U.S. NUCLEAR REGULATORY COMMISSION
REGION I
ENGINEERING AND TECHNICAL SUPPORT INSPECTION

REPORT NO.	50-293/92-18
DOCKET NO.	50-293
LICENSE NO.	DPR-35
LICENSEE:	Boston Edison Company 800 Boylston Street Boston, Massachusetts 02199
FACILITY NAME:	Pilgrim Nuclear Power Station
INSPECTION AT:	Plymouth and Braintree Massachusetts
INSPECTION DATES:	August 17-21, 1992

INSPECTOR: James M. Trapp, Team Leader, EB, DRS — Date: 9-10-92

APPROVED BY: Jacque P. Durr, Chief, EB, DRS — Date: 9/10/92

Areas Inspected: An announced inspection was conducted to verify that the program for the design, implementation, and closeout of plant modifications is conducted in accordance with controlled procedures which satisfy NRC requirements. In addition, an evaluation of the engineering department's effectiveness in providing support to the plant was evaluated.

Results: The program for the design, implementation, and closeout of plant modifications is effective. The plant design changes reviewed were detailed and technically sound. The process for closeout of modifications was well controlled and thorough. The Nuclear Engineering Department continued to implement changes to provide more effective support to the plant. A number of positive engineering initiatives in the areas of shutdown risk, fuel design, and the drawing upgrade project were noted. The program for design basis reconstruction is being developed. No violations or deviations were identified.

1.0 INSPECTION SCOPE

The objective of this inspection was to verify that changes made to safety-related systems, which are described in the Final Safety Analysis Report (FSAR), are made in accordance with controlled administrative procedures which satisfy regulatory requirements. The effectiveness of the engineering and technical support organizations to develop, implement, and closeout plant design changes was evaluated. A review of the temporary modification process and certain temporary modifications was conducted. The control of plant design changes is important to safety to assure that the margin of safety, described in the FSAR, is not reduced by the installation of the modification.

The engineering department's ability to provide plant support was reviewed. The effectiveness of the engineering departments organization structure, staffing, communication/interface with the site, work backlog closeout, and plant outage support were evaluated. In addition, several Nuclear Engineering Department (NED) initiatives were discussed with the cognizant engineers.

2.0 INSPECTION FINDINGS

2.1 Plant Design Changes (37700)

2.1.1 Administrative Controls for Design Changes and Modifications

The administrative procedures which control plant design changes were reviewed to assure that plant design changes are controlled in accordance with American National Standards Institute (ANSI) 45.2.11-1974, "Quality Assurance Requirements for the Design of Nuclear Power Plant."

Permanent plant design changes are controlled by Nuclear Organization Procedure, NOP83E1, "Control of Modifications to Pilgrim Station," and Nuclear Engineering Department Procedure NED 3.02, "Preparation, Review Verification, Approval and Revision of Design Documents for Plant Design Changes." These procedures are supported by a number of specific administrative procedures for items such as calculations, field revision notices, safety evaluations and drawing control.

The administrative procedures reviewed provided adequate detail to assure that plant design changes were designed and implemented in a controlled manner. Detailed guidance was provided in the areas of program requirements, design process, interface control, design verification, document control, and design change control. The administrative procedures satisfied the requirements detailed in ANSI 45.2.11-1974.

The area of design verification was noted as being particularly strong. Each plant design change (PDC) is reviewed by a Design Review Board (DRB) prior to approving the PDC. The DRB is comprised of the Nuclear Engineering Department Division Managers. The cognizant engineer presents the PDC to the DRB which conducts the multi-discipline review of the PDC. In addition to the DRB, the PDCs were reviewed by the Operations Review Committee in accordance with the plant Technical Specifications.

2.1.2 **Plant Design Change Packages**

Selected plant design changes were reviewed to verify that changes to the station's safety systems were controlled in accordance with station procedures and regulatory requirements. The following plant design change documents were reviewed:

1. PDC 92-20, "Replacement of Level Switches on the EDG Day Tank," replaces the existing Robertshaw level switches on the emergency diesel generator (EDG) day tanks with new Magnetrol switches. The level switches provide input to the Hi-Lo EDG day tank annunciators in the control room. This design change includes moving of the level switch sensing lines due to physical differences in the switch design. The pressure boundary of the switches and the sensing lines to the switches are safety related components. This design change is required because one of the existing switches is leaking diesel fuel and qualified replacement parts for the Robertshaw switches are not available. This design change has been issued by engineering for construction, but has not been installed.

2. PDC 91-63, "Replacement of the HPCI/RCIC invertors at C903/C904," replaced the existing Topaz invertors with new Abacus Controls invertors. The invertors provide control power for the high pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) systems. The invertors are safety related components. The reason for this design change was that an input voltage transient, caused by the starting of certain emergency core cooling pumps, could cause the invertors to trip. Tripping of the invertors causes the HPCI/RCIC systems to be inoperable, until the invertors are manually reset. The new invertor design provides an increased input voltage range, which allows the input voltage trip setpoint to be increased. The increase in the setpoint will help to prevent the inadvertent tripping of the invertors. This design change has been installed at the plant.

3. Field Revision Notice (FRN) 92-03-17, "Overspeed Shutdown Switch of Diesel Fire Pump," replaced the automatic overspeed trip reset feature with a manual reset. The reset switch is a fire protection safety related component. The previous design allowed an automatic restart of the diesel fire pump following an overspeed trip. The

reason for this modification was to prevent recurring overspeed trips of the diesel fire pump. By requiring manually reset, the pump can be monitored by an operator during startup and the cause of the overspeed condition can be established. This plant design change was installed using the standing PDC 92-03, "Standing PDC for Mechanical Modifications."

4. FRN 92-03-28, "RHR Valves Yoke Replacement," replaced the yokes for the residual heat removal system (RHR) outboard motor-operated injection valves MO 1001-28A & B. The valve yokes are safety related components. The new valve yokes are an improved design which eliminates high stress points. The reason for this modification was the structural failure of the previous valve yokes. This plant design change was installed using the standing PDC 92-03, "Standing PDC for Mechanical Modifications."

The plant design changes reviewed were detailed and technically sound. Each plant design change was documented in accordance with the controlling administrative procedures. The design changes were independently reviewed by an engineer, cognizant division manager, Design Review Board, and the Operations Review Committee. The PDCs were approved by the Nuclear Engineering Department Manager and the Quality Assurance Department Manager.

The standing PDC is written to conduct minor design changes. A field revision notice (FRN) is written against the standing PDC to implement the design change. Administrative limits on the scope of design changes, which may be installed using this process, are documented in the standing PDC. The standing PDC is subject to the same reviewed and approval process as other PDCs. The FRNs which are written against the standing PDC are only required to be reviewed and approved by the cognizant engineer and engineering division manager. The standing PDC field revision notices reviewed replaced a design equivalent yoke on a RHR valve and modified the overspeed trip reset on a fire protection system pump. In both cases the use of the standing PDC was appropriate. However, the potential exists to inappropriately install plant design changes using the standing PDC. The Design Section Manager stated that to reduce the potential for the inappropriate use of the standing PDC, an engineering section manager reviews and signs each FRN written against the standing PDC. This provides a second verification that the standing PDC is being appropriately applied.

The post-modification testing, established by the cognizant engineer, provided appropriate test requirements and acceptance criteria. The test procedures developed for performing the post-modification tests were detailed and of high quality. The results of the tests were acceptable.

In general, the station procedures were revised to incorporate appropriate procedure changes due to the design change. The revisions to procedures were tracked and implemented prior to the design change being accepted for operation. However, in one isolated case, the plant procedure for the operation of the diesel fire pump was not updated following the installation of the manual overspeed shutdown switch (FRN 92-03-17). This oversight was due to an error to identify the appropriate operating procedures to be revised following the installation of this design change, and was not a deficiency in the design change closeout process.

The operator training for PDC 91-63 was reviewed. The training was provided to the licensed operators describing the event in which the RCIC invertor had tripped in October 1991. This training also included the PDC and a review of the procedure revisions which were incorporated as a result of the PDC. The training for this PDC was appropriate.

The priority "A" drawings and vendor manuals are updated prior to the modification being accepted for operation. Selected drawings and vendor manuals were verified as being updated.

The plant design changes reviewed were detailed and of good quality. Only a small number of field revisions were required to install the design changes which indicates comprehensive installation instructions. The closeouts of plant design changes reviewed were thoroughly tracked and documented. The Nuclear Engineering Department's development of plant design changes and the Modification Management Division closeout of modifications were noted as being well controlled and represented program strengths.

2.1.3 **Safety Evaluations**

The review of safety evaluations was conducted to assure that an adequate basis was provided to conclude that the plant design changes did not involve unreviewed safety questions. In addition, the administrative procedure guidance for performing safety evaluations was reviewed to assure that the procedure satisfied the requirements of 10 CFR 50.59, "Changes, tests, and experiments."

The safety evaluations associated with the plant design changes 91-63 and 92-20 were reviewed. The Field Revision Notices 92-03-17 and 92-03-28 were determined by the licensee not to require safety evaluations. Administrative procedure 1.3.23, "10CFR50.59 Safety Evaluations," provides the requirements for writing safety evaluations.

The safety evaluations for the PDCs were thorough and provided an adequate basis to determine that these design changes do not involve an unreviewed safety question. The safety evaluations were written and approved in accordance with procedure 1.3.23. The modifications reviewed did not involve an unreviewed safety question and were not required to be provided to the NRC for review prior to installation.

A "Preliminary Evaluation Checklist" was performed for the FRNs which determined that a safety evaluation was not required. Safety evaluations for the FRNs were not required because the component modified did not affect the system as described in the FSAR. With regard to PDC 92-03-17, the diesel driven fire pump is described in the section 10.8 of the Final Safety Analysis Report (FSAR); however, the overspeed trip function for the pump is not described in the FSAR. The valve yoke replacement documented in FRN 92-03-28 does not change the design of the component as described in the FSAR. The conclusion that a safety evaluation was not required for these design changes was appropriate.

2.1.4 **Temporary Modifications**

Selected temporary modifications were review to verify that they were implemented and controlled in accordance with station procedures and regulatory requirements. Temporary modifications TM 91-54, "Pressure Switches PS 4557 A & B Relocation," and TM 91-59, "EDG "B" Turbo Assist Piping," were selected for review.

Temporary modifications are controlled in accordance with procedure 1.5.9, "Temporary Modifications." This procedure provides detailed guidance for controlling temporary modifications. The review and approval, technical adequacy, installation, tagging, and auditing of the temporary modifications were verified. In general, the temporary modifications reviewed were in accordance with procedure 1.5.9. However, a tag was missing on temporary modification 91-59. The licensee reviewed other temporary modifications and located a few additional missing tags. The licensee stated that they are considering action to assure that the identification tags are maintained on the temporary modifications. The detail of documentation provided for the temporary modification was appropriate. There were 27 temporary modifications installed at the time of this inspection. The majority of the temporary modifications were recently installed.

2.2 **Communication/Interfaces**

The Nuclear Engineering Department (NED) has implemented a number of initiatives to enhance their effectiveness in support of the site organizations. The daily plant meeting is attended by the NED management in Braintree via a tele-conferencing link. This information allows the engineering department to be involved and respond to daily plant issues. Rotational assignments between the engineering and plant organizations are encouraged. The recently assigned Deputy Manager of the Nuclear Engineering Department was previously the Operations Section Manager at the site. In addition to rotation of personnel, a number organization changes were made to increase the engineering presence at the station. Four engineers, one in each of the engineering disciplines, and three project engineers were transferred from NED to the Project and Construction Section at the site. The four engineers complemented other engineers at the site to increase the field engineering organization on site to 12 engineers. This change allows daily engineering issues, which previously required Braintree based engineers involvement, to be solved by the site engineers. An additional four engineers from the NED were transferred to the onsite Materials and Component Engineering

Section. The reorganization, which incorporates the engineers into the line organization, provides enhanced support for the line organizations. The NED has also developed a client manager program to enhance support to the site organizations. Key section managers at the site are provided, with a manager in NED who acts as the client manager. The client manager tracks the client's NED tasks and acts as a focal point for the client's needs. The NED has implemented a number of initiatives to provide timely support to resolve daily plant issues.

2.3 Engineering Backlog and Prioritization

The Nuclear Engineering Department's (NEDs) outstanding work is primarily tracked as engineering service requests (ESRs). The NED department goal is to maintain the open ESRs to less than 300. At the time of the inspection, the backlog of ESRs was 187, which was a decrease from 952 in 1989. The NED was effectively controlling the backlog of ESRs.

The NED provided strong support to complete plant design changes (PDCs) in a timely manner for the scheduled outages. The PDCs for the mid-cycle outage #9, scheduled to begin in October 1992, were complete. The PDCs for refueling outage #10, scheduled to begin in April of 1993, were nearly complete and the PDCs for mid-cycle outage # 10, scheduled for April of 1994, were being developed.

2.4 NED Staffing/Technical Training

The NED continued to maintain a stable and highly qualified staff of engineers. Over half of the NED engineers have advanced college degrees and nearly half are professional engineers. The average Boston Edison Company experience for the engineering staff is approximately 9 years with an overall industry experience average of 19 years. The NED staffing is currently 95% of the approved complement.

The NED has provided a number of internal training courses to the engineering staff. Two NED staff members are attending Senior Reactor Operator training courses. Twenty-five other NED engineers attended a root cause/failure analysis course. In addition, fifteen engineers completed the Institute fo clear Power Operations technical staff and managers training course. The NED recently developed annual refresher training on NED procedures.

2.5 Engineering Projects

The Nuclear Engineering Department (NED) has been managing a number of long term projects. The progress on several of these projects was reviewed to assess the initiatives and to evaluate the response to industry issues.

A pilot program to reconstruct the design basis information for the high pressure coolant injection system (HPCI) was completed during the first quarter of 1992. However, the pilot format was not satisfactory to the licensee's management and a new document format has been adopted. The HPCI design basis document will be revised to conform with the new format. The planned completion date for the HPCI system design basis information reconstruction, using the new format, is the first quarter of 1993. The design basis reconstruction project for all safety-related systems is scheduled for completion in 1998. The implementation of the design basis information reconstruction program has progressed slowly.

The update of plant drawings is progressing well. Nearly 90% or 8000 of all the drawings requiring updating have been completed. The project is scheduled to be completed by the end of 1992. In addition, several plant piping and instrument drawings (P&IDs) have been completed using to the Phoenix design control system software. The Phoenix drawings provide improved quality and clarity over the existing P&IDs.

The NED Systems and Safety Analysis Division performed an assessment of the risk of fuel uncovery during the refueling outage #8. This study was accomplished by modifying the risk models developed for the full power simplified probabilistic risk assessment (PRA). The results of the study indicated that the risk was relatively constant throughout the outage. This indicated that the proposed schedule had incorporated measures to address shutdown risk. Based on the risk study insights, scheduling of outage work was adjusted. The development of the risk study is a positive initiative to enhance plant safety.

The licensee has taken actions to incorporate the latest General Electric enhanced fuel designs during core reloads. This has allowed the fuel cycles to extend to two years. The engineering organization has incorporated a number of features to increase the efficiency of the fuel. For example, the use of flux spectral shift, increased core flow, and feedwater temperature reduction have all been incorporated to increase the efficiency of the fuel.

2.6 (Closed) NRC Unresolved Item 50-293/91-16-01 Temporary Modification Design Control

The temporary modifications process is used to install modifications to the plant which are not permanent. During a previous NRC Inspection (NRC Inspection Report 50-293/91-16, Section 2.0) it was noted that complex safety significant modifications had been installed as temporary modifications. The administrative controls for temporary modifications provided in procedure 1.5.9, "Temporary Modifications," were not adequate for the installation of complex design changes. The administrative procedure did not require soliciting design inputs, interface controls, or design verification and testing as recommended by ANSI 45.2.11-1974, "Quality Assurance Requirements for the Design of Nuclear Power Plants."

A number of revisions were made to the temporary modification procedure 1.5.9 to address this concern. The Nuclear Engineering Department Manager is now responsible to assure that NED Independent Design Verification and Design Review Checklist forms and the Design Criteria Specification form are include in the temporary modification package for complex modifications. The cognizant engineer responsibilities include specifying functional testing. A review of temporary modification 91-59, "A/B EDG Air Start & Turbo Assist Piping," verified that this temporary modification was documented in accordance with the administrative procedure and included design inputs, interface control and design verification, and testing requirements. Based on the changes made to procedure 1.5.9, "Temporary Modifications," this unresolved item is closed.

3.0 CONCLUSION

The inspector concluded that the plant design change process is controlled using detail procedures. The NED provided high quality plant design change packages to the plant. The supporting safety evaluations provided an adequate basis to determine that an unreviewed safety question was not involved. The install plant design changes were thoroughly closed out and appropriate changes to station documents were conducted prior to declaring the design change acceptable for operation. The overall design change process was determined to be of high quality.

The Nuclear Engineering Department interfaces with the plant were good. The backlog of outstanding engineering work was being tracked and controlled. The effort to plan design changes in advance of planned outages is a positive effort. The engineering staff was well qualified and training was provided to continue to enhance staff qualifications.

The engineering projects such as the drawing update and the risk assessment for shutdown were positive initiatives. However, the project to reconstruct design basis information appeared to be progressing slowly.

4.0 MANAGEMENT MEETING

The inspector met with those denoted in Attachment 1, on August 21, 1992, to discuss the preliminary inspection findings which are detailed in this report.

ATTACHMENT 1
PERSONS CONTACTED

Boston Edison Company

* J. Alexander III, Nuclear Training Department - Manager
* R. Anderson, Sr. V.P. - Nuclear
  P. Antonopoulos, Design Section Manager
* J. Bellefeuille, Technical Section Manag
  S. Bibo, QA Audit Div. Manager
* E. Boulette, Station Dir/ V.P. Nuclear Operations
  P. Cafarella, Mech. Systems Eng. Div. Manager
* J. Calfa, Sr. Compliance Eng.
* L. Calfa, Sr. QA Eng.
* W. Clancy, Plant Manager (Acting)
  R. Clough, Project Manager
  N. Desmond, Compliance Div. Manager
* D. Ellis, Compliance Div. Manager (Acting)
* R. Fairbank, Nuclear Engineering - Manager
* F. Famulari, QA - Manager
  T. Hauske, Sr. M chanical Engineer
  J. Keenan, Sr. Construction Eng.
* W. Knapp, Sr. Modification Engineer
  G. McHugh, Sr. Electrical Engineer
  C. Minott, Project Manager
  G. Mileris, Fluid Systems Div. Manager
  F. Mogolesko, Project Manager
* H. Oheim, Regulatory Affairs Manager
  L. Olivier, NED Deputy Manager
  J. Piascik, Nuclear Fuels Administrator
* W. Riggs, Field Eng. and Supervision Div. Manager
* W. Rothert, Director Nuclear Engineering
  R. Sheridan, Sr. QA Eng.
  Y. Urim, Modification Management Eng.
* E. Wagner, V.P. Nuclear Technical

U. S. Nuclear Regulatory Commission

* D. Kern, Resident Inspector - Pilgrim
* J. MacDonald, Sr. Resident Inspector - Pilgrim

Massachusetts State

* J. Muckerheide, Ma State Nuclear Eng.

Asterisk (* denotes those present at the exit meeting.