U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-293/94-03

Docket No. 50-293

License No. DPR-35

Licensee: Boston Edison Company
RFD #1 Rocky Hill Road
Plymouth, Massachusetts 02360-5599

Facility Name: Pilgrim Nuclear Power Station

Inspection At: Plymouth, Massachusetts

Inspection Conducted: January 31 through February 4, 1994

Inspector: T J Bores for 2/18/94
J. Noggle, Senior Radiation Specialist Date
Facilities Radiation Protection Section

Approved by: Robert J Bores 2/18/94
R. Bores, Chief, Facilities Date
Radiation Protection Section

Areas Inspected: Areas covered in this inspection included a review of: audits and surveillances, training and qualifications, radiological problem reports, and external exposure control programs.

Results: The licensee has installed a new computer system for controlling personnel access at the radiological controlled area. Personnel access lists have been added to the radiation work permits (RWPs) that now limit unauthorized personnel from using the wrong RWP. Additional briefing requirements have been imposed on personnel utilizing general RWPs, which previously did not require any HP staff interface. These are good control measures that strengthen the licensee's radiological controls program. The station problem report program continued to effectively identify station problems. One weakness was noted in that the problem report program threshold may be too high to identify, for thorough review and resolution, some significant radiological safety issues. No safety concerns or violations of NRC regulatory requirements were noted in this report.

DETAILS

1.0 Individuals Contacted

1.1 Boston Edison Company

* E. T. Boulette, Senior Vice President - Nuclear
* J. Calfa, Senior Compliance Engineer
* R. Fairbank, Regulatory Affairs and Emergency Preparedness Department Manager
* F. Famulari, Quality Assurance Department Manager
* P. Hamilton, Licensing Division Manager
* E. Kraft, Jr., Vice President - Nuclear Operations
* W. Mauro, Radiological Section Manager (acting)
* L. Olivier, Nuclear Services Department Manager
* R. O'Neill, Technical Programs Division Manager
* W. Rothert, General Manager, Technical
* L. Schmeling, Plant Manager
* L. Wetherell, Radiological Section Manager

1.2 USNRC Personnel

* R. Bores, Chief, Facilities Radiation Protection Section
* D. Kern, Resident Inspector
* J. MacDonald, Senior Resident Inspector

* Denotes attendance at the exit meeting on February 4, 1994.

2.0 Purpose

This inspection was an announced safety inspection of the Pilgrim Nuclear Power Station radiation control programs.

3.0 Previously Identified Items

3.1 (Closed) Inspector Followup Item (50-293/93-16-01)

The licensee discussed plans to implement a new automated exposure control system at Pilgrim Station by January 1994. The new computer software was to restrict radiation work permit (RWP) use to only authorized users. The licensee stated that this would help prevent the incorrect use of RWPs by unauthorized individuals.

The inspector reviewed implementation of the new PRORAD computer program developed by Science Applications International Corporation (SAIC). PRORAD is used as a real-time dosimetry and access control system. The inspector observed the radiation work permit (RWP) controls, noting that for all general and specific RWPs (except for the dose tracker and general entry RWP) an access list was required with

at least a daily briefing by HP staff. This new system will help minimize the use of RWPs by unauthorized individuals. This item is closed.

3.2 (Closed) IFI (50-293/93-16-02)

Procedure 6.1-022 provided the work supervisor RWP responsibilities. The licensee agreed to clarify the work supervisor's responsibilities by excluding from those responsibilities the authority to perform the formal radiological briefings.

The inspector reviewed Procedure 6.1-031, Rev. 1 (Procedure 6.1-022 was renumbered) and noted under Section 8.1.4 that the work supervisor is to ensure workers are cognizant of the work scope, however work briefings are not in lieu of the RP briefing by a qualified RP technician, if required. This item is closed.

3.3 (Closed) IFI (50-293/93-16-03)

Procedure 1.3.106 described the alarming pocket dosimeter alarms and the required responses to each. The licensee agreed to clarify the language in Section 5.3 of this procedure to provide for unambiguous interpretation of alarm response required by the procedure.

The inspector reviewed Procedure 1.3.114 (Procedure 1.3.106 was renumbered) and noted that specific instructions were provided for alarm conditions of the electronic dosimeters. Remaining in an area under a constant alarming condition is now prohibited under this procedure. This item is closed.

3.4 (Closed) Unresolved Item (50-293/93-16-04)

The inspector had requested training qualification records on six randomly selected HP technicians. The licensee was not able to provide the requested records before the end of the previous inspection due to record retrieval difficulties.

The inspector reviewed the subject six HP technician training records and found them satisfactory. This item is closed.

3.5 (Closed) Violation (50-293/93-16-05)

On April 30, 1993, a refueling floor incident occurred in which three workers received measurable intakes of radioactive material while packaging highly contaminated main steam line plugs. At the time of the incident, the main steam line plugs had not been surveyed to determine the radiological hazard to the workers. Subsequent to the event, the licensee determined that the plugs had contamination levels of 5 mrad/hr/100 cm^2 smearable and a total contamination level of 30 mrem/hr measured at contact with the plugs. Had the main steam line plugs been surveyed

prior to the job, appropriate safety precautions could have been prescribed on a specific RWP and an unplanned internal exposure event could have been prevented. This was a violation of 10 CFR 20.201(b), failure to survey, pursuant to 10 CFR 20.103.

The NRC reviewed a December 24, 1993 response letter to the Notice of Violation in which the licensee specified the corrective actions for the event of April 30, 1993. The licensee identified personnel error as the direct cause of the event. The corrective actions taken included: a survey of the main steam line plugs; a requirement for respiratory protection to complete the task; counseling of all involved individuals; the use of radio headphones was established between the control point HP technician and the roving HP technician on the refueling floor; and incorporation of the incident into the continuing HP training program and the training for contractor HP personnel. The inspector reviewed the corrective actions during the inspection and found them satisfactory for this event. One remaining concern involved the scope of review by the licensee. The problem report review was narrowly focused. The problem report classified this event as a level 2, which did not require a formal root cause analysis, but required only a direct cause determination with associated corrective actions. The establishment of a direct cause did not ensure other contributing causes would be investigated and corrected. This issue was investigated during this inspection and was successfully resolved and is discussed in Section 6.0 below. The violation is closed.

3.6 (Closed) IFI (50-293/93-16-06)

The inspector determined that the operating technician was not properly trained to correctly operate the high-purity intrinsic-germanium body counter. The licensee indicated that the training program was good, but not timely, as HP technicians were rotated through a temporary duty in the whole body count room without a whole body counter operation training refresher prior to accepting the responsibility for performing bioassay measurements. The licensee agreed to review these practices and provide for the current whole body counter operator training inadequacies.

The long-term corrective action plan involves establishing a permanent position for the whole body counter operator. The licensee had entered into discussions with the appropriate union representatives to establish permanent positions for personnel assigned to various HP support functions including the whole body counter operator. During this inspection, the licensee developed a whole body counter operator training refresher checklist to be used as an on the job training signoff. In addition, during this inspection, Procedure 6.4-005 was amended to indicate that personnel shall not operate the whole body chair counter without RP supervision, unless authorized in writing by the RP Supervisor-Respiratory Protection, and additional instruction was provided regarding proper germanium crystal cooldown time prior to applying voltage to the detector. A standing order (used to communicate a change of policy to affected

personnel) was issued on February 2, 1994, restricting unqualified personnel from operating the whole body chair counter. This item is closed.

4.0 Audits and Surveillances

The January 1993 Institute for Nuclear Power Operations Pilgrim audit was reviewed. This audit identified weaknesses in workers' contamination control practices and observed an incorrect RWP was used during a primary system breach. Strengths mentioned included the expanded use of closed-circuit television surveillance and robotics to reduce personnel exposures.

The inspector reviewed sixteen surveillances that had been performed since the last NRC HP inspection of September 3, 1993. A variety of technical HP areas were reviewed, which included: tool control, radiological postings, RWP controls, respiratory protection equipment issue, air sampling, HP instrument control, personnel frisking, hot spot control, and TLD quality assurance. The surveillances typically measured a few defined procedural objectives. In general the surveillance reports reflected favorably on the program elements measured. Areas for continued emphasis included: personnel frisking, respirator inspections, and hot spot documentation. Overall, the audits and surveillances reviewed demonstrated effective oversight and assessment of the radiation protection program.

5.0 Training and Qualifications

As discussed in Section 3.4 above, the inspector completed the review of six randomly selected HP technicians and verified the qualification to station procedures. The licensee is currently pursuing a requalification program for HP technicians. This is viewed as a good initiative.

During the previous two HP inspections[1] the licensee's corrective action program, known as problem reports, listed training as a corrective action recommendation for several radiological incidents. The licensee has developed an advanced radiation worker training course in response. This two-day course was scheduled to be presented during annual station requalification training (the seven-week period between January 17th and March 4, 1994). The inspector reviewed this training course while training was in progress and discussed the course material with the instructors and students. The advanced radiation worker training course was practically oriented, giving station personnel opportunities to reverse roles with HP technicians, evaluate radiological areas for poor practices, and participate in a multi-disciplined radiological work scenario. The instructors and students appeared to be

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[1] Inspection Reports 50-293/93-10 and 50-293/93-16

enthusiastic about the training. The inspector will review subsequent problem reports to determine the effectiveness of the training in a future inspection.

6.0 Problem Reports

The inspector reviewed the problem report process through discussions with the licensee, attendance at a problem assessment committee meeting, and through the review of problem report documents. The problem report process was a strong program that quickly reviewed licensee-identified concerns for immediate actions and set a priority level based on significance of the problem. For the highest priority, level I problems, a formal root cause analysis was required and all contributing causes were identified, requiring corrective actions for each. For level II and level III problems, a direct cause of the problem was identified and corrective actions that affect the direct cause were assigned. Other than for multiple repeat occurrences, the radiological incidents have been typically assigned to the level II or III category with the result of occasionally limited scope of corrective actions taken by the licensee.

Problem reports for the period September 1993 through January 1994 were reviewed. There were three significant radiological problem reports; two of which involved personnel who continued to work after receiving dose alarms on their electronic dosimeters. In both of these cases the dosimeter alarm could not be heard because the workers were in high noise areas of the plant. The HP section is currently reviewing alternatives for improving dosimeter alarm personnel alerting performance in high noise areas. A third problem report (93.0735) documented a November 17, 1993 incident in which the air balance in the RWCU holding pumps room was positive with respect to the reactor building, blowing air out of the room in spite of operating a portable HEPA unit installed inside the room designed to cause a negative ventilation air balance. The "open" problem report stated that an air sample of 0.94 MPC indicated that unexpected internal intakes of >10 MPC-hours and <35 MPC-hours had occurred. The licensee determined that the direct cause of the positive air balance was that the door to the room was left open to allow necessary hoses and electrical cables into the room and the small HEPA ventilation unit was not large enough to counteract the airflow out of the doorway. At the time of the inspection, the licensee was working to install a ventilation port through the wall of the room to enable the use of a larger HEPA unit to be installed.

The first two dosimeter-related problem reports were rated by the licensee as level I problems and a formal root cause analysis had been performed and solutions to the problem were being resolved to prevent future occurrences. The third problem report was rated by the licensee as a level II problem, requiring a direct cause determination which, in this case, was a larger than anticipated positive air flow from the room when the door was left open. The resulting corrective actions addressed the particular direct cause, however, only this one room has been considered in the licensee's review. The reactor building ventilation system provides a significant air draft that

may affect other room ventilation requirements in a similar fashion. Corrective actions to prevent a similar incident involving other rooms were not addressed by the problem report review process.

The inspector reviewed the problem report program with regard to the narrowness of review, as was also discussed in regard to close-out of the latest violation as described in Section 3.5 and in the paragraph above. Specifically, the licensee's review of the radiological incident was limited to the establishment of a direct cause and the corrective actions associated within the scope of the defined cause.

The inspector reviewed with the licensee the NRC enforcement policies (10 CFR 2, Appendix C) which allow the exercise of discretion for licensee self-identification of violations that are resolved and do not represent a repeat occurrence. When a licensee-identified problem report is properly closed and a violation of NRC requirements has occurred, then NRC may exercise its discretion in determining whether to issue a citation. If a repeat incident occurs, even though the licensee's problem report process may pick it up and escalate the problem to a level I or II and perform a root cause analysis, according to the NRC enforcement policy, a repeat occurrence of a violation results in the issuance of a citation.

The licensee's process for handling level I problems was found adequate for ensuring that repeat occurrences of these incidents would be unlikely. The licensee stated that the thresholds for categorizing the level of problem in the corrective action system would be reevaluated with regard to radiological incidents that involved unplanned or uncontrolled exposures. This commitment satisfied the inspector that safety significant radiological events would be provided with the appropriate level of review and corrective action.

7.0 External Exposure Controls

7.1 Automatic Access Control System

The inspector reviewed the basic functions of the new PRORAD RWP and dosimetry access control system with the licensee. The new access control system provides many new control features as compared to the previous manual method. Specific access lists and training completion can now be automatically used as bases for permitting personnel access to radiologically controlled areas. To further restrict access, specific RWPs may be put "on hold" after each shift, requiring the notification of active work assignment and appropriate turnover to the responsible HP supervision and technicians prior to reactivation of the RWPs. The electronic dosimeters have also been changed. The new PRORAD system utilizes the PD-1 electronic dosimeter as an integral part of the system. This self-indicating dosimeter

provides a dose rate and an accumulated dose alarm as the previous ALNOR dosimeter. The new PRORAD system began operation on January 1, 1994, and according to the licensee, station implementation has gone smoothly. The system provides for increased RWP control and automatic access to dose records and is viewed as a very good program enhancement.

7.2 Radiological Postings

Through tours of the station, the inspector made the following observations. The radiological work areas were posted as required. General area dose rates were often posted in areas of elevated dose rates and there were several "Do Not Loiter" signs in several of these areas. Low dose waiting area rubber mats were also found in various plant floor locations. The TIP room and the drywell were posted as very high radiation areas. No posting discrepancies were noted.

7.3 Surveys

The inspector reviewed the current list of required radiation survey routines. The routine frequency of surveys was reasonable with respect to worker safety and the control of radioactive material. The inspector reviewed all of the station surveys performed during January 1994. The surveys were generally of good quality, although very few surveys contained any alpha measurements of smears and no beta radiation measurements were found. This finding is not very significant considering the plant was in an operating mode and most of the surveys involved clean areas of the plant and general walkway areas.

One of the routine January air samples was taken in the HPCI room and indicated 1.4 E-8 uCi/cc, or 0.02 DAC, as determined by gamma spectroscopy analysis of a particulate air sample. There were 15 unknown gamma energy peaks listed at the end of the analysis report. These peaks represented approximately 30% of the total counts measured on the sample and these peaks were not reflected in the final activity or DAC determination. The RP Supervisor-Respiratory Protection, explained that a new gamma spectroscopy system was brought on line in December of 1993 and further refinements in the radioisotope library were continuing to be made. The air sampling analytical procedure requires that any air sample report indicating $\geq$ 0.3 DAC be reviewed by the HP Supervisor-Respiratory Protection with the expectation that any unknown gamma energy peaks would be identified and recalculations made to accurately reflect the activity of the sample. The inspector will review air sample records in a future inspection to determine if accurate and complete analyses have been made.

The inspector reviewed the licensee's HP instrument response check and issue facility. The licensee properly performed a response check on three scales of a survey instrument utilizing a cesium-137 source. Appropriate source locking and postings

were provided for this facility. The inspector reviewed the active HP instrument issue log and determined that the licensee maintained an accurate issue log of portable radiological survey instruments and exercised appropriate controls.

7.4 Procedures

The following HP procedures were reviewed during this inspection.

6.1-001, Rev. 0, "Radiological Protection Procedure Training"
6.1-014, Rev. 0, "High Radiation Area Control"
6.1-018, Rev. 2, "Radioactive Hot Spot Control Program"
6.1-025, Rev. 0, "Radiological Posting"
6.1-031, Rev. 1, "Radiation Work Permits"
6.1-032, Rev. 0, "Hot Particle Contamination Control Program"
6.1-213, Rev. 0, "Radiological Controls of Vehicles and Materials"
6.2-020, Rev. 0, "Assessment of Intakes of Radioactive Material"
6.2-021, Rev. 0, "Personnel Monitoring Program Evaluation"
6.3-061, Rev. 0, "Radiological Survey Techniques"
6.4-019, Rev. 0, "Operation of Lapel Air Samplers"
6.4-024, Rev. 0, "Operation of the Nuclear Enterprises Small Article Monitor Model 10-90"
6.5-022, Rev. 0, "Calibration of SAIC PD-1"
6.6-114, Rev. 6, "Issue and Control of Radiation Protection Survey Instruments"

All procedures reviewed contained sound methods and reflected the new 10 CFR 20 requirements.

9.0 Exit Meeting

The inspector met with licensee representatives at the end of the inspection, on February 4, 1994. The inspector reported the inspection results and the licensee acknowledged the inspection findings.