



**Boston Edison**

Pilgrim Nuclear Power Station  
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BEC0 Ltr. 2.97-009

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

Docket No. 50-293  
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**Reply to Notice of Violation 96-06-02**

We have provided in this letter our response to Violation 96-06-02 that describes procedural usage and adequacy problems at Pilgrim Station. As we stated in previous correspondence (BEC0 Ltr. #2.96-057 dated June 17, 1996), efforts were underway to resolve problems within these areas when the NRC issued the 40500 team inspection report (IR 96-80 dated April 16, 1996). The results of the NRC report offered insights into our procedural weaknesses, and those insights were factored into our performance improvement plan.

As requested, we have provided in this letter the reasons for the violation, corrective action taken and results achieved, actions planned to avoid further violations, and the date when full compliance will be achieved. Furthermore, we have included a clarification of our integrated plan to correct the identified problems and completion dates for corrective actions specified in our June 1996 letter. Finally, we have included a summary of our common cause analysis. This information is contained in the enclosure to this letter.

The letter contains the following commitments:

- Evaluate and redesign our process for changing procedures, as appropriate. The new process will be implemented by the end of September 1997.
- Consolidate our Mission, Organization and Policy Manual and Nuclear Organization Procedures then review and revise, as necessary, our NOPs and administrative procedures by the end of 1997.
- Submit a change by the end of September 1997 to the NRC that will allow us to consolidate our deficiency report and nonconformance report processes with our problem report process.
- Provide training on a periodic basis to reinforce management expectations on procedural adherence. The first of these sessions will be held prior to commencing our February outage.

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- Evaluate and redesign our modification process as appropriate. The new process will be implemented by the end of September 1997.
- Complete initial training on our new root cause analysis (RCA) and human error prevention techniques by the end of September 1997. We will also have incorporated RCA refresher training into our continued training program by this date.



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Attachment: Reply to Notice of Violation  
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## ENCLOSURE

### REPLY TO NOTICE OF VIOLATION

#### BACKGROUND

In April 1996, the NRC issued the results of the 40500 team inspection of the Pilgrim corrective action process (IR 96-80). The NRC identified what appeared to be a broad procedural usage and adequacy issue. Boston Edison (BECo) replied to that report in June 1996 (BECo Ltr #96-057) acknowledging the NRC findings were consistent with the results of self assessments performed by BECo personnel. We also provided our corrective action plan. In October 1996, the NRC issued IR 96-06 containing the following violation:

"As a result of an inspection conducted January 22, 1996 through February 9, 1996, information received on June 17, 1996, and additional inspection conducted during this inspection period (July 29 - September 23, 1996), the following violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy (60 FR 34381; June 30, 1995), the violation is described below:

Criterion XVI, "Corrective Action," of 10 CFR Part 50, Appendix B, states, in part, that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected. 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, corrective actions for problems identified since at least April 1995, were not effective in identifying and correcting overall procedural adherence and adequacy problems at Pilgrim. The following specific procedural adherence and adequacy problems were identified:

1. Procedure 2.2.87, Control Rod Drive System, Revision 53, was inadequate by not providing direction to operators moving reactor fuel to verify the correct orientation of the blade guide before control rod insertion. As a result, on April 30, 1995, control rod 18-35 was inserted into the reactor core and physically jammed into a mispositioned blade guide causing blade guide and control rod damage.
2. Procedure 9.13, Control Rod Sequence and Movement Control, Revision 12, Attachment 3 listed control rods to be moved. During the power reduction required on October 6, 1995, operators did not follow the reverse order of the pull sheet as evidenced when control rod 34-23 became mispositioned.
3. Nuclear Operating Procedure NOP 92A1, "Problem Report Program," Step 6.5.3 directs that Severity Level I problem report evaluations be forwarded to NSRAC for their review. However, as of January 1996, the NRC identified that NSRAC had not been forwarded approximately one-third (60) of the Level I evaluations.

4. On July 31, 1996 valve MO-1001-16A ("A" RHR loop heat exchanger bypass) became mispositioned when a reactor operator failed to follow the established RHR procedure when securing torus cooling. The valve was mispositioned for approximately 11 hours.
5. In February 1995, a calibration problem on the "B" scale of the Rockwell Hardness Tester machine was adverse to quality and was not promptly identified or corrected. Quality control inspectors relied on verbal advice from an outside vendor rather than contacting the BECo measurement and test equipment personnel, as specified in the M&TE program, or initiating a problem report in accordance with NOP 92A1, "Problem Report Program". Also, the degradation of a related BECo calibration block has not adequately been addressed to date.

This is a Severity Level IV violation (Supplement IV)."

In this response, we will address the overall problem of procedural usage and adequacy rather than each of the specific events described; however, each of the specific events have been entered into our corrective action process. The details of the requested information follows.

## **REQUESTED INFORMATION**

### **Common Cause Analysis Summary**

The common cause analysis of problem reports was completed by a team trained in the Failure Prevention & Investigation International (FPI) methodologies for determination and correction of human performance based errors. The report provides a detailed trend review of all problem report (PR) evaluations issued between June 1995 and June 1996. Of the 726 PRs generated during this interval, 227 were determined to be caused by human performance based errors. These results were further evaluated to determine the underlying causes of organizational, programmatic, and personnel performance problems. The report also contained the results of the first Pilgrim culture index survey.

Major findings from the common cause analysis report included:

- The overall number of human performance inappropriate actions documented by PRs is low compared to industry averages and performance indicators. This is due to the perception that punitive measures will accompany reports of human performance issues and the lack of confidence that the corrective action process is effective for correcting human performance issues.
- The modification process accounted for 17% of all inappropriate actions. These inappropriate actions were fairly evenly distributed between the design and implementing organizations.
- The personnel accountability system needs improvement. Accountability is perceived as inequitable within and across organizations and is applied according to the individuals involved.
- Of all trended events, 15% were associated with procedure noncompliance. Most of these deviations were associated with external factors (e.g., misjudgments, not meeting commitment) and not a product of deliberate violation.

Major recommendations arising from the common cause analysis report were:

- Executives and group managers should review the current personnel accountability system. Reward and punishment should be balanced throughout all departments. Awards should be considered for multi-discipline efforts to encourage teambuilding. Action should be taken to reverse the negative stigma associated with identifying and reporting human performance errors.
- Group and department managers should explain the purposes of the PR process and the Human Error Prevention program to workers. Identifying problems via the PR process and using human error prevention and performance improvement techniques should be encouraged. Leadership by example is encouraged.
- An independent team should review (in-depth) procedure usage at Pilgrim Station. This review should include:
  1. Level of detail within procedures as it relates to the complexity of the task, safety significance, and skill of the craft.
  2. Methodologies for simplifying the procedure revision process to make it easier, more cost effective, and timely.
  3. Required training of personnel to minimize level of detail in procedures.
  4. Procedure revision tracking.
  5. Procedure revision trending.
- An independent team should review the administrative, technical, and review/approval requirements of the modification process to minimize associated performance errors.
- Group and department managers should review all sections of the common cause analysis and culture index to use it as a platform for self assessment within their organizations.

To assess the culture index at Pilgrim Station, a survey was conducted also using FPI methodologies. The index is a leading indicator that forecasts whether performance will improve, degrade, or remain the same.

### **Reasons for the Violation**

As explained in our June 1996 letter and the common cause analysis /cultural index results, several weaknesses worked together to produce the overall procedural usage and adequacy problem described in the violation. The primary cause of these weaknesses was a corrective action process that did not provide consistent depth of analysis and performance monitoring capabilities to inform management of adverse trends in procedural usage and adherence. Several programmatic weaknesses were identified that contributed to this deficiency.

One of these weaknesses was manifested in the form of inconsistent root cause analyses (RCAs). Information of varying depth and scope, lack of independent review, missing or incomplete information, use of involved parties as evaluators, and lack of input from involved parties were issues of concern. Other general concerns with the root cause analysis process were inadequate examination of procedural usage factors (e.g., adherence, usage, adequacy, and understanding) and poor quality of RCA documentation packages. As will be discussed, the quality of our RCA process has a direct impact on our ability to identify and trend procedural usage causal factors.



The root cause for the problems associated with RCAs was the inconsistent quality of training provided to those involved in the RCA process. Contributing to the problem were procedures that did not require independent review of RCAs and allowed the use of involved parties as evaluators. Another contributor to this condition was an inconsistent understanding within the organization of how organizations behave, how programs can fail, and how humans can err.

Second, the trending aspect of our corrective action process was weak particularly in the area of human performance. The ability to trend problem report (PR) and deficiency report (DR) data was hampered by the difficulty in translating causal factors from RCAs into the integrated action database (IADB). The cause for this condition was outmoded corrective action methods and procedures.

Third, independent oversight groups did not identify the broad-based procedural issues within our organization. Contributing to this problem were the ineffective performance indicators used to analyze human performance issues. This in turn was caused partly by the RCA weaknesses already discussed that resulted in poor data input to the trending process. Poor quality data input to the trending process created obstacles to detecting the procedural problems.

Fourth, our less-than-efficient procedure change process made it difficult for individuals attempting to make improvements.

### **Corrective Actions Taken To Prevent Recurrence**

#### ***Human Error Prevention Training***

We contracted FPI International, who are proven performers and are widely recognized leaders in the industry, to provide training to our organization on failure prevention methodology. This training provided the key elements of a strong self improvement culture as well as the knowledge and skills for investigating human performance, organizational, and programmatic failure modes.

Approximately 85% of all Pilgrim Station executives and managers have already attended various training sessions that introduced fundamental techniques for identification and correction of programmatic and human errors.

#### ***Root Cause Analysis Training***

Also, 30 workers have been trained as RCA experts using our new methods; every future RCA team must have at least one member trained to this level. Through this training, we expect to see consistent RCAs that significantly improve the quality of data fed into our trending process. Additionally, many managers and workers have attended human error prevention training.

#### ***Problem Report/Corrective Action Process***

The corrective action process has undergone significant revision as the result of insights gained during our line organization participation in the FPI training. Organization-wide, open forum training sessions were personally conducted by the Plant Manager and operations support personnel on the new process. Key elements of the training included focus on the need for identification of problems at a very low threshold, particularly human performance errors.

To encourage reporting of human performance errors, a Pilgrim Error Free Policy endorsed by the entire executive team was introduced at the corrective action training sessions. This policy states that no disciplinary action will accompany identified human errors unless the errors are willful in nature. The policy is aimed at eliminating the negative stigma perceived to accompany the reporting of human errors. We feel the most effective way to solve human performance issues is to set high expectations for performance, hold managers accountable for results, and solve the environmental factors that cause problems rather than place blame.

Also the PR initiation process was simplified to further encourage workers to identify problems. Perhaps the most significant change, however, was the method by which PRs are now screened and categorized. The four significance levels by which PRs were previously categorized were condensed into two categories: significant conditions adverse to quality and non-significant conditions adverse to quality.

Under the revised process, only significant conditions adverse to quality require RCAs. Using the new root cause methods, procedural usage and adequacy causal factors will be identified and appropriate corrective actions determined.

Non-significant conditions adverse to quality are assigned either apparent cause or direct cause evaluations. All non-significant conditions adverse to quality will require the apparent or direct cause be identified for trending purposes and the immediate problem be fixed. Causal factors from all these evaluations will be fed into our improved trending process thereby improving the quality of our trend reports.

Another improvement in the corrective action process relates to senior management involvement in that process. The senior licensed individual at Pilgrim continues to review all new PRs daily, and the Pilgrim Management team continues to be briefed on potentially significant PRs as part of the station Plan of the Day Meeting. The Plant Manager, Engineering Manager, and other senior managers as determined by the subject being reviewed will form the Corrective Action Review Board whose charter is to review all RCAs. RCAs will be performed on all problems that merit a high degree of attention. Together, these changes in the corrective action process are expected to improve participation in our corrective action process.

### ***Self Assessment Process and Oversight***

The self assessment process has been revised with emphasis on increased management participation and oversight. Key elements include worker level assessments and quarterly group level management assessments. Cross-functional assessments are conducted by each group every 18 months. The Nuclear Managers Committee(NMC) and the Nuclear Safety Review and Audit Committee review all group self assessments.

The Independent Oversight Team (IOT) has been formed to monitor and trend performance. As part of their charter, the IOT will also independently review RCAs, self assessments, human performance corrective actions, and other data. These reviews will ensure high quality RCAs are consistently performed and will determine the effectiveness of human error corrective actions in preventing recurrence. The IOT will include the observations from management tours (e.g., performance review checklists) during their real-time trending of human performance.

The Quality Assurance Group will continue to oversee organization activities through various audits and assessments.

Management tours, observations, and discussions with workers continue with the expectation that workers will appreciate management commitment to reducing human errors. Managers are expected to reinforce the need for procedural compliance during routine tours. These tours have the added benefit of sensitizing managers to worker needs and concerns.

### ***Performance Indicators and Trend Reports***

The corrective action process has been revised to maximize the use of information from root cause, apparent cause, and direct cause analyses. Data is also provided from management observations of human performance during routine tours. A new work instruction, "Performance Evaluation Program" contains guidance on what types of errors are typically made for different types of work and will also provide a source of data for trending.

The capability to monitor and trend human performance has been improved by adding leading, real-time, and lagging indicators to the program although it is too early to measure their effectiveness. Our monthly human error performance reports include graphs of our human performance ratio, human performance PRs, personnel error rate, significant personnel error rate, and LER 4-quarter rolling average. Use of these indicators in performance monitoring enhances our ability to identify current problems and determine whether trends are significant enough to merit immediate corrective action to avoid significant errors in the future.

Common cause analysis reports are expected to be generated on a 6 month frequency and culture index surveys approximately every 12-18 months.

### ***MOP/NOP Revisions***

We have completed a top down review of the Nuclear Organization Mission, Organization and Policy Manual (MOP), the Nuclear Operations Procedures (NOPs), and administrative procedures. From this review, we developed a plan for consolidation and revision as necessary to ensure the policies and procedures properly communicate management expectations and standards. Also expected is a clear statement of organization oversight responsibilities and simplified/streamlined processes.

### **Effectiveness of Actions Taken**

The December Human Performance Trend Report provides an indication that corrective actions taken have had a positive effect on the organization. During December, 31 of 153 PRs written were human performance related. Approximately 60% of the human performance issues were self identified. The December self identification percentage represents a favorable increase. Also, from this data, we see that even though more PRs are being submitted as the result of lowering the threshold for PRs, the ratio of human performance problems to total problems has remained fairly constant.

During December, 19 of the 31 human performance PRs were associated with the incorrect use of administrative procedures. Although most of the errors have been generally minor in nature, this



highlights the need to complete our review and revision of NOPs by the end of June 1997 and to maintain management focus on attention to detail.

Two other indicators, the personnel error rate and significant personnel error rate, took a turn in the adverse direction during the past month. Indeed, the station goal of 0.07 for the significant personnel error rate (approximately 1 Level I human error PR per 120,000 man-hours) was not achieved at year end; actual year end performance was 0.1. This was due primarily to the fact that three relatively minor PRs were issued on the lifted lead and jumper log process during December. Taken individually, these PRs might have been treated as non-significant. However, they were viewed collectively as significant since they involved the same activity, and they were categorized accordingly. Therefore, this single process weakness was documented by 3 significance 1 PRs and caused the disproportionate spike on the significant personnel error rate trend.

Another indicator trended at Pilgrim Station is the human performance ratio (HPR). The HPR is a potential leading indicator that compares the number of significant human performance PRs to the total number of human performance PRs each month. Also trended on the same graph is the rolling average of monthly HPRs. In December, the Pilgrim Station HPR rolling average decreased for the sixth consecutive month even though the monthly HPR increased over the previous month's HPR because of the 3 PRs issued on the lifted lead and jumper log. The LER rate, a lagging indicator, also favorably declined in December.

### **Integrated Corrective Action Plan**

#### ***Procedures Process Redesign***

The scope of this effort is to redesign and implement the process for developing, reviewing, and approving procedures. The new process will assure procedure revisions are produced in a timely manner, and it will require a minimum of resources to maintain. Goals of this project include:

- reduce the effort required to produce quality procedures
- improve the use of procedures in the work control process
- reduce the cycle time for the development of new and modified procedures
- improve the quality of procedures

A multi-functional breakout team will be assigned to identify required process changes, implement the new process, and train on it by the end of September 1997.

The Plant Manager will provide training on a periodic basis to reinforce management expectations on procedural adherence. The first of these sessions will be held prior to commencing our February refueling outage.

#### ***MOP/NOP Revisions***

A top down review of the MOPs, NOPs, and administrative procedures was completed. We will integrate into lower tier implementing procedures many of the higher level policies currently contained in MOPs with the expectation that a clearer tie between policies and implementing procedures will be provided. The remaining policies will be consolidated into a single NOP on policies.

Also, NOPs will be reviewed to ensure these high level procedures clearly reflect high management standards for safety, compliance, error avoidance and prevention. Also, some NOPs may be more effectively implemented as lower tier procedures. The NOPs will be revised as necessary to achieve

this objective. A further benefit of consolidating higher tier procedures into lower tier documents will be the ease with which process changes can be made. By consolidating procedures, fewer procedures will be affected when a policy revision is required. MOP and NOP revisions will be completed by the end of June 1997.

The lower tier station administrative procedures have been reviewed. Planned changes to these procedures will continue through 1997. Priority will be given to making the NOP changes to ensure that management expectations are first captured in the NOPs.

### ***Other Procedure Changes***

A plan to integrate deficiency reports (DRs) and nonconformance reports (NCRs) from the quality assurance audit process into the PR process will provide the ability to more consistently capture data and trend human error performance. This effort requires submittal of a change to the Boston Edison Quality Assurance Manual for NRC review and approval. The proposed submittal is planned for completion by the end of September 1997. Once implemented, the changes will improve the quality and value of our trend reports.

### ***Modification Process Redesign***

Changes to NESG Procedure 3.02, "Preparation, Review, Verification, Approval, and Revision of Design Documents for Plant Design Changes" and other station procedures are being developed to incorporate the modification team concept, streamline the process, consolidate forms/paperwork, and simplify the close-out process. The conceptual solution to each of these items has been agreed upon, and the details are currently under development.

To ease the process of assimilating the planned changes, they will be introduced to the organization in two phases. The first phase incorporates a more streamlined modification close-out process. This change will become effective following training prior to commencing our February outage. Rather than attempt the implementation of all changes to the modification process so close to our February refueling outage, we decided to wait until the end of the outage before implementing the second phase (i.e., design portion of the modification process). Implementation of these changes will be completed by the end of September 1997.

### ***Training***

Additional initial RCA training classes will be conducted as appropriate. We will also complete initial training for the remaining managers and supervisors in methods for human error prevention and identification. We will complete initial human error prevention training for our work force after completion of refueling outage #11. All these training activities are scheduled for completion by the end of September 1997. Also, RCA refresher training will be incorporated into our continued training program.

### **Date When Full Compliance Will Be Achieved**

We will complete implementation of the plan including process changes and training by the end of 1997.