS-95) was completed with no deficiencies noted. Final review and approval of the calculation will be completed by March 31, 1992. NED is also developing a calculation to document the BIL rating. This calculation will be completed by April 30, 1992.

UNR 91-80-04, ADEQUACY OF CONTAINMENT ELECTRICAL PENETRATION AND CIRCUIT PROTECTION

CONCERN

Review of Calculation PS-74, "Electric Power Penetration Assemblies" was performed to verify the heat generated within the penetrations was below the manufacturer recommendations and the penetrations were protected by suitable protective devices. The team noted documentation did not exist to demonstrate the adequacy of the penetrations such that seal integrity is not affected due to a postulated failure. This item is unresolved pending the development of this documentation.

RESPONSE

This concern is being addressed in two phases. The time-current curves for each penetration circuit are being developed and will be documented in PS-74. This effort is scheduled for completion by December, 1992. Secondly, PS-74 will be revised by December, 1992 to incorporate the derating factors for the loads that are active during a LOCA.

UNR 91-80-05, EFFECT OF LARGE MOTOR STARTING ON 120 VAC SYSTEM

CONCERN

The team noted that during steady state conditions the voltage available to most of the devices were adequate; however, some voltages were marginal. The calculation PS-70, "120 Volt System Voltage Profile" did not consider the effect of large motors starting on these circuits. This item is unresolved pending completion of the licensee's analysis to determine the effect of large motor starting on the 120 VAC System and review by the NRC.

RESPONSE

Engineering reviewed PS-70 for impact of a large motor start on the 120 VAC distribution system with respect to degraded voltage. This assessment concluded no negative impact would result. Notwithstanding, we are considering replacing the 480V/120V transformers with new regulating transformers during Refueling Outage 9 to eliminate any concerns with respect to degraded voltage at the 120 VAC System. (See Response to UNR 91-80-02)

UNR 91-80-06, ADEQUACY OF HVAC FOR SWITCHGEAR AND BATTERY ROOMS AND THE QUALIFICATION OF EQUIPMENT UNDER A POSTULATED FAILURE

CONCERN

The team concluded the adequacy of the HVAC for the switchgear and battery rooms under a postulated failure had not been determined. The qualification of the electrical equipment and its operation under the worst case conditions has not been fully evaluated. Additionally, no administrative controls existed to monitor the temperature of the Class 1E equipment rooms.

RESPONSE

Compensatory measures are in place as described in previous correspondence on this issue (BECo letters 91-101, 91-117, 91-145).

A detailed evaluation of the switchgear and battery room worst case distribution of temperature versus time is ongoing. The need for a permanent plant modification or removal of the compensatory measures will be assessed based on the outcome of this evaluation. This evaluation is scheduled for completion by December 31, 1991.

Additionally, a temperature alarm has been added to Control Room Panel 905L-A2 for the Switchgear and Battery Rooms. If the temperature reaches 95 degrees Fahrenheit, the operators will follow the instructions outlined in Procedure 2.4.153, "Loss of Switchgear Area Ventilation", to maintain Switchgear and Battery Room temperature.

ENCLOSURE 3

REPLY TO OBSERVATIONS

Boston Edison Company  
Pilgrim Nuclear Power Station

Docket No. 50-293  
License No. DPR-35

Discussed below are the actions taken and/or planned for the Observations noted during the EDSFI conducted July 22-26, 1991. The target dates for completion may change based on work priorities and available resources.

1. SMALL MARGIN BETWEEN THE EDG RATING AND WORST CASE DESIGN ACCIDENT LOAD.

The EDG load margin is closely controlled by the design change process. This ensures the impact on the EDG loading is determined for any plant modification. Additionally, an evaluation is ongoing to determine the feasibility of upgrading non safety-related Drywell Unit Cooler load shed logic to safety-related. This would provide additional margin to the EDG load rating.

2. NO INSTRUCTIONS/TABULATION OF LOADS/PROCEDURES TO PREVENT INADVERTENT LOADING OF EDGS

An operator aid will be developed to help ensure the EDGs are not inadvertently overloaded as operators manually connect loads. The operator aid is scheduled to be completed by February 28, 1992.

3. NO LOSS OF FIELD AND FIELD GROUND PROTECTION PROVIDED FOR EDGS

- An evaluation is scheduled to be completed by April 30, 1992 to determine the need for a loss of field relay.
- An EDG ground fault alarm is installed to alert the operators. An evaluation will be completed by 12/31/92 to determine the need for additional ground fault protection.

4. INCOMPLETE OVERCURRENT PROTECTION CURVE FOR EDGS

BECO will attempt to obtain the thermal capability curve (if available) from the manufacturer by December 31, 1991. The coordination curves are scheduled to be revised by June 30, 1992 to document the proper protection for the EDGs based on the overcurrent protection devices.

5. LOW LEVEL ALARM SETPOINT FOR DIESEL FUEL STORAGE TANK IS NOT SET AS STATED IN THE TECHNICAL SPECIFICATION BASES.

The Technical Specification bases is scheduled to be revised by March 31, 1992 to eliminate the inconsistency.

6. DISCREPANCIES IN THE EDG FUEL REQUIREMENT CALCULATION AND SMALL MARGIN BETWEEN THE CALCULATED VALUE AND TECHNICAL SPECIFICATION REQUIRED MINIMUM LIMIT

To increase the margin, administrative limits for onsite fuel storage above the Technical Specification requirements are scheduled to be implemented by January 31, 1992. An evaluation is scheduled to be completed by April 30, 1992 to determine if modifications are necessary to increase the fuel oil margin.