

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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License Nos: NPF-11; NPF-18

Report Nos: 50-373/98020(DRS); 50-374/98020(DRS)

Licensee: Commonwealth Edison Company

Facility: LaSalle Nuclear Generating Station, Units 1 and 2

Location: 2605 N. 21st Road
Marseilles, Illinois 51341-9756

Dates: August 12-13, 1998

Inspector: W. Slawinski, Senior Radiation Specialist

Approved by: G. L. Shear, Chief, Plant Support Branch 2
Division of Reactor Safety

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EXECUTIVE SUMMARY

LaSalle Nuclear Generating Station, Units 1 and 2
NRC Inspection Reports 50-373/98020; 50-374/98020

This announced, special inspection was conducted to review the circumstances surrounding a July 23, 1998 incident, involving the transfer of radioactive samples from a storage area on the refuel floor to the radioactive waste truck bay. This report covers a two day site inspection concluding on August 13, 1998, performed by a regional Senior Radiation Specialist.

Plant Support

- The licensee's investigation of a July 23, 1998 incident involving the transfer of radioactive samples from the refuel floor was timely and thorough, and corrective actions were adequate to address the apparent causes. No significant radiological consequences resulted from the incident; however, worker judgement was poor because work was conducted outside the known scope of the as-low-as-is-reasonably-achievable (ALARA) plan, and continued even though the electronic dosimetry worn by the workers alarmed on several instances and other radiological problems occurred during the course of the work. Although the radiological work conditions were continually monitored by a radiation protection technician and job coverage was adequate to prevent an exposure in excess of regulatory limits, the problems with job planning and procedural adherence placed workers at increased radiological risk. A non-cited violation was identified (Section R1.1).

Report Details

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Problems During Transfer of Radioactive Samples

a. Inspection Scope (IP 83750)

The inspector reviewed the circumstances surrounding a July 23, 1998 incident, involving the transfer of radioactive samples from a storage area on the refuel floor to the radioactive waste (radwaste) truck bay. The inspector interviewed plant staff involved in the incident and its follow up investigation, reviewed the licensee's investigation report, and reviewed the radiation work permit (RWP), the as-low-as-is-reasonably-achievable (ALARA) plan and associated documents and procedures.

b. Observations and Findings

(1) Background Information

In mid-1996, the licensee collected samples from spent fuel bundles for offsite analysis by the fuel vendor, as part of an effort to evaluate the effectiveness of the zinc injection program. The samples were composed of fuel bundle scrapings collected on filter papers, and housed in small (scintillation cocktail sized) vials. Several unsatisfactory samples were not shipped for vendor analysis, and were bagged and stored in a shielded container on the refuel floor, where they remained for over two years. Contact dose rates on the samples were believed to exceed 1 rad/hour, and their form was expected to be solid and not readily dispersible.

In 1998, the licensee initiated a program to reduce the number of radiologically controlled areas on the refuel floor. As part of this program, the licensee planned to transfer the stored samples along with a small volume of dry active waste to the radwaste truck bay, for packaging and subsequent shipment to a low level waste burial site.

(2) Job Planning and Scheduling

Job coordination involved the station fuel handler, radiation protection and radwaste groups, the latter two supporting the former. On or about July 15, 1998, the radwaste staff notified the fuel handler group that a cask (high integrity container) was available for shipment of the samples to a burial site. The fuel handling supervisor, however, did not notify and seek assistance from the radiation protection (RP) ALARA group until July 21, 1998, leaving little time to develop an RWP and ALARA plan since the job was scheduled to begin the

next day. The job was later rescheduled for July 23, 1998, due to problems in the radwaste truck bay.

On July 22, 1998, an ALARA plan was developed by the station's ALARA analyst with assistance from the fuel handling supervisor, who determined that the work could be conducted under an existing RWP that was routinely used by the fuel handlers. That RWP encompassed fuel handling, housekeeping, decontamination, and minor maintenance activities on the refuel floor. The electronic dosimetry (ED) dose rate alarm setting established by the existing RWP was 100 millirem/hour, a value later determined by the licensee's investigation to be too low for the job. The alarm setting was not based on radiological survey data specific to the job, as required by licensee procedure.

The inspector evaluated the ALARA plan, discussed its development with RP management and staff, and concluded that the plan was not adequately developed. (The ALARA analyst that prepared the plan could not be interviewed by the inspector because the individual's employment was terminated by the licensee shortly after the incident). Specifically, both RP management and the inspector agreed that the ALARA plan contained insufficient radiological information about the samples, the plan failed to indicate the number of samples or describe their packaging, and the plan did not include contingencies should the work plan fail or if problems occurred. Although the ALARA plan indicated that the contact dose rate on the samples(s) collectively was 20 rad/hour, that information was reportedly based on an individual's recollection from 1996, when the samples were collected. A more recent survey of the samples was not performed, the survey information from 1996 was not confirmed or additional information sought, and a walkdown of the job site was not made to ensure that the equipment intended for the job was appropriate. Additionally, the ALARA plan was not documented on the licensee's standardized "ALARA Plan" form or similar record, and the plan did not include all the information normally documented in the licensee's ALARA plans. For example, the ALARA plan did not indicate if lessons learned were incorporated in the job, did not specify if the plan was based on estimated dose rates, and failed to indicate if contingency plans were applicable, or provide other information relevant to the successful completion of the job. Since the ALARA analyst was unavailable for interview, it is not known why current radiological data or additional historical data and other useful information concerning the samples was not obtained or confirmed. The licensee speculated that time constraints impacted the development of the ALARA plan, and the decision to use an existing RWP.

(3) ALARA Plan Implementation and Dose Controls

The ALARA plan required that "reach tools" be used during removal of the samples from the shielded storage container, during placement of the samples into a 3-inch by 12-inch tube, and during transfer of the tube (using an attached rope) onto a cart for transport to the radwaste area. The tube was to be shielded with lead blankets, after its placement on the cart. The ALARA plan indicated

that "no direct contact of samples should be made." It was intended that a 4-foot long pole equipped with finger-type pinchers, a tool routinely used by the fuel handlers, be used as the reach tool.

Just prior to job commencement on July 23, 1998, a pre-job brief was held by the ALARA analyst with the crew and supervisory staff involved in the work. Attendance at the briefing included the two fuel handlers that were involved in the transfer of the samples from the refuel floor, and a radiation protection technician (RPT) that provided continuous job coverage. The two fuel handlers and RPT indicated to the inspector that the use of the reach tools was stressed during the briefing. However, one of the fuel handlers indicated that he questioned the necessity of the tools, since he handled the samples without tools in 1996, when they were originally placed in the storage container. Although the 20 rad/hour maximum expected sample dose rate was mentioned at the pre-job briefing, the work crew indicated that the ED alarm settings were not discussed, nor was the number of samples or their packaging. While one of the fuel handlers recalled that the shielded container housed several small samples within a plastic bag, the RPT anticipated a single sample vial laying loose in the storage container.

While preparing for the job at the job site, the RPT and one of the fuel handlers determined that the reach tool could not be effectively used due to the storage container's small diameter well in relation to the size of the tool's fingers, and because there was not adequate clearance in the work area to manipulate the reach tool. The work area was located in the back corner of the refuel floor behind an elevator, an area that the inspector observed to be dimly lit and cramped. The fuel handler removed the bag that contained the samples from the storage container by hand, despite requirements to the contrary in the ALARA plan because: (1) the work crew reasoned that the samples could quickly and efficiently be removed by hand; (2) the fuel handler previously handled the samples without tools in 1996; and (3) the RPT was confident that the job could be conducted with little dose expended, based on the dose rate measured at the mouth of the container's storage well after the lid was removed. The dose rate measured by the RPT in the storage well was less than the 20 rad/hour value specified in the ALARA plan.

As the fuel handler attempted to force the bag into the 3-inch diameter tube by hand, the worker's ED alarmed, indicating a dose rate greater than 100 millirem/hour. However, the work continued until the bag opened and some of the sample vials fell to the floor. During the attempted transfer of the bag into the tube, the dose rate at the fuel handlers chest was measured by the RPT at 500 millirem/hour. At this time, the RPT learned that the fuel handler's ED alarm was set at 100 millirem/hour, a value much lower than presumed by the RPT. According to the RPT, radiation levels near the loose vials were about 1.5 rad/hour, after they fell to the floor. The workers left the area, regrouped, and decided to continue the job after a larger diameter tube was obtained by the other fuel handler supporting the job. One of the fuel handlers subsequently

retrieved the loose vials by hand, placed them into the larger tube, capped the tube and transferred it to the cart. The EDs worn by both fuel handlers momentarily alarmed while each placed lead blankets around the tube to shield the samples. The RPT measured 5 rad/hour on contact with the unshielded tube containing all the samples. A fourth, momentary ED dose rate alarm occurred later, when one of the radwaste operators connected a sling to the unshielded tube in preparation for its placement into the shipping cask.

The fuel handling supervisor was not present during the job, and later learned of the difficulties in completing the task. The ALARA analyst arrived on the refuel floor to observe the job while the lead blankets were being placed over the tube and the fuel handler's ED alarmed. The analyst then learned of the other problems that took place, and initiated a problem identification form (PIF). A Prompt Investigation and Apparent Cause Evaluation (ACE) followed.

The highest dose rate measured by the fuel handler's ED was determined by the licensee to be 2.2 rad/hour, apparently while the lead blankets were placed over the tube that contained the samples. Emergency processing of the thermoluminescent dosimetry (TLD) worn by each fuel handler to monitor whole body dose and the extremity monitor worn by the individual handling the samples, showed maximum whole body and extremity doses of 56 millirem and 105 millirem, respectively, for the July 1-23 period. Seventy three millirem was conservatively assigned as the deep dose equivalent for the maximally exposed worker, based on ED results for the period. The dose assigned to the RPT for the job was 10 millirem, also based on ED data. The inspector discussed dosimetry placement with the work crew and the RP staff, and agreed with the licensee's conclusion that the dosimetry provided an accurate assessment of the dose incurred by the workers.

The inspector determined that although the RPT allowed the crew to work outside the scope of the ALARA plan and handle the samples without the reach tool, the RPT was cognizant of the radiological conditions throughout the job and adequately monitored the fuel handlers dose. No significant radiological consequences resulted from the incident; however, both the RPT and work crew demonstrated poor judgement in handling the samples without tools, and continuing to work despite ED alarms. Although RPT job coverage was adequate to prevent exposures from approaching regulatory limits, the weaknesses in planning and implementing the job placed the work crew at increased radiological risk.

(4) Procedure Adherence Issues

Several procedure adherence problems occurred during the job. These problems were identified in the licensee's prompt investigation and ACE, and further developed by the inspector during the inspection.

Technical Specification 6.2.A(a) requires that applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978, be established, implemented, and maintained. Appendix A of Regulatory Guide 1.33, Revision 2, February 1978, specifies in Section 7(e) that radiation protection procedures cover: (1) access control to radiation areas including a radiation work permit system; (2) personnel monitoring; and (3) implementation of ALARA program.

LaSalle Radiation Protection Procedure LRP-5824-10 (Rev 0), "Operation and Use of the Merlin Gerin Electronic Dosimeters," a procedure that implements the personnel monitoring program to satisfy Regulatory Guide 1.33, requires in Step F.2(a)(2) that the electronic dosimetry's dose rate alarm threshold be normally set at a level based on survey information for the job and, if applicable, historical information. However, as described in subsection (2) above, on July 23, 1998, the dose rate alarms on the electronic dosimetry used by the fuel handlers were not set at a level based on survey information for the job, or based on historical information.

LaSalle Administrative Procedure LAP-2200-7 (Rev 0), "ALARA Plan," a procedure that implements the ALARA program to satisfy Regulatory Guide 1.33, requires in Step D.1 that ALARA Plans be based on current radiological surveys of the actual work location or based on data obtained from similar jobs previously performed. Step F.13 requires that the ALARA plan be documented on Attachment A, "ALARA Plan," or that a computer generated plan with applicable information be completed. As described in subsection (2) above, on July 22, 1998, the ALARA Plan was not based on current radiological surveys of the samples, or based on adequate historical survey data and other information necessary to properly handle the samples. Also, the ALARA Plan was not documented on Attachment A, or on a computer generated plan that included information equivalent to that specified on Attachment A.

LaSalle Administrative Procedure LAP-100-22 (Rev 21), "Radiation Work Permit Program," a procedure that implements the radiation work permit system to satisfy Regulatory Guide 1.33, requires in Step E.2.2 that the Job Supervisor ensure that workers in the work party perform the task in accordance with the provisions of the ALARA review. Step E.2.5 requires that the Radiation Protection Technician ensure that requirements from the ALARA review have been implemented and to contact radiation protection supervision if a conflict exists. Additionally, Step E.8 requires that radiation work permit pre-job briefings include, in part, a discussion of electronic dosimetry alarms, specifying the dose rate and accumulated dose alarm settings. As described in subsection (3) above, on July 23, 1998, neither the job supervisor or radiation protection technician that provided job coverage ensured that the requirements of the ALARA plan were implemented. Reach tools were not used as required by the plan, and workers had direct contact with the samples. Also, the radiation protection technician did not contact radiation protection supervision when a conflict existed between the ALARA plan and the work activity. Additionally, the

pre-job briefing conducted on July 23, 1998, did not include a discussion of electronic dosimetry alarm settings. Had the dosimetry alarm settings been discussed, their appropriateness may have been questioned, prompting further review of the job plan.

This non-repetitive licensee identified and corrected violation is being treated as a non-cited violation (NCV), consistent with Section VII.B.1 of the NRC Enforcement Policy (NCV 50-373/98020-01; 50-374/98020-01).

(5) Licensee Corrective Actions

The licensee's ACE attributed the apparent cause of the incident to the RPT's overconfidence. The RPT's decision to work outside the scope of the ALARA plan and continue despite ED alarms and other problems was based upon his job coverage experience, and the presumption that the job could be completed with less dose than if the job was stopped and resumed later. Contributing causes were the lack of proper job planning and scheduling and included an inadequately developed ALARA plan, and poor decisions by the RPT and work crew. Inspector interviews also disclosed that workers were confused prior to the incident regarding station management expectations for implementing ALARA plans, and about recent changes in RP work coverage philosophy.

Licensee corrective actions included disciplinary action for the involved staff and review of the event with RP and fuel handler groups. Additionally, management expectations regarding job coverage, ALARA plan development and implementation, and ED alarm response were discussed with RP staff and documented in RP shift standing orders. A PIF was initiated to track the job scheduling problem. These corrective actions appeared adequate.

c. Conclusions

The licensee's investigation of the incident was timely and thorough, and corrective actions were adequate to address the apparent causes. No significant radiological consequences resulted from the incident; however, the work crew's judgement was poor because work was conducted outside the known scope of the ALARA plan, and continued even though several radiological problems occurred during the course of the work. Although the radiological conditions were continually monitored by a RPT and job coverage was adequate to prevent an exposure in excess of regulatory limits, the problems with job planning and procedural adherence placed workers at increased radiological risk.

V. Management Meetings

X1 Exit Meeting Summary

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on August 13 1998. The licensee acknowledged the findings presented and identified no proprietary information.

PARTIAL LIST OF PERSONS CONTACTED

P. Barnes, Restart Program Manager
C. Berry, Chief of Staff
F. Dacimo, Site Vice President
T. Halliday, Assistant Health Physics Manager
N. Hightower, Health Physics Manager
C. Kelley, Lead Health Physicist, Operational
P. Knoll, Root Cause Analyst
D. Reif, Fuel Handling Supervisor
B. Riffer, Quality and Station Assurance Manager

INSPECTION PROCEDURES USED

IP 83750 Occupational Radiation Exposure

ITEMS OPENED AND CLOSED

Opened and Closed

50-373/98020-01	NCV	Multi-procedure adherence problems involving the development and implementation of the ALARA plan, pre-job briefing discussion, and dose rate alarm set points.
50-374/98020-01		

LIST OF ACRONYMS USED

ACE	Apparent Cause Evaluation
ALARA	As-Low-As-Reasonably-Achievable
ED	Electronic Dosimetry
NCV	Non-Cited Violation
PIF	Problem Identification Form
Radwaste	Radioactive waste
RP	Radiation Protection
RPT	Radiation Protection Technician
RWP	Radiation Work Permit
TLD	Thermoluminescent Dosimeter

PARTIAL LIST OF DOCUMENTS REVIEWED

Station Procedures

LRP 5000-07 (Rev 6)	Unescorted Access to and Conduct in Radiologically Posted Areas
LRP 5824-10 (Rev 0)	Operation and Use of the Merlin Gerin Electronic Dosimeters
LAP 100-22 (Rev 21)	Radiation work Permit Program
LAP 2200-07 (Rev 0)	ALARA Plan

RWPs and ALARA Plans

RWP # 980192 (Rev 0)	Fuel Handling, Fuel Receipt, Housekeeping, Decontamination, Water Blasting, Minor Maintenance
ALARA Plan (7/22/98)	Hi Rad Transfer From Refuel Floor to Radwaste

Investigation Reports and PIFs

Prompt Investigation (7/23/98)	Work Completed Outside the Scope of the RWP ALARA Plan
Apparent Cause Evaluation and Attachments (8/11/98)	Work Outside Original Scope of ALARA Plan
PIF # L1998-5370 (7/23/98)	Work Outside Original Scope of ALARA Plan
PIF # L1998-5637 (8/6/98)	Failure of Fuel Handling to Schedule High Risk Evolution
PIF # L1998-3836 (5/22/98)	Lack of Conservative Decision Making by RP Personnel