

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-249/91033(DRSS)

Docket No. 50-249

License No. DPR-25

Licensee: Commonwealth Edison Company

Facility Name: Dresden Nuclear Power Station, Unit 3

Inspection At: Dresden Site, Morris, IL

Inspection Conducted: October 15-25, 1991

Inspector:

M. A. Kunowski  
M. A. Kunowski  
Senior Radiation Specialist

11-8-91  
Date

Reviewed By:

M. C. Schumacher  
M. C. Schumacher, Chief  
Radiological Controls and  
Chemistry Section

11-8-91  
Date

Approved By:

L. Robert Greger  
L. Robert Greger, Chief  
Reactor Programs Branch

11-8-91  
Date

Inspection Summary

Inspection on October 15-25, 1991 (Report No. 50-249/91033(DRSS))

Areas Inspected: Special, announced inspection (Inspection Procedure (IP) 83750) to review the circumstances of the October 11, 1991, unplanned exposures of two workers during inservice inspection of the "B" recirculation pump discharge valve.

Results: The exposures of the two workers were inadequately planned and, in part, unnecessary. While the exposures did not exceed regulatory limits, there was a potential for this to occur. The exposures were the result of poor planning at two pre-job meetings, miscommunications between the workers and radiation protection personnel at the drywell just prior to the job, the failure of radiation protection personnel to recognize and implement corrective actions during the job when inappropriate work activities occurred, and the failure of the two workers themselves to implement radiologically conservative work practices. Three apparent violations were identified-failure to follow plant procedures (Section 4), inadequate evaluation of radiation hazards (Sections 4 and 6), and inadequate personnel dosimetry (Section 6).

## DETAILS

### 1. Persons Contacted

#### Commonwealth Edison

- \*D. F. Ambler, Health Physics Services Supervisor
- \*S. Berg, PWR Operations
- \*J. Coonan, Maintenance Staff
- \*E. D. Eenigenburg, Station Manager
- \*R. Falbo, Regulatory Assurance Assistant
- \*R. Flessner, PWR Operations
- \*L. F. Gerner, Technical Superintendent
- \*M. Horbaczewski, Technical Staff Group Leader
- \*D. Karjala, Zion Station, Performance Improvement
- \*K. Kociuba, Nuclear Quality Programs Superintendent
- \*M. Lesniak, Nuclear Stations Radiation Protection, Health Physics Supervisor
- \*K. Peterman, Regulatory Assurance Supervisor
- \*R. Ralph, Assistant Technical Staff Supervisor
- \*F. Rescek, Nuclear Stations Radiation Protection, Radiation Protection Director
- \*D. Saccamando, Nuclear Licensing, Compliance Engineer
- \*R. Stachniak, Performance Improvement Supervisor
- \*M. C. Strait, Technical Staff Supervisor
- \*K. E. Yates, Onsite Nuclear Safety Administrator

The inspector also talked with and interviewed other station and corporate personnel during the inspection.

#### Nuclear Regulatory Commission

- \*W. Rogers, Senior Resident Inspector
- \*M. C. Schumacher, Section Chief, Radiological Controls and Chemistry Section

\* Denotes those attending the exit meeting on October 25, 1991.

### 2. General

This was a special inspection (IP 83750) to review the circumstances of the unplanned exposures to two workers conducting inservice inspection of the components of the "B" recirculation pump discharge valve. The NRC inspection consisted of a review of the licensee's investigation of the problem and independent inspection activities.

### 3. Event Overview

On October 11, 1991, during the Unit 3 refueling outage, the licensee began work on a critical path job for removal, disassembly, inservice inspection (ISI), repair, re-assembly, and re-installation of the components of the "B" recirculation pump discharge valve (valve 3-202-5B),

a 28" double-disc gate valve. The work was being performed under work request D90960 and radiation work permit (RWP) 10576A, and was initiated because of a stretched valve stem. After the components had been removed, an ISI engineer and a maintenance scheduler entered the work area and conducted a visual examination of the disc seating surfaces located in the valve body and of the seating surfaces on the discs themselves (licensee representatives indicated the scheduler accompanied the ISI engineer, whose expertise was in ISI of hangers and supports, to guide the inspection and interpret the engineer's findings). Radiation protection (RP) personnel in the drywell bullpen area were observing the work on a video monitor and talking to the workers via a two-way voice link. In addition, the job was being videotaped for future reference. After the ISI was completed, the ALARA Coordinator and another RP manager reviewed the videotape to determine the possible cause of an administrative overexposure to a maintenance worker who had re-positioned the discs during the ISI. During this review, they observed that the dosimeters worn by the ISI engineer and the scheduler were not located on the area of the whole-body subject to the highest doses. The licensee subsequently stopped further work on the RWP and began an investigation. On October 12, 1991, the NRC senior resident inspector was notified of the problem.

The licensee's investigation included close review of the videotape and detailed measurements of dose rates in the areas entered by the workers. Dose reconstructions based on the investigation indicated that doses to the ISI engineer and the maintenance scheduler were below NRC quarterly limits. Details of the event are discussed below.

#### 4. Job Planning

On September 10, 1991, the Station ALARA Committee discussed the job, with the emphasis on the removal, repair, and re-installation of the valve components. The need to perform the ISI was mentioned, but there was no discussion of the details regarding position of the ISI inspectors in relation to the valve bowl or the discs, tools used for the inspection, or placement of dosimeters. The Station's ALARA Coordinator, the radiation protection manager, the station manager, and the mechanical maintenance foreman who was supervising the repair efforts attended that meeting.

On the morning of October 11, 1991, the pre-job briefing required by Dresden Administrative Procedure DAP 12-09, Revision 4, "ALARA Action Reviews," was held and included the ALARA Coordinator, the maintenance foreman, one of the RP technicians assigned to the job (RPT #1), and other maintenance personnel. The ISI engineer and the mechanical maintenance scheduler who performed the ISI, and the RP technician (RPT #2) who provided RP coverage for most of the ISI were not at the briefing. Again, the only discussion of the ISI was that it needed to be done. The absence of the ISI engineer (or any representative of the ISI group) and RPT #2 from the pre-job briefing was contrary to DAP 12-09, which required that all work groups involved in the job, including the RP technician monitoring the job, attend the briefing. The failure to follow the procedure is an example of an apparent violation of Technical Specification 6.2.B., which requires that radiation protection procedures be adhered to (249/91033-01a).

After the pre-job briefing, the work was begun and the valve components were removed from the valve body. Radiation protection coverage was provided by RPT #1, who was physically at the job site during the work. After the discs were removed, the ISI engineer and the maintenance scheduler were summoned and went to the drywell bullpen where RPT #1 briefed them on general area and contact dose rates and protective clothing requirements. The briefing also included a review of the job site using the video monitor. However, a current survey of the area was not available for review by the workers, contrary to a requirement of procedure DRP 1140-04, Revision 0, "Writing Radiation Work Permits." The failure to follow the procedure is another example of an apparent violation of Technical Specification 6.2.B. (249/91033-01b). Work area surveys conducted by RPT #1 prior to the ISI were documented after the ISI was completed.

The licensee's investigation indicated that during the bullpen briefing, the ISI engineer asked about a dosimeter for his head, stating that he had to lean into the valve body and that RPT #1 had stated that the ISI engineer should not break the horizontal plane of the valve flange with any part of his body. In an interview with the NRC inspector, the ISI engineer stated that he interpreted the statement as a warning not to dwell in the valve body, not as a prohibition against entry. Except for the brief discussion about entering the valve body, it appears that no other details of the inspection were discussed at the bullpen briefing. The failure at the station ALARA committee meeting, at the pre-job ALARA briefing, and at the bullpen briefing to adequately evaluate the position of the two workers during the ISI in relation to potential radiation hazards is an example of an apparent violation of 10 CFR 20.201(b). This regulation requires the licensee to make a reasonable evaluation of radiation hazards to ensure compliance with other regulations in Part 20, including the quarterly dose limits in 10 CFR 20.101 (249/91033-02a).

On the assumption that the two men would be standing on the valve flange to inspect the inside of the valve body and would be standing to inspect the discs, RPT #1 directed them to attach their dosimeters, consisting of a thermoluminescent dosimeter (TLD) and an electronic alarming dosimeter, to the lower right leg. The dose alarm of the electronic dosimeters was set at 240 millirem (80% of the 300 millirem daily administrative limit) and the dose rate alarm was set at 500 millirem/hour. The workers were to leave the jobsite if the dose alarm actuated, but were instructed that the dose rate alarm would likely sound during the inspection and would serve as an indicator of high dose rate areas. According to the licensee, this was not in keeping with current practice which was to set the dose rate alarm slightly higher than the expected highest dose rate, not lower.

#### 5. Valve Body Inspection

After the bullpen briefing, the two workers began the inspection of the valve. Meanwhile, the ALARA Coordinator intermittently watched the job on the video monitor for RPT #2 who was receiving a turnover from RPT #1. At the same time, the ALARA Coordinator was also observing several other jobs on video monitors.

At the jobsite, the workers did not stand on the flange for the inspection, but instead leaned with their chests near or on the flange where the dose rate ranged from 0.7-2 rem/hour and with their lower legs and dosimeters positioned below the flange in an area where the dose rate was about 140 millirem/hour. During the inspection, the ISI engineer periodically placed his head, arms, and chest into the valve body, below the plane of the flange, where an earlier two-point survey by RPT #1 indicated a dose rate of 10 rem/hour inside the valve body. On at least one occasion during the 7.5-minute inspection, the ALARA Coordinator instructed the ISI engineer over the audio link to keep his head out of the valve body. The ISI engineer stated to the NRC inspector that he interpreted this statement as admonishment or as a "typical" RP reminder to minimize dose, not as a prohibition.

#### 6. Inspection of the Discs

After the inspection of the valve body was completed, the workers went over to the discs, which were lying nearby. A check of the maintenance scheduler's electronic dosimeter at this time indicated he had received 20 millirem during the valve body inspection. Around this time, RPT #2 returned from his turnover and began to watch the job on the monitor. For the next eight minutes, the workers examined the outer face of one of the discs (the face marked "north"). The earlier survey by RPT #1 indicated a dose rate of 4-5 rem/hour at 2 inches from the surface of the two outer faces. During the exam, the ISI engineer put his face within several inches of the disc face, and touched it with various parts of his body, such as his feet, hands, arms, and legs. While at times, the leg with the dosimeters was positioned such that whole-body dose was adequately monitored, at other times it was not. This was also true of the maintenance scheduler, although he spent less time in contact with or close to the face of the disc.

After inspection of the north disc face was completed, the ISI engineer and maintenance scheduler waited in the adjacent rubber-gear change area, while two maintenance workers separated and repositioned the two discs, so that the outer (south) face of the other disc could be examined. The NRC inspector in reviewing the videotape noted that the workers' feet had touched previously unsurveyed faces of the discs during this operation (however, placement of their dosimeters appeared appropriate to monitor this exposure). It was also during this operation, that one of the workers left the area because his electronic dosimeter alarmed on accumulated dose. The failure to survey the inner surfaces of the discs to ensure radiation levels were not significantly greater than what was identified on the two outer surfaces of the discs is another example of an apparent violation of 10 CFR 20.201(b) (249/91033-02b).

After the discs were repositioned, the ISI engineer and the maintenance scheduler inspected the south face, which took about approximately four minutes. Again, the placement of the dosimeters on the lower right leg was inappropriate for the body position assumed by the ISI engineer.

Several times during the inspection of both faces, the ALARA Coordinator and RPT #2 directed the workers via the audio link to stay off the discs; however, as with the valve body inspection no stronger action was taken

to correct the workers and no action was taken to better evaluate their exposure. The failure during the ISI to evaluate their potential exposure is another example of an apparent violation of 10 CFR 20.201(b) (249/91033-02c).

Early during the inspection of the discs, the ALARA Coordinator had noted the placement of the dosimeters and discussed it with RPT #2 who indicated that the dosimetry was appropriate. The ALARA Coordinator indicated that he did not pursue the issue further. The failure to supply appropriate dosimetry to adequately measure doses in the varying exposure conditions of this job is an apparent violation of 10 CFR 20.202(a)(3), which requires the licensee to supply appropriate personnel monitoring equipment to each individual who enters a high radiation area (249/91033-03).

A review of the videotape by the NRC inspector and discussions with the licensee also indicated that the adequacy of the protection afforded by the negative-pressure respirators worn by the workers had not been reevaluated for the manner in which the ISI inspection was actually performed compared to the anticipated inspection techniques. As noted earlier, the actual work involved touching and stepping on the highly contaminated discs. The failure to reevaluate potential airborne exposure is another example of an apparent violation of 10 CFR 20.201(b) (249/91033-02d). No intakes of radioactive material were indicated by whole-body contamination monitors (a PCM-1B) when the workers left the drywell.

#### 7. Dose Estimation

The ISI engineer's dose according to his electronic dosimeter was 241 millirem, whereas his collocated TLD indicated 307 millirem. The scheduler's dose was 195 millirem by electronic dosimeter and 162 millirem by TLD. Because the dosimeters were not in the proper location during the work, the licensee calculated the doses using time and motion information available from the videotape, statements of the workers, and ion chamber and TLD tree readings made in the valve body and near the discs. The calculated doses of the ISI engineer were 1175 millirem for whole-body, 1429 millirem for skin, and 1683 millirem for extremity. The calculated doses of the maintenance scheduler were 558 millirem for whole-body, 746 millirem for skin, and 846 millirem for extremity. Previous doses in the calendar quarter were minimal, and no regulatory limits were exceeded. The licensee's dose estimation methodology appears reasonable. The videotape of the ISI eliminated much of the uncertainty inherent in post-event dose estimation, although distances were difficult to judge when viewing the tape.

#### 8. Corrective Actions

The licensee's corrective actions within a few hours after discovery of the problem were to stop all further work on the job, review similar ongoing jobs for similar problems, inform station upper management, prohibit the two workers from entering the RCA, and initiate an investigation involving station and corporate personnel. The technicians, the ALARA Coordinator, and the two workers were also counseled.

A "Lessons Learned Initial Notification" sheet describing the event was issued on October 15, 1991, to managers and supervisors at all of the licensee's nuclear plants. Corporate management met with station management on October 24, 1991, to discuss this event and convey corporate management's expectations regarding this event and the conduct the work. This information was relayed to station personnel during special staff meetings on October 25, 1991, in which a number of recent performance problems were discussed. All station work was effectively stopped to allow employees to attend these meetings. In addition, a "Dresden Situation Review Team," composed of corporate and station personnel, was formed to review this problem and related past problems, as well as several recent problems in other areas. The licensee's long term corrective actions are still being developed and will be at least partly dependent on the outcome of this review.

#### 9. Past Performance

Since early 1990, several similar problems with inadequate planning and communications have occurred for which corrective actions were taken and should have prevented the most recent problem. As discussed in Inspection Report No. 50-237/90012; No. 50-249/90011, weaknesses in pre-job dose evaluations for work on the Unit 2 Reactor Water Cleanup system resulted in three whole-body exposures above administrative limits and one significantly higher than expected extremity exposure (of 7 rem). In a written response to NRC concerns on these weaknesses, the licensee described several actions taken to prevent recurrence, including the addition of the requirement for the RP technician to attend pre-job briefings, dissemination of "Guidelines for Work in High Dose Rate Gradients or Localized Hot Spot Areas," and the emphasis with RP technicians and supervisors of the necessity of concise communications with workers and of comprehensive surveys.

Later in 1990, as discussed in Inspection Report No. 50-237/90026; No. 50-249/90025, a Notice of Violation was issued for workers not adhering to RP requirements while working in high dose rate gradient areas. These adherence problems had also resulted in several unplanned exposures. Part of the corrective actions taken in response to the Notice was to emphasize with station personnel the importance of ensuring that RP technicians understood job location and work activities.

And finally, in December 1990, the licensee documented a problem in which two technical staff engineers and RP personnel did not communicate adequately about work locations and activities. This lack of communication resulted in external and internal contamination of the workers.

#### 10. Exit Meeting

An exit meeting was conducted with NRC and licensee representatives (Section 1) on October 25, 1991, to discuss the tentative findings and possible enforcement actions. The inspector identified several apparent violations including inadequate evaluation and failure to promptly document a survey. The NRC representatives also expressed concern about the adequacy of the RWP, the training of the persons involved in the event, and the recurrent nature of some of the problems. The licensee acknowledged the comments and stated that it is conducting a utility-wide effectiveness review of RWPs. The licensee did not identify any likely inspection report material as proprietary.