

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-293/84-25

Docket No. 50-293

License No. DPR-35 Priority -- Category C

Licensee: Boston Edison Company M/C Nuclear
25 Braintree Hill Office Park
Braintree, Massachusetts 02184

Facility Name: Pilgrim Nuclear Power Station

Inspection At: Plymouth, Massachusetts

Inspection Conducted: August 6-10, and 24, 1984

Inspectors: R. L. Nimitz
R. L. Nimitz, Senior Radiation
Specialist

9/17/84
date

R. L. Nimitz for
R. T. Hogan, Radiation Specialist

9/17/84
date

Approved by: W. J. Pasciak
W. J. Pasciak, Chief, BWR
Radiation Safety Section

9/17/84
date

Inspection Summary: Inspection on August 6-10, 1984 (Report No. 50-293/84-25)

Areas Inspected: Special unannounced (August 6-10, 1984) and special announced (August 24, 1984) inspection of licensee Radiation Protection Program. Areas inspected included follow-up on allegations concerning workers acquiring unnecessary exposure; licensee corrective action for previously identified violations; licensee implementation of corrective action in Confirmatory Action Letter 84-03; external exposure control; internal exposure control; ALARA program, and unplanned extremity exposure of a worker on August 18, 1984. The inspection involved 84 hours on-site by two regionally based inspectors. This report also details a Management Meeting held in NRC Region I on September 5, 1984. This meeting was attended by NRC and licensee management and lasted approximately 3 hours.

Results: Three apparent violations and one Deviation were identified (failure to perform radiation surveys as required by 10 CFR 20.201, paragraph 9.4; failure to instruct workers per 10 CFR 19.12, paragraph 9.4; failure to use ORC approved procedures as required by T.S. 6.8; Deviation - failure to adhere to recommendations of Regulatory Guide 8.8, paragraph 9.4).

DETAILS1. Persons Contacted1.1 Boston Edison Company

- 1) J. F. Crowder, Senior Compliance Engineer
- E. Graham, Compliance Group Leader
- 1) J. D. Keyes, Regulatory Affairs and Projects Group Leader
- 1) P. E. Mastrangelo, Chief Operations Engineer (Acting Station Manager)
- 3) 2) 1) A. L. Oxsen, Vice President - Nuclear Operations
- 3) 1) A. R. Trudeau, Chief Radiological Engineer
- 3) W. D. Harrington, Senior Vice President, Nuclear
- 2) W. Hoey, Radiological Engineer
- 2) B. Eldridge, Radiation Protection Supervisor
- 3) 2) C. Mathis, Station Manager

1.2 Nuclear Regulatory Commission

- 3) 2) 1) J. R. Johnson, Senior Resident Inspector
- 3) 1) W. J. Pasciak, Chief, BWR Radiation Safety Section
- 3) L. Tripp, Chief, Reactor Projects Section 3A
- 3) T. T. Martin, Director, Division of Engineering and Technical Programs
- 3) R. W. Starostecki, Director, Division of Projects and Resident Programs
- 3) R. R. Bellamy, Chief, Radiological Protection Branch
- 3) G. Meyer, Project Engineer
- 3) J. M. Allan, Deputy Regional Administrator
- 3) E. C. Wenzinger, Chief, Projects Branch 3
- 3) J. R. White, Senior Radiation Specialist
- 2) M. McBride, Resident Inspector

1) Denotes those individuals attending the exit interview on August 10, 1984.

2) Denotes those individuals attending the exit interview on August 24, 1984.

3) Denotes those individuals attending the Management Meeting in the NRC Region I on September 5, 1984.

The inspector also contacted other individuals.

2. Purpose of Inspection

The purpose of this safety inspection was to review the following:

August 6-10, 1984

- Licensee implementation of corrective actions for violations identified during NRC Region I Inspection No. 5U-293/84-03

- Licensee implementation of commitments documented in a January 25, 1984 NRC letter (CAL No. 84-03) to the licensee
- External Exposure Controls
- Internal Exposure Controls
- ALARA
- Circumstances surrounding two allegations dealing with radiation protection and safety matters

August 24, 1984

- Circumstances and licensee correction action following August 18, 1984 unplanned extremity exposure of worker disassembling control rod drives.

In addition, this report summarizes the NRC Region I requested meeting held in NRC Region I on September 5, 1984 with licensee management.

3. Follow-up of Corrective Actions for Violation Identified During Inspection 50-293/84-03 (Control Rod Drive Disassembly Incident)

3.1 (Open) Violation (50-293/84-03-03)

Licensee failed to label or attend containers of radioactive materials consistent with the requirements of 10 CFR 20.203(f). The inspector examined licensee corrective actions for this item with respect to the corrective actions described in a May 17, 1984 letter to NRC Region I. The licensee's performance in implementing the specified corrective actions was based on the following:

- Examination of radiation protection procedure changes and/or other applicable documentation initiated in response to the violation.
- Examination of personnel training records to ensure applicable personnel had been trained in the procedure changes and/or other appropriate documentation.
- Examination of on-going work and radiation work permits and
- Discussions with cognizant licensee and contractor personnel.

The review of licensee implementation of corrective actions identified the following deficiencies:

- The licensee issued a memorandum on February 11, 1984 which discussed improvement in documentation of radiation surveys, maintenance of radiation work permit packages, communicating radiological status of work to oncoming personnel, and disciplinary actions for nonconformance. Inspector review found that the licensee was unable to demonstrate that all appropriate personnel had received the memorandum and that they were cognizant of it.

The licensee immediately reissued the memorandum, with a sign-off sheet, to those individuals (licensee technicians) who had not acknowledged receipt and cognizance of the memorandum.

- The licensee revised procedure 6.1-022, "Radiation Work Permits", on May 4, 1984 to provide more specific guidance for establishing positive control for work in high radiation areas, and subsequently issued a memorandum on May 12, 1984 to radiation protection supervisory personnel regarding the changes to be made to the procedure. However, the licensee: 1) did not ensure that all appropriate radiation protection technicians were cognizant of the revision to the procedure and; 2) did not ensure that all radiation protection supervisory personnel were cognizant of the clarification memorandum. In addition, inspector review indicated the procedure did not contain guidance as to where to place the surveillance requirements while the memorandum stated that surveillance requirements are to be placed in the remarks section. As a result, the high radiation area surveillance requirements could be confused with survey frequency requirements which are specified in a separate location on the radiation work permit.

Review of a revised radiation work permit (RWP) issued June 22, 1984 and used for controlling work in the control rod drive disassembly room indicated no specific high radiation area surveillance requirements (e.g. constant coverage) were entered on the RWP consistent with the guidance in the memorandum. The permit only presented survey frequency. This matter was brought to the attention of licensee representatives. The subject RWP was immediately revised to describe appropriate high radiation area surveillance requirements.

The licensee should revise the radiation work permit procedure to provide guidance to clearly indicate survey frequency versus high radiation area surveillance requirements.

Inspector review of the licensee's training program identified that the licensee had established a mechanism to notify personnel of procedure changes. However, the mechanism was informal and the tracking and follow-up of personnel not signing to indicate their understanding of the procedure changes was not performed in a diligent manner. The inspector noted that although

the revision to the radiation work permit procedure (discussed above) affected radiation protection technicians, it was not brought to their attention. Further, the licensee was temporarily upgrading technicians to supervisors but no provisions had been made to inform these temporary supervisors of previously issued memoranda. This matter was brought to the licensee's attention. The licensee immediately initiated action to bring the revised procedure to the attention of appropriate radiation protection technicians and to the attention of applicable supervisory personnel.

The inspector discussed this matter with licensee representatives in a August 16, 1984 telephone conversation. Licensee representatives indicated that the training of supervisory personnel in the memorandum had been completed on August 13, 1984, and that this memorandum had been forwarded to the Training Department for inclusion in future supervisor training programs. Regarding training of technicians in the revision to the RWP procedure, the licensee indicated that all appropriate technicians would be instructed in the procedure revision by August 31, 1984.

The licensee also revised procedure No. 6.1-024, "Radiological Posting of Areas of the Station", to provide additional guidance for control of radioactive material. Review of personnel training in this procedure change indicated the following:

1. As of August 9, 1984, the licensee's documentation of individuals who had read and were cognizant of the procedure change indicated that about 20% of the licensee's technicians had not read this change.

The licensee immediately initiated action to bring this change to the attention of these remaining technicians. Based on the referenced August 16, 1984, telephone conversation, this was to be completed by August 31, 1984.

2. The procedure did not incorporate sufficient guidance to ensure compliance with 10 CFR 20.203(f) in that it did not discuss generation and maintenance of written records for radioactive material containers that are only accessible to persons authorized to handle or use them (exemption 20.203(f)(3)(vi)).

This matter was brought to the attention of the licensee representatives.

In summary, the inspector found that as a result of the above training program deficiencies, a radiation protection technician who had been upgraded to a supervisor issued an RWP essentially the same as that

which was in place at the time of the January 18, 1984 incident. The upgraded technician was not provided a high radiation area surveillance clarification memorandum and did not specify high radiation area surveillance requirements on the RWP consistent with the memorandum.

The following matter remains open and will be reviewed during a subsequent inspection:

- Licensee training of radiation protection technicians and supervisors in the procedure changes and memoranda issued as a result of the January 18, 1984 event (50-293/84-03-03).

In addition, the following matter is unresolved and will be reviewed during a subsequent inspection:

- Licensee establishment and implementation of a program to train radiation protection technicians in new procedures, and procedure changes (50-293/84-25-01).

3.2 (Closed) Violation (50-293/84-03-04)

Licensee failed to provide extremity dosimetry as required by 10 CFR 20.202. The inspector examined licensee corrective actions for this item with respect to the corrective actions described in a May 17, 1984 letter to NRC Region I. The licensee revised procedure 6.3-060, "Radiation Survey Techniques", on April 17, 1984 to provide additional guidance regarding quantification of radiation dose rates emanating from small sources. The licensee also issued a memorandum to all radiation protection personnel on February 17, 1984, which described errors associated with measuring the dose rates from small sources. This memorandum was transmitted to the Training Department for inclusion in future radiation protection technician training programs. The licensee was unable to demonstrate that all radiation protection personnel had received and were cognizant of the procedure revision and/or memorandum. The licensee reissued the memorandum and requested that personnel signify their receipt and cognizance of the memorandum by signing a sign-off sheet. The licensee's completion of the matter will be reviewed in conjunction with final review of Item 50-293/84-03-03 (See Section 3.1 of this report).

3.3 (Closed) Violation (50-293/84-03-02)

Licensee failed to instruct workers as required by 10 CFR 19.12. The inspector examined licensee corrective action for this item with respect to the corrective actions described in a May 17, 1984 letter to NRC Region I. The licensee revised procedure 6.1-022, "Radiation Work Permit", on May 4, 1984 to provide more specific guidance for establishing positive control for work in high radiation areas. The licensee also issued a memorandum to radiation protection supervisory

personnel regarding the changes to the procedure. However, as discussed in Section 3.1 of this report, the licensee was unable to demonstrate the applicable radiation protection personnel received the procedure change and/or memorandum and were cognizant of them. Inspector review indicated a number of personnel were unaware of the changes and/or memorandum. The licensee immediately initiated action to bring the change and/or memorandum to the attention of cognizant personnel as described in Section 3.1 of this report.

The licensee's action on this matter will be reviewed in conjunction with final review of Item 50-293/84-03-03 (See Section 3.1 of this report).

4. Confirmatory Action Letter Follow-up

The inspector reviewed licensee implementation of corrective actions documented in a January 25, 1984 NRC letter (CAL No. 84-03) to the licensee. This letter dealt with licensee actions to be taken following a January 18, 1984 unplanned extremity exposure of an individual.

The licensee's corrective actions to be taken and the status of these actions are as follows:

Item 1

Prevent access of the individual who may have exceeded the regulatory limits for quarterly extremity radiation dose to radiation areas at Pilgrim until assignment of his personal exposure. Limit subsequent exposure accordingly.

The licensee restricted the individual from radiation areas on January 18, 1984. Radiation Protection Supervisory personnel incorrectly allowed the individual to enter radiation areas on January 20, 1984 under the misassumption that a proper extremity exposure evaluation had been performed. This error was identified on the same day. The individual was again restricted from radiation areas until February 7, 1984 when the dose evaluation was completed. Examination of this individual's exposure records for the period January 19, 1984 through February 7, 1984 indicated the individual sustained minimal exposure (~5 millirem). The results of the licensee's exposure evaluation indicated the individual need not be restricted further from radiation areas.

Based on the above, the item is closed.

Item 2

Establish and maintain positive health physics coverage for the work performed in the Control Rod Drive (CRD) repair room pending completion of the evaluation described in Item 4.

The licensee initiated constant health physics coverage for all entries into the Control Rod Drive Repair Room on January 19, 1984. This requirements was still in effect as of the time of this inspection. Inspector examination of the CRD log book entries for January 19, 1984 indicated constant coverage was initiated at that time.

Based on the above, the item is closed.

Note: Several deficiencies in the area of long term maintenance of positive health physics coverage for CRD Repair Room work were identified. These are discussed in Section 3 of this report.

Item 3

Evaluate, by January 31, 1984, the actions of all workers who may have entered the CRD repair room on the 23 foot elevation of the Reactor Building between January 14 and 18. Assign resulting personnel exposure by February 15, 1984 and implement personnel exposure restrictions, as necessary, to comply with 10 CFR 20.101.

The licensee completed the evaluation of the actions of all workers who may have entered the CRD repair room between January 14 and 18, 1984 on January 27, 1984. The licensee assigned personnel exposure accordingly based on the evaluation. No personnel exposure restrictions were necessary. The licensee generated a questionnaire for this purpose. Inspector review of selected completed questionnaires did not identify any deficiencies.

Based on the above, this item is closed.

Item 4

Evaluate the health physics controls used for the work in the CRD repair room between January 14 and 18. Include in this evaluation, as a minimum: (a) the adequacy of the information provided to workers relative to the hazards associated with the radioactive material in the CRD repair room; and (b) the adequacy of the radiation surveys performed, the radiation work permit used, source controls, and the personnel dosimetry supplied to the workers involved.

The licensee evaluated the health physics controls provided for the work in the CRD repair room during the period January 14 through January 18, 1984. In response to Item 5 (see below) the licensee provided to the NRC a summary of the evaluation results in a letter dated February 15, 1984. The report provided a summary of the adequacy of: information provided to workers; radiation surveys performed; radiation work permit; source controls; and personnel dosimetry supplied. The summary included actions to correct identified deficiencies.

Regarding adequacy of information provided to workers, the licensee concluded that the information provided was adequate except for entries made on January 18, 1984. The licensee's failure to provide adequate information to workers on January 18, 1984 was the subject of NRC escalated enforcement action (See Section 3). The licensee implemented corrective action for this matter.

Regarding the adequacy of radiation surveys performed, the licensee concluded adequate surveys were performed and documented. However, the applicable surveys were not placed with the Radiation Work Permit. The licensee implemented corrective action for this matter.

Regarding the adequacy of the Radiation Work Permit (RWP) used, the licensee concluded that the RWP and the requirements that it imposed were adequate except that one improvement should be implemented. This improvement is the requirement for constant health physics coverage.

Based on the above review, the licensee addressed the items requested in the Confirmatory Action Letter.

Several deficiencies were identified with respect to the adequacy of revisions to procedures and training of personnel. These are discussed in Section 3 of this report.

This item is closed.

Item 5

Provide in writing the results of the evaluations identified above and any corrective actions determined to be necessary to the Regional Administrator by February 17, 1984.

The licensee provided a report of the results of the evaluation and the corrective actions determined to be necessary in a February 15, 1984 letter to the Regional Administrator.

This item is closed.

5. External Exposure Control

The following elements of the licensee's external exposure control program were reviewed:

- Performance, evaluation and documentation of radiation surveys
- Implementation of radiation and high radiation area posting and/or access controls
- Implementation and adequacy of the radiation work permit program

The review was with respect to criteria contained in the following:

- Technical Specification 6.11, "Radiation Protection Program"
- Technical Specification 6.13, "High Radiation Area"
- Procedure No. 6.3-060, Revision 5 "Radiation Survey Techniques",
- Procedure No. 6.1-022, Revision 13 "Radiation Work Permit"
- Procedure No. 6.1-024, Revision 5 "Radiological Posting of Areas of the Station"

The evaluation of the licensee's performance in this area was based on:

- Observations by the inspector
- Performance of independent radiation surveys by the inspector
- Review of documentation
- Discussions with cognizant licensee personnel

Within the scope of this review, the following matter requiring licensee attention was identified:

- Procedure No. 6.1-024, "Radiological Posting of Areas of the Station", did not address all criteria for posting of a Radiation Area. The procedure did not address posting of areas in which an individual could receive a dose of 100 millirem in any 5 consecutive days. This criterion could be applicable for office trailers positioned next to box trailers in which radioactive material was stored. Certain trailers produced dose rates of between 2-3 millirem/hour at about 2 feet from their sides. Licensee representatives indicated this matter would be reviewed.

The licensee's action on this matter will be reviewed during a subsequent inspection (50-293/84-25-02).

6. Internal Exposure Control Program

The following elements of the licensee's internal exposure control program were reviewed:

- Performance, evaluation, and documentation of airborne radioactivity surveys

- Bioassays
- Generation and maintenance of bioassay data
- Generation and transmittal of bioassay data upon worker termination.

The review was with respect to criteria contained in the following:

- Technical Specification 6.11, "Radiation Protection Program"
- 10 CFR 20, "Standards for Protection from Radiation"
- 10 CFR 19, "Instructions to Workers"

The evaluation of the licensee's performance in this area was based on:

- Inspector observation of on-going work
- Review of airborne radioactivity survey data
- discussions with cognizant licensee personnel.

Within the scope of the review, the following matters requiring licensee attention were identified:

- The licensee selected conservative beta-gamma MPC-hour exposure criteria to preclude exposure of personnel to airborne radioactivity in excess of 40 MPC-hours when exposure to airborne alpha radioactivity is included. However, the licensee's maintenance of personnel MPC-hour exposure tabulations was backlogged about 9 days. Consequently, the licensee could not ensure compliance with the 2 and 10 MPC-hour exposure maintenance of 10 CFR 20.103. The licensee immediately initiated action to prioritize and update personnel airborne radioactivity exposure tabulations.
- Examination of gross beta-gamma and gamma spectroscopy analyses of the same air sample indicated a potential for the presence of pure beta emitters (e.g. Sr-90). The licensee immediately initiated action to review the matter.
- Work groups entering the drywell were identified as not wearing lapel air samplers. The licensee's current practice is to provide each work group with a lapel air sampler and require that the work group remain together while in the drywell. The licensee immediately initiated action to correct the situation. The licensee also counseled the workers and foremen.
- Licensee procedures do not contain provisions for including airborne radioactivity intake measurements in worker termination reports.

Examination of whole body count data and personnel termination reports indicated that personnel who had sustained intake of radioactive material, although minor, had not been provided this exposure data. Licensee representatives indicated this matter would be reviewed and appropriate corrective action taken. This matter is unresolved.

Based on the above review, the following aspects of the licensee's internal exposure control program are open and will be reviewed during a subsequent inspection (50-293/84-25-03).

- Maintenance of airborne radioactivity exposure records
- Results of licensee review for the presence of Sr-90.
- Licensee inclusion of airborne radioactivity intake estimates with termination reports.

7. ALARA

The inspector reviewed selected aspects of the licensee's ALARA Program for the Recirculation Piping Replacement Project with respect to criteria contained in the following:

- Regulatory Guide 8.8, Revision 3, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Reasonably Achievable",
- Regulatory Guide 8.10, "Revision 1-R "Operating Philosophy for Maintaining Occupational Radiation Exposure As Low As Is Reasonably Achievable".

The licensee's performance in the area was based on:

- Review of on-going work
- Discussions with cognizant licensee personnel and
- Review of documentation

The licensee has made progress in the development of an ALARA program since this area was last reviewed. The licensee has improved the coordination of the ALARA program by reorganizing contractor ALARA supervisors under one Boston Edison ALARA engineer. This reorganization involved the assignment of a dedicated ALARA supervisor to the Exposure Management and Tracking System (EMTS). This indicates a commitment by management to the ALARA program. The EMTS is a computerized exposure tracking system which has been developed to provide weekly, monthly and cumulative radiation exposure data.

During the inspection, it was found that the licensee had no criteria for review of on-going work for purposes of comparing task man-rem estimates with actual man-rem obtained during the performance of the task. The licensee subsequently implemented computer generated notifications at 50%, 75%, and 100% of accumulated task exposure in ALARA Job Analysis.

The inspector discussed several areas where ALARA Program improvements could be made. These included:

- Obtaining a better description of tasks to be performed to allow more effective ALARA preplanning. The inspectors identified four workers in respirators being trained in the drywell for steam line valve lapping. The licensee was unaware of this matter and initiated a review.
- Quality Assurance personnel were needlessly testing control rod drives in a high radiation area for about a month. The licensee became aware of it when the Quality Assurance personnel were becoming concerned about approaching permissible administrative exposure limits. The licensee subsequently moved the testing to a generally lower radiation area. The licensee's radiation protection personnel had assumed that the testing was required to be performed in the high radiation area (Control Rod Drive Repair Room).
- Upgrade the review and use of previous ALARA experience at other utilities. Licensee representatives indicated a comprehensive review of ALARA measures for recirculation piping replacement had not been performed. The licensee rather was relying on the experiences of the piping replacement contractor.
- All appropriate (e.g. radiation workers) personnel were not aware of the licensee's Radiological Occurrence Report (ROR) system. The system could be used by workers to report ALARA problems or concerns.

The licensee's ALARA Program will be reviewed during future inspections.

8. Allegation Relating to Radiation and Industrial Safety

8.1 Allegation 1

On April 26, 1984 an individual contacted the NRC to express concerns regarding his receiving unnecessary exposure. The individual stated the personnel were required to remain in the reactor building even though they may be finished with their work.

Inspector review of this matter indicated that a memorandum was issued on January 6, 1984 to all outage personnel prohibiting loitering in process buildings and receiving unnecessary personnel radiation exposure. This memorandum was reissued on April 11, 1984 for incorporation into the new hire safety program.

During the inspection, the inspector made observations at various checkpoints, and dress-out locations during shift changes and break periods and discussed the contents of the memorandum with workers and supervisory personnel. The individuals contacted were generally knowledgeable in the requirements outlined in the memorandum. The inspector found no indication of personnel loitering in process buildings and receiving unnecessary radiation exposure.

On August 10, 1984, the licensee reissued the memorandum by attaching it to each individual's dosimetry.

Based on the above, the item is resolved.

8.2 Allegation 2

On May 2, 1984, an individual contacted the NRC to express concerns regarding poor ALARA practices and unsafe scaffolding in the drywell.

Regarding the poor ALARA practices, workers said that due to the unavailability or difficulty in locating proper welding leads and tools personnel were receiving unnecessary exposure.

During the inspection, the inspector toured the drywell and observed ongoing work including welding, grinding, and lapping operations. The inspector observations and discussions with workers did not identify any poor ALARA practices relating to the unavailability of or difficulty in locating proper tools or equipment.

Based on the above, this matter is resolved.

To further review this matter, the inspector discussed the worker's concern with licensee representatives regarding poor ALARA practices and questioned licensee representatives as to what mechanism was in place to allow workers to bring potential poor ALARA practices to the licensee's attention. Licensee representatives indicated that the Radiological Occurrence Report (ROR) is used for this purpose. Inspector review however, indicated that most workers questioned were unaware of the ROR or its purpose. Consequently, the inspector concluded that the ROR, as a tool to bring worker ALARA problems and concerns to the licensee's attention is ineffective. This matter was brought to the licensee's attention.

Regarding the individual's concern for unsafe scaffolding, this matter was brought to the licensee's attention on or about the time that the individual contacted the NRC. This matter was also brought to the attention of the Occupational Safety and Health Administration (OSHA). OSHA representatives met onsite with licensee representatives on July 26, 1984. On July 31, 1984 OSHA contacted NRC Region I and outlined a complaint received from the individual.

The inspector met with licensee safety representatives on August 9, 1984 and discussed this matter. The licensee's safety representatives indicated that a contracted safety inspector had been making a daily tour of the drywell since the start of the outage. Licensee safety representatives indicated a GE safety inspector tours the drywell three times per day since July 1984. The licensee's outage manager is provided a report of safety hazards and corrective actions identified the previous day.

The inspector review indicated that the reports provided were handwritten and not formalized. For example, no check list had been developed (per licensee representatives) as to what, as a minimum, was to be reviewed. Also, the licensee was unable to provide documentation showing close out of each of the workers safety concerns.

Based on the above, this item is open.

The NRC Senior Resident Inspector will complete the review of this item. (50-293/84-23-03)

9. August 18, 1984 Unplanned Extremity Exposure

9.1 General

On August 18, 1984, at about 1:30 p.m., a General Electric worker, disassembling Control Rod Drives (CRDs), in the CRD Repair Room, sustained an unplanned extremity exposure of about 1.1 rem. The licensee initiated a review of the event at about 3:00 p.m. on the same day. The licensee suspended all CRD work in the room at that time. The NRC was notified of this matter on August 20, 1984. An NRC radiation specialist was dispatched to the site on August 24, 1984, to review the unplanned exposure.

9.2 Description

On August 18, 1984, three Control Rod Drives (CRDs) were scheduled to be disassembled in the CRD Repair Room (See Figure 1). At about 9:00 a.m. several boilermakers entered the CRD storage room using RWP No. 84-1669 and transferred three drives from the storage room to the Decontamination Table in the CRD Repair Room. At about this same time, mill-wrights entered and removed the filters from the drives and moved the three drives to the CRD Flush Tank (See Figure 1). The boilermakers completed their work at about 9:30 a.m. and left the room. The mill-wrights completed the insertion of the drives into the flush tank at about 9:45 a.m. and also left the room. The CRDs were left to flush for about one hour.

At about 10:50 a.m. two G.E. technicians, (Individuals A and B), a G.E. Supervisor, (Individual C), and an Radiation Protection Technician, (Individual D), entered the CRD Repair Room to disassemble

drives. The individuals removed one drive from the flush tank, disassembled it, decontaminated it, placed the CRD parts in a parts bucket for inspection, and then moved the CRD to the East End of the CRD Repair Room for storage. During the work, the radiation protection technician monitored the disassembly of the CRD. The technician noted that the tool tray, at the spud end of the CRD measured about 600 millirem/hr at about 2 inches from the tray. Also, straps for CRD wrenches measured about 750 millirem/hr to 1000 millirem/hr. The technician surveyed the tool tray to identify highly radioactive point sources (known as chips) but did not find any.

The individuals removed a second drive from the flush tank and started to disassemble the drive. This job was terminated at about 12:00 noon because a G.E. Technician's, (Individual B), whole body dose was approaching his allowable administrative limit.

(Note: The radiation protection technician, (Individual D), notified his replacement, (Individual E), that the dose rates in the tool tray at the spud end of the CRD were reaching abnormally high levels. This notification was made prior to the next entry of Individual E into the CRD Repair Room.)

At about 1:30 p.m., on August 18, 1984, two G.E. technicians, (Individuals A and F), a G.E. Supervisor, (Individual C), and the replacement radiation protection technician, (Individual E), entered the CRD Repair Room to re-initiate CRD disassembly. The G.E. technicians and supervisor had been notified prior to their entry that the radiological conditions in the room were normal for three drives in various states of disassembly. The new radiation protection technician, (Individual E), was briefed by the morning shift technician, (Individual D), and informed that radiological conditions were normal except in the area of the tool tray located at the spud end of the CRD. The dose rate in this area averaged between 500 millirem/hr and 1000 millirem/hr.

Upon entry into the room in the afternoon, the two G.E. technicians went to the CRD flush tank area to complete the disassembly of the second drive. The G.E. Supervisor went to the East End of the CRD Repair Room to inspect CRD parts. The radiation protection technician, (Individual E), performed his routine room surveys in the area of the East End of the CRD Repair Room and set up to collect routine airborne radioactivity samples. The radiation protection technician, (Individual E), monitored the parts and buckets being inspected by the G.E. Supervisor, (Individual C).

The G.E. technicians, (Individuals A and F), completed disassembly of the second drive, placed the parts in a parts bucket, decontaminated the CRD, and moved it and the parts to the East End of the CRD Repair Room for inspection. The radiation protection technician did not perform surveys of these operations.

After movement of the second CRD, the G.E. technicians, (Individuals A and F) used a crane to pull the third CRD from the flush tank and prepare it for disassembly. As the CRD was removed from the flush tank, the radiation protection technician, (Individual E), commenced a survey of the CRD at the flange end and measured about 2000-3000 mr/hr on contact with the flange. The radiation protection technician, (Individual E), surveyed the CRD from the flange end toward the spud end.

As the radiation protection technician, (Individual E), neared the spud end of the CRD, he noted that the G.E. technician, (Individual A), had disassembled the major portion of the spud end of the CRD. The disassembly was estimated to have taken about 1 minute. The radiation protection technician, (Individual E), then surveyed the area of the tool tray at the spud end and found the dose rates to be between 500 millirem/hour and 700 millirem/hour. As the radiation protection technician, (Individual E), continued to survey the tool tray, he found that the CRD disassembly strap tools measured about 3000-4000 millirem/hour. As the radiation protection technician, (Individual E), continued to survey, he identified a chip like piece of metal measuring about 23,000 millirem/hour at $\frac{1}{2}$ inch. At this time the radiation protection technician, (Individual E), noted that both G.E. technicians were working at the flange end of the CRD and were away from the chip. The radiation protection technician, (Individual E), then walked passed the G.E. technicians, stepped down off the CRD flush tank grating and proceeded to the East End of the CRD Repair Room to inform the G.E. Supervisor, (Individual C), that a hot chip had been located. The G.E. supervisor, (Individual C), obtained a long handled tool and attached a piece of tape to the end of the tool in order to retrieve the piece without handling it. As the radiation protection technician, (Individual E), proceeded to the location of the chip, the radiation protection technician noted that the G.E. technicians (Individuals A and F) were now working at the location of the chip. The radiation protection technician yelled through his respirator to the G.E. technicians to get away from the area. The G.E. technician, (Individual A), did not understand and did not back away. The radiation protection technician, (Individual E), then surveyed the tool tray again, located the chip, and pointed at the chip with his survey meter. At this point, the G.E. supervisor, (Individual C), moved toward the chip in an attempt to retrieve it and dispose of it with a long handled tool. However, the G.E. technician, (Individual A), believed that, he was being directed to retrieve the piece and dispose of it. The G.E. technician, (Individual A), picked up the chip with his right hand and held it for about 3 seconds as he threw it off the tool tray. The radiation protection technician, (Individual E), attempted to locate the chip but could not find it. The radiation protection technician, (Individual E), directed the G.E. technician, (Individual A), who handled the chip to leave the

area. The radiation protection technician, (Individual E), then monitored the decontamination of the remaining drive by the G.E. technician, (Individual F), and the G.E. supervisor, (Individual C). This task lasted for about 5 minutes to 10 minutes after which the G.E. technician, G.E. supervisor, and radiation protection technician left the room (@ 2:30 p.m.).

The radiation protection technician, (Individual E), notified his supervisors at which point an investigation was initiated. The licensee suspended all work in the CRD Repair Room pending a review of this incident.

(Note: Although the radiation protection technician, (Individual E), measured 23 R/hr with a RO-2, on contact with the chip, a subsequent licensee evaluation indicated the chip measured about 1120 R/hr on contact. The G.E. technicians performing CRD disassembly work at the flush tank area were not provided extremity dosimetry.)

9.3 Licensee Plans for Re-Entry Into the CRD Repair Room

The inspector contacted licensee representatives via telephone on August 30, 1984, to determine the licensee's plans for re-initiation of work in the CRD Repair Room. Discussions with a member of the licensee's radiation protection staff indicated that CRD work was not planned to be re-initiated until the cause of the unplanned extremity exposure was determined and corrective action initiated. The licensee representative said that the CRD Repair Room would be entered for purposes of decontamination and to allow access to a cubicle located under a shield plug in the room.

Discussions with the licensee radiation protection representatives indicate the following radiological controls were to be implemented for the entry:

- All personnel entering the room would wear extremity dosimetry
- All personnel would be briefed on the above described incident prior to their work
- Workers will be instructed that prior to initial handling of material, the material is to be surveyed by a radiation protection technician
- Constant radiation protection coverage would be provided for each worker
- A special instruction will be established to provide guidance as to what actions will be taken following identification of a highly radioactive chip

- Radiation protection personnel will be instructed in the inadequacies of using radiation survey instruments to measure contact dose rates on point sources
- Special precautions will be taken to ensure unidentified chips are not left in mop buckets

The inspector contacted licensee representatives on September 6, 1984 to discuss the status of the decontamination. Licensee radiation protection representatives said that a total of 12 additional chips were found during the decontamination of the CRD Repair Room. Of these chips, 4 were found in the flush tank, 1 was found under the CRD flush tank grating, 5 were found in the spud end tool tray, and 2 were found in the flange end tool tray. These chips measured 15 R/hr to about 30 R/hr on contact with an RO-2 survey meter. Using the licensee's corrective factor of 40, the actual contact dose rate ranged from 600 R/hr to about 1200 R/hr.

9.4 Findings

Within the scope of the review, the following apparent violations were identified:

- 10 CFR 20.201(b) requires that licensee's make radiation surveys which are necessary to comply with the regulations in Part 20 and are reasonable under the circumstances to evaluate the extent of radiation hazards which may be present.
- 1) Contrary to the above, on August 18, 1984, radiation surveys, necessary and reasonable to ensure compliance with the dosimetry supply provision of 10 CFR 20.202 and the occupational exposure radiation limits of 10 CFR 20.101, were not made during disassembly of the spud end of a CRD. Although previous radiation surveys showed the area of the spud end exhibiting abnormally high radiation dose rates and previous experience showed that highly radioactive chips could become lodged in a CRD, radiation surveys were not performed during initial disassembly of the spud end. As a result, an individual unknowingly worked in the presence of a chip with a contact dose rate of about 1100 R/hr for a limited period of time prior to the chips discovery. (50-293/84-25-04)
 - 2) Contrary to the above, radiation surveys, necessary and reasonably under the circumstances to ensure compliance with 10 CFR 20.101 and 10 CFR 20.202, were not made in the Control Rod Drive Repair Room, in that as of August 18, 1984, and for an undetermined amount of time prior to this date, 12 highly radioactive chips were present in the room, were not identified, and their associated radiological hazards were not evaluated. The 12 chips, located in various areas of the room exhibited contact radiation dose rates of between about 600 R/hr to 1200 R/hr. (50-293/84-25-04)

- 10 CFR 19.12 requires in part that individuals working in or frequenting any portion of a restricted area be kept informed of the storage and use of radioactive materials or radiation and be instructed in precaution or procedures to minimize exposure.

Contrary to the above, on August 18, 1984 a worker disassembling the spud end of a control rod drive was not adequately instructed in precautions and procedures to minimize his exposure in that, due to the lack of effective communication on the part of a radiation protection technician monitoring the work, the worker picked up and disposed of by hand a radioactive chip with a contact dose rate of about 1100 R/hr on contact. As a result, the worker received an unplanned extremity exposure of about 1.1 rem. (50-293/84-25-05)

- Technical Specification 6.8, requires that written procedures be established, implemented and maintained that meet or exceed the requirements and recommendation of Appendix "A" of USNRC Regulatory Guide 1.33 and be reviewed by the ORC and approved by the ORC Chairman prior to implementation. Appendix "A" of Regulatory Guide 1.33 (1972) recommends that procedures for replacement and repair of Control Rod Drives be established.

Contrary to the above, on August 18, 1984, and for an undetermined amount of time prior to this date, procedures not reviewed by the ORC and approved by the ORC Chairman, were used for disassembly of Control Rod Drives in the CRD Repair Room. (This matter is discussed in section 10.3 of this report) (50-293/84-25-06)

Within the scope of this review, the following apparent Deviation was identified:

- 10 CFR 20.1(c) states in part, "Persons engaged in activities under licenses issued by the Nuclear Regulatory Commission ... should, in addition to complying with the requirements set forth in this part, make every reasonable effort to maintain radiation exposures ... as low as reasonably achievable." Regulatory Guide 8.8, "Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable", dated June 1978, states in part in Section C.3.b, "During operations in radiation areas, adequate supervision and radiation protection surveillance should be provided to ensure that the appropriate procedures are followed, that planned precautions are observed, and that all potential radiation hazards that might develop or that might be recognized during the operation area addressed in a timely and appropriate manner."

Contrary to the above, on August 18, 1984, and for an undetermined period of time prior to this date, workers disassembling control rod drives in the CRD Repair Room, routinely used tools

with recognized contact radiation dose rates up to 1000 millirem/hour and no timely and appropriate actions was taken by radiation protection personnel to preclude unnecessary exposure of personnel using the tools. (50-293/84-25-07)

10. Management Meeting

10.1 Introduction

A Management Meeting was held at the request of NRC Region I on September 5, 1984. The conference with licensee representatives was held to discuss Radiological Controls Program deficiencies identified during this inspection (Inspection No. 50-293/84-25). The discussions at this conference focused on the identified deficiencies, their significance, cause, and licensee corrective actions thereof.

10.2 Discussions

NRC personnel presented the apparent Radiological Controls Program deficiencies identified. The findings discussed were in the following areas:

- ALARA controls for CRD disassembly work including contamination controls.
- Maintenance procedures used for CRD disassembly.
- Communications
- Radiation work permits and radiation protection procedures used during CRD disassembly
- Instructions to workers following identification of highly radioactive chips during CRD disassembly
- Training provided to radiation protection personnel providing coverage of CRD disassembly work.
- Radioactive source identification and control
- Radiation survey instrumentation used including interpretation of results
- Extremity dosimetry
- Management Control and oversight of on-going CRD work

The licensee was asked to provide his perception of these findings, any additional qualifying information, and his corrective action.

10.3 Licensee Presentation

Licensee management presented their perception of the NRC findings. Licensee management stated that they believe that they have an adequately trained and qualified staff and organization to manage the Radiological Controls Program at Pilgrim Station. However, the licensee indicated the following actions will be taken:

- The currently combined chemistry and radiation protection organizations will be split into two separate organizations.
- A contractor has been hired to review NRC concerns identified and the Radiological Controls Organization at Pilgrim Station.
- Regarding further work in the CRD Repair Room, licensee management indicated the following actions will be taken prior to further CRD work in the room:
 - 1) All personnel performing CRD work in the Repair Room will be trained on a mock-up. This includes radiation protection personnel.
 - 2) A special instruction will be attached to the CRD disassembly RWP provide guidance as to what actions to take following identification of a highly radioactive chip.
 - 3) The CRD disassembly/repair procedure will be revised to include specific CRD radiation survey hold points and CRD repair room allowable contamination and dose rate criteria. The licensee will provide NRC Region I with a copy of this procedure for review.
 - 4) Additional radiation protection technicians will be used to monitor on-going activities.
- The licensee verified that all appropriate personnel have read and understood recent procedures and memorandums generated as a result of the previous unplanned extremity exposure in the CRD Repair Room.

Licensee management stated that the procedures used for the CRD work in the CRD Repair Room were General Electric procedures and that G.E. was apparently not using the station approved procedures for CRD disassembly work. Licensee management stated that the failure of personnel to use the proper procedure contributed to the less than adequate ALARA controls in the CRD Repair Room.

10.4 Concluding Statements

Licensee management concluded by stating that their planned actions should address NRC concerns.

NRC Region I management acknowledged the licensee's statements and indicated that the licensee would be informed of the enforcement action addressing the August 18, 1984 unplanned extremity exposure of a worker at a later date.

11. Exit Interview

The inspector met with licensee representatives (denoted in Section 1) on August 10, 1984 and August 24, 1984. The inspector summarized the purpose, scope and findings of the inspection. At no time during the inspection did the inspector provide written material to the licensee.