

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

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Reports No: 50-295/97015(DRS); 50-304/97015(DRS)

Licensee: Commonwealth Edison Company (ComEd)

Facility: Zion Generating Station, Units 1 & 2

Location: 101 Shiloh Boulevard
Zion, IL 60099

Dates: June 2-6, 1997

Inspector: S. Orth, Senior Radiation Specialist
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Approved by: G. Shear, Chief, Plant Support Branch 2
Division of Reactor Safety

EXECUTIVE SUMMARY

Zion Generating Station, Units 1 & 2
NRC Inspection Report 50-295/97015; 50-304/97015

This announced inspection included aspects of the licensee's plant support performance and, specifically, an evaluation of the effectiveness of the radiation protection (RP) program. The report covers a one-week inspection concluding on June 6, 1997, performed by two radiation specialists.

- With the exception of radiation monitoring system operability, the licensee's assessment of the RP program identified specific actions needed prior to Unit 2 start-up. Management's RP expectations concerning changes in radiation protection technicians' responsibilities and in radiologically protected area (RPA) access were well communicated and resulted in some improvement in radiological conditions within the Auxiliary Building (Section R1.1).
- An inspection follow-up item was identified concerning the control of radioactive material. Through a comprehensive radiological survey of the site, the licensee had identified radioactive material outside of RPAs, indicating problems concerning the control of radioactive material and the release of material from RPAs (Section R1.2).
- Radiological controls for materials stored within the spent fuel pool were acceptable. The inspectors identified minor problems concerning inventories of items suspended within the spent fuel pool (Section R1.3).
- The licensee implemented a personnel exposure control program in accordance with as-low-as-is-reasonably-achievable (ALARA) principles. The RP staff properly monitored doses and, as required, approved personnel doses which were above administrative action levels (Section R1.4).
- The RP staff provided good radiological planning for the retrieval of a highly radioactive piece of metal from the reactor vessel flange area (Section R1.5).
- The RP staff properly calibrated personnel contamination monitors at the Auxiliary Building and security exit points. However, the inspectors identified some weaknesses in calibration procedures (Section R2.1).
- Radiation workers were properly trained and instructed concerning radiological hazards (Section R5.1)

Report Details

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Implementation of 1997 Operating Plan and Improvements in the Radiation Protection Program

a. Inspection Scope (83750)

The inspectors reviewed the status of licensee corrective actions discussed during the Predecisional Enforcement Conference conducted on March 19, 1997. The inspectors reviewed radiation protection (RP) self assessment results, programmatic improvement initiatives, and the communication of RP expectations to plant personnel. The inspectors discussed the effectiveness of these actions with RP management and technicians (RPTs) and evaluated the effect of these actions on the radiological condition of the Auxiliary Building.

b. Observations and Findings

The RP staff completed a department review to determine the RP issues that would impact the start-up of Unit 2 (U2). The RP staff performed a critical evaluation of performance and categorized issues according to the potential effect of the issues on U2 start-up. The inspectors noted that the assessment was consistent with the RP department objectives contained in the licensee's 1997 operating plan, which addressed radioactive waste shipping, source term reduction, contamination control, radiation monitor operability, and radiation worker performance. Of those items that potentially affected start-up, the RP staff identified routine radiological survey requirements, radiation monitor system (RMS) setpoint adjustments, and lead shielding removal. In addition, the RP staff identified a programmatic issue concerning the operability of the RMS; however, the staff had not specified what actions needed to be completed to address this issue. At the time of the inspection, the acting radiation protection manager (RPM) indicated that the staff were aware of the historical RMS operability issues and were evaluating the scope of RMS corrective actions that needed to be implemented prior to U2 start-up.

The inspectors also reviewed the status of the licensee's RP program improvements. On May 26, 1997, the RP staff changed the conduct of radiation protection technician (RPT) coverage of the Auxiliary Building via the implementation of the "Zone Coverage" concept. The licensee divided the Auxiliary Building into zones, which were manned by assigned RPTs, and defined the responsibilities of the RPTs for each of the zones. For example, the identified RPTs were responsible for performing surveys of the zone, for ensuring that radiological postings were correct, and for maintaining high radiation area (HRA) keys for required entries in that zone. In addition, plant personnel were expected to discuss work activities with the applicable zone RPT. The inspectors discussed the implementation of the changes with RPTs and plant personnel, who indicated that the changes had produced positive results. Individuals indicated that RPTs were

more visible in the field, that RPTs' responsibilities were better defined, and that management's expectations were more clearly defined.

On May 26, 1997, the licensee also changed the access to the radiologically posted area (RPA). During the day-shift, an RPT was stationed at the RPA entrance to ensure that personnel were prepared to enter the RPA. For example, the RPT ensured that personnel had the required dosimetry and questioned personnel on work location, scope of work, and radiation work permit (RWP) requirements. On other shifts, the access to the RPA was routed through the RP office, where similar questioning would occur. Licensee management communicated RP expectations to plant personnel via work group meetings and Zion Generating Station Policy Statement No. 1-30, dated April 4, 1997. Although the objectives were well defined, the inspectors identified that RP management did not clearly communicate the actions to take when problems were identified and corrected. The inspectors observed that the RPTs were not certain if radiation worker problems identified and corrected at the RPA access point should be documented in the RP log, in problem identification forms (PIFs), or in another tracking mechanism to ensure that the staff was aware of potential trends or more significant issues. In the interim, the RPTs were either correcting the workers on-the-spot or returning the workers for additional instructions. The RPM acknowledged the inspectors concerns and planned to review the guidance communicated to the RPTs.

During reviews of radiological conditions in the Auxiliary Building, the inspectors noted some improvement in radiological postings and some reduction in contaminated area. The inspectors noticed that the radiological impediments in the residual heat removal pump and heat exchanger rooms had been somewhat reduced, i.e. the contaminated boundaries were moved within the rooms. However, the inspectors continued to observe that major portions of the rooms remained contaminated. In addition, the licensee decontaminated the primary sample room, evaporator room, and crystallizer areas. However, the RPM acknowledged that additional improvements were needed and planned.

c. Conclusions

With the exception of RMS operability, the licensee's assessment of the RP program identified specific actions needed prior to U2 start-up. Overall, management RP expectations concerning changes in RPT responsibilities and RPA access were well communicated and had resulted in some improvement in radiological conditions in the Auxiliary Building.

R1.2 Control of Radioactive Material

a. Inspection Scope

The inspectors reviewed the results of the licensee's site-wide survey to identify any radioactive material outside of the RPA. The inspectors reviewed the licensee's status and the licensee's programmatic corrective actions.

b. Observations and Findings

On May 3, 1997, a member of the licensee's staff identified a stanchion bearing a radioactive materials label within the Turbine Building and outside of any RPA. Using a portable survey instrument, the RP staff measured fixed radioactive contamination of about 136,000 disintegrations per minute (dpm) on the stanchion. Based on the recent discovery and previously identified items, the licensee initiated a comprehensive, site-wide survey to identify any additional radioactive material outside of RPAs. At the time of the inspection, the licensee had completed a survey of the owner controlled area outside of the protected area and had identified about 30 items with radioactive contamination of about 500 to 10,000 dpm. The licensee had collected and cataloged the items. The inspectors noted that the contamination of the majority of items was less than 5000 dpm, and the items did not pose a radiological dose hazard to the public. The licensee planned to continue the survey within the protected area. Since the licensee had not completed its site survey, the inspectors will review this area during a future inspection. (IFI 50-295/304-97015-01).

The licensee implemented immediate corrective actions to improve positive control of material released from RPAs. As of May 26, 1997, the licensee increased the RP departments control of material removed from the Auxiliary Building. Previously, the licensee allowed plant personnel to release personal materials via tool monitors located at the Auxiliary Building exit. Subsequently, RPTs performed all release surveys and controlled the use of the tool monitors. The licensee also de-activated the exit security card reader in the Fuel Handling Building trackway to eliminate an alternate access/egress point from the Auxiliary Building. In addition, the RP department improved control over satellite RPAs (i.e. those RPAs outside of the Auxiliary Building) to ensure that materials removed from those locations were properly surveyed. For example, the control of access to the Dry Active Waste Building was exclusively transferred to RP staff.

The RP staff also reviewed the status of radioactive material storage areas and satellite RPAs. The inspectors discussed the findings and recommendations with a member of the RP staff, who indicated that the staff was evaluating the recommendations. However, the goal of the RP staff was to reduce the number of storage areas and satellite RPAs.

c. Conclusions

An inspection follow-up item was identified concerning the control of radioactive material. Through a comprehensive radiological survey of the site, the licensee had identified radioactive material outside of RPAs, indicating problems concerning the control of radioactive material and the release of material from RPAs.

R1.3 Storage of Radioactive Material in the Spent Fuel Pool

a. Inspection Scope (83750)

The inspectors reviewed the licensee's control of radioactive material stored in the spent fuel pool. The inspectors reviewed the inventories, labeling, and instructions given to workers.

b. Observations and Findings

The inspectors noted that a number of objects were suspended within the spent fuel pool via cables, ropes, and brackets leading to the surface of the pool. Although not a procedure requirement, the fuel handling staff performed inventories of items suspended in the pool to ensure that items were properly labeled and to verify the integrity of the material used to hang the item. Based on the licensee's most recent inventory (April 5, 1997), the items consisted of a variety of tools, underwater lights, vacuum units, and other miscellaneous objects. The inspectors noted some minor problems concerning the inventory. For example, the frequency of the inventory was not defined in plant procedures. A fuel handling supervisor indicated that it was an expectation that the inventory be performed weekly but that it was not a requirement. In addition, the inspectors noted that the contents of two containers were not specifically listed on the inventory sheets. Licensee personnel indicated that the contents were small parts which were not significant sources of radioactivity. The inventory form also contained a column noting the date the material was originally placed in the pool, which was not consistently used. The licensee planned to review the inventories and to evaluate the need for any additional controls.

The RP staff maintained radiological controls which were consistent with the considerations discussed in NRC Information Notice No. 90-33, "Sources of Unexpected Occupational Radiation Exposures at Spent Fuel Pools." The RP staff attached a radioactive material label to each cable containing the requirement to contact RP prior to removal. The inspectors noted that labels were legible and were properly attached to each cord/cable exiting the pool. In addition, RP procedure ZRP 6200-1, "Radiological Job Guidelines," Revision 0, requires that there be continuous RP coverage while removing any items from the pool and that items be wrapped to prevent the spread of contamination and be properly labeled. The inspectors also verified that the fuel handling department RWP (RWP No. 97009, revision 0) properly reflected the requirements of ZRP 6200-1 for RPT coverage when removing items. ZRP 6200-1 also requires that individuals have electronic alarming dosimetry for all work involving spent fuel pool work. With the exception of an event concerning material removed from the fuel transfer canal (NRC Inspection Reports No. 50-295/96008(DRP) and 50-304/96008(DRP)), RPT personnel were unaware of any issues concerning material improperly removed from the spent fuel pool.

b. Conclusions

Radiological controls for materials stored within the spent fuel pool were acceptable. The inspectors identified minor problems concerning inventories of items suspended within the spent fuel pool.

R1.4 Personnel Radiation Dose Control

a. Inspection Scope (83750)

The inspectors reviewed the licensee's control of radiation dose to personnel. The inspectors reviewed 1995 and 1996 personnel exposure records and the licensee's implementation of RP procedure ZRP 5300-2, "Exposure Review and Authorization," revision 3.

b. Observations and Findings

The licensee maintained several administrative levels of dose control as required by procedure ZRP 5300-2 to maintain radiation doses as-low-as-is-reasonably-achievable (ALARA). For example, procedure ZRP 5300-2 requires that the lead health physicist approve individuals to receive a deep dose equivalent greater than 300 millirem in a day or a total effective dose equivalent (TEDE) greater than 3000 millirem in a calendar year. The licensee also maintained a listing of individuals who approach the annual administrative dose level or who have a high lifetime TEDE (i.e. a TEDE in rem greater than the individual's age in years). The inspectors observed that exposure approvals for personnel in 1996 were properly documented.

Personnel exposure records indicated that the number of personnel receiving doses in the higher ends of the dose spectrum decreased. Between 1995 and 1996, the number of persons receiving doses between 1000 and 2000 millirem decreased by a factor of about 4. The inspectors also noted that no individuals received a dose greater than 3000 millirem from activities at the site in 1995 and 1996. Each department also implements a 3-year rolling dose average to equalize personnel doses within the work groups. The inspectors reviewed doses of various work groups no anomalies were identified.

c. Conclusions

The licensee implemented an exposure control program in accordance with ALARA principles. The RP staff properly monitored doses and, as required, approved personnel doses which were above administrative action levels.

R1.5 Identification and Removal of Radioactive Material from Reactor Vessel Flange Area

a. Inspection Scope (83750)

On May 17, 1997, RPTs identified a piece of material in the reactor vessel flange area with a contact dose rate of about 40 Rem per hour (Rem/hr). The inspectors reviewed the licensee's surveys of the area and the planning and controls for the removal of the material.

b. Observations and Findings

On May 14 and 16, 1997, the licensee performed radiological surveys in the reactor vessel flange area to support flange cleaning and did not identify any abnormalities in the dose measurements. Personnel performed the flange cleaning without any electronic dosimeter alarms or indications of unexpected dose rates. RPTs monitored the individuals remotely and maintained constant communications with the individuals. However, on May 17, 1997, an RPT performed a final survey of the area and detected highly elevated dose rates near a piece of material. RP staff indicated that the material was not in the immediate vicinity of the work area and was not in the well-defined path that the group had traversed. Due to the elevated general dose rates in the area, on May 14 and 16, the RPTs had surveyed (both remotely and in the area) only those areas necessary to perform the evolution. A member of the RP staff planned to evaluate the RP staff's remote survey capabilities to improve future surveys in areas having elevated dose rates.

On May 17, 1997, the licensee's staff retrieved the material and transferred the material into a high integrity container for disposal. The inspectors observed that the licensee performed good ALARA planning for the evolution. The ALARA plan and RWP required the use of remote handling tools, communications, and wireless remote monitoring dosimetry and contained contingency plans and radiological hold points. The individuals completed the evolution without any unexpected personnel contaminations and accrued a total dose of about 14 millirem.

c. Conclusions

The RP staff provided good radiological planning for the retrieval of a highly radioactive piece of metal from the reactor flange area.

R2 Status of RP&C Facilities and Equipment

R2.1 Calibration of Personnel Contamination Monitors

a. Inspection Scope (83750)

The inspectors reviewed the calibrations and quality control testing of personnel contamination monitors (PCMs) used at the Auxiliary Building exit and the security exit. The inspectors observed RP staff performing daily quality control testing and calibration of a security PCM and reviewed records of 1996 and 1997 PCM calibrations.

b. Observations and Findings

On June 3, 1997, an inspector observed the RP staff calibrating a PCM at the security exit. The RP staff properly followed procedure ZRP 5822-10, "Calibration of the Eberline PM-7 Portal Monitor," Revision 2. Prior to returning the monitor to service, a health physicist adequately reviewed the calibration data to ensure the calibration was acceptable. The inspectors reviewed 1996 calibration records which indicated that the remaining security PCMs were properly calibrated at the required frequencies. Although the inspectors did not identify any problems

concerning the calibration data, the inspectors observed that procedure ZRP 5822-10 does not require that an alarm test be performed following calibration nor does it contain criteria to ensure that the new calibration is acceptable (e.g. the detector efficiencies and voltage settings). The inspectors noted that an RPT performed a daily alarm test on each PCM; however, the RPT may have performed the test several hours after a calibration. The RPM acknowledged that performing an alarm test following a calibration was a conservative RP practice and planned to evaluate the current calibration methods for improvements.

The inspectors noted that the RP staff calibrated Auxiliary Building exit PCMs at a 6-month frequency and performed daily alarm tests as required by ZRP 5822-7, "Calibration of the NE Technology IPM-8 Whole Body Frisking Monitor," Revision 1. In accordance with the procedure, the RP staff calibrated the PCMs using both cobalt-60 and cesium-137 sources to represent typical mixes of plant contamination. The inspectors reviewed the calibration data; no problems were identified. However, the inspectors had similar observations concerning the lack of acceptance criteria for the cobalt-60 calibration data and the lack of an alarm test following calibration.

c. Conclusions

The RP staff properly calibrated PCMs at the Auxiliary Building and security exit points. However, the inspectors identified some weaknesses in PCM calibration procedures.

R5 Staff Training and Qualification in RP&C

R5.1 Radiation Protection Training for Plant Personnel

a. Inspection Scope (83750)

The inspectors reviewed the licensee's radiation worker training program with respect to the requirements of 10 CFR Part 19. The inspectors reviewed the licensee's "Instructor's Guide for Nuclear General Employee Training (N-GET): Plant Access Training and Radiation Worker Training," Revision 10, reviewed training records, observed training, and discussed the program with a member of the training staff.

b. Observations and Findings

The inspectors reviewed lesson plans and observed portions of the licensee's N-GET. The licensee conducted initial N-GET for incoming personnel and annual requalification N-GET. During the training, the instructors properly discussed RP topics and issues and stressed recent industry events and events at the station. However, the inspectors noted that neither the instructor nor the lesson plans addressed recent licensee problems concerning propping open doors with radiological postings and not properly securing hoses and cables that cross contaminated area boundaries. Since the RP staff considered these issues general RP training topics, the RPM planned to review N-GET training to ensure that these issues were properly discussed with plant personnel.

The inspectors reviewed the licensee's examination process to ensure that personnel adequately understood the content of the N-GET. The instructors indicated that a three part written exam was administered to personnel, consisting of fitness for duty, security, and radiation worker training sections. The licensee required individuals to correctly answer 80 percent of each section to pass the course. If an individual did not achieve a passing score on any section of the initial N-GET course examination, the individual's supervisor decided whether the individual was given an additional written examination or if other measures were taken. If an individual did not pass a requalification N-GET course examination, the individual was given an additional written examination. If an individual did not pass the successive examination, the individual was required to attend an additional training class. The instructors provided all individuals with a student handbook and with corrected examinations to ensure that the individuals understood questions which had not been answered correctly. The inspectors reviewed training records which indicated that persons were properly tested and retested if applicable.

c. Conclusions

Radiation workers were properly trained and instructed concerning radiological hazards.

V. Management Meetings

X1 Exit Meeting Summary

On June 6, 1997, the inspectors presented the inspection results to licensee management. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

C. Allen, Regulatory Assurance
J. Baxter, Health Physics
D. Beutel, Regulatory Assurance
A. Christensen, Site Quality Verification
R. Laburn, Health Physics
J. Lewis, Acting Radiation Protection Manager
D. Murphy, Site Quality Verification
J. Myers, Health Physics
C. Oshier, Health Physics
M. Pavey, Licensing
B. Robinson, Health Physics
M. Serpe, Health Physics
R. Starkey, Plant General Manager
W. Stone, Regulatory Assurance

INSPECTION PROCEDURES USED

IP 83750: Occupational Radiation Exposure

ITEMS OPENED, CLOSED, AND DISCUSSED

OPENED

50-295/304-97015-01 IFI Control of radioactive material. (Section R1.2)

LIST OF ACRONYMS USED

ALARA	As-Low-As-is-Reasonably-Achievable
CFR	Code of Federal Regulations
HRA	High Radiation Area
DPM	Disintegrations Per Minute
IFI	Inspection Follow-up Item
PCM	Personnel Contamination Monitor
PIF	Problem Identification Form
RMS	Radiation Monitoring System
R _P	Radiation Protection
RPA	Radiologically Posted Area
RPT	Radiation Protection Technician
RP&C	Radiation Protection and Chemistry
RWP	Radiation Work Permit
U2	Unit 2
TEDE	Total Effective Dose Equivalent
TS	Technical Specification

PARTIAL LIST OF DOCUMENTS REVIEWED

"Instructor's Guide for Nuclear General Employee Training (N-GET): Plant Access Training and Radiation Worker Training," dated February 5, 1997.

IPM-8 Calibration Reports for Monitors No. ORIC-AR 22 through 25, dated February 20, 1996, through March 4, 1997.

IPM-8 Source Check Log dated April 14, 1997, through May 23, 1997.

PM-7 Daily Source Check Log dated January 23, 1997, through May 22, 1997.

PM-7 Calibration Reports for Addresses 1 through 4 dated September 4, 1996, through June 2, 1997.

Problem Identification Forms (PIFs) No.: 97-2192, 97-2296, 97-2297, 97-2298, 97-2299, 97-2300, 97-2301,

Radiation Work Permits (Nos.): 970009, Revision 0; 973239 revision 0; 973705 revision 0; and 97352, revision 0.

Radiation Department Logs, pages 3 and 10, for May 15 and May 17, 1997.

Spent Fuel Pool Hanging Inventories performed on the following dates: April 5, 1997; March 19, 1997; March 5, 1997; March 12, 1997; February 26, 1997; February 12, 1997; February 6, 1997; and January 29, 1997.

Survey Nos. 97-0650, 97-0687, and 97-0703.

Zion Generating Station Policy Statement No. 1-30 dated April 4, 1997.

Zion Nuclear Station 1997 Operational Action Plan.

ZRP 5010-1, "Radiological Posting and Labeling Requirements," Revision 5.

ZRP 5300-2, "Exposure Review and Authorization," Revision 3.

ZRP 5710-2, "Control of Materials for Conditional or Unconditional Release from Radiologically Posted Areas," Revision 2.

ZRP 5822-7, "Calibration of the NE Technology IPM-8 Whole Body Frisking Monitor," Revision 1.

ZRP 5822-10, "Calibration of the Eberline PM-7 Portal Monitors," Revision 2.

ZRP 6200-1, "Radiological Job Guidelines," Revision 0.

ZRP 6210-4, "Radiological Controls for Work in the Fuel Building and Containment Transfer Canals," Revision 3.