January 27, 2004

EA-04-006

Mr. M. Nazar
Senior Vice President
Nuclear Generation Group
American Electric Power Company
500 Circle Drive
Buchanan, MI 49107

SUBJECT: D. C. COOK NUCLEAR POWER PLANT, UNITS 1 AND 2
NRC RADIATION PROTECTION INSPECTION REPORT
05000315/2003016(DRS); 05000316/2003016(DRS)

Dear Mr. Nazar:

On December 12, 2003, the U. S. Nuclear Regulatory Commission (NRC) completed a baseline radiation protection inspection at your D. C. Cook Nuclear Power Plant, Units 1 and 2. The enclosed report documents the inspection findings which were discussed on December 12, 2003, with Mr. Jensen and other members of your staff. Following the onsite inspection, during a conference call on January 8, 2004, we further discussed with Messrs. Wood and Woods, of your staff, a radioactive material transportation issue that appears to have low to moderate safety significance.

The inspection examined activities conducted under your license as they relate to radiation safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed activities, interviewed personnel, and made independent radiation measurements.

The enclosed report discusses a finding that appears to have low to moderate safety significance. As described in Section 2PS2 of this report, the finding involved a failure to prepare a package (sea-land container) of radioactive material for shipment on October 7, 2003, so that under conditions normally incident to transportation, the radiation level does not exceed 200 millirem/hour at any point on the external surface of the package. Upon arrival of the package at a waste processing facility in Tennessee on October 8, 2003, radiation surveys identified a small area on the surface of the package that measured 250 millirem/hour. This finding was assessed using the Public Radiation Safety Significance Determination Process and was preliminarily determined to be White (i.e., a finding with some increased importance to safety, which may require additional NRC inspection). The finding has low to moderate safety significance because: (1) the external radiation level on the surface of the package exceeded Department of Transportation limits by 25 percent; and (2) the area of elevated radiation on the package surface was determined to be accessible to members of the public since a portion of an individual's whole body could have come into contact with it. However, given the location and small size of the spot of elevated radiation, the physical characteristics of the package which limited an individual's accessibility to the spot and based on the lack of any prolonged

stops while the transport vehicle was en route to Tennessee, it appears that no members of the public were unduly exposed to radiation. Therefore, the shipment did not present an immediate safety concern to members of the public.

Your staff took immediate measures to evaluate this condition and initiated actions to prevent recurrence. Those actions included dispatching your shipping specialist to the Tennessee facility to evaluate the problem, suspending all radioactive material shipments unless approved by the Radiation Protection Manager, conducting a stand-down with all staff involved in radioactive material shipments to discuss the situation, and initiating a formal apparent cause evaluation. Other actions planned include revisions to shipping procedures and training to staff.

The finding is also an apparent violation of NRC and Department of Transportation requirements and is being considered for escalated enforcement action in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600. The current Enforcement Policy is included on the NRC's Web site at http://www.nrc.gov/reading-rm/adams.html.

We believe that all relevant information was considered to make this preliminary significance determination. However, before we make a final decision on this matter, we are providing you an opportunity to: (1) present to the NRC your perspectives on the facts and assumptions, used by the NRC to arrive at the finding and its significance, at a Regulatory Conference; or (2) submit your position on the finding to the NRC in writing. If you request a Regulatory Conference, it should be held within 30 days of the receipt of this letter and we encourage you to submit supporting documentation at least one week prior to the conference in an effort to make the conference more efficient and effective. If a Regulatory Conference is held, it will be open for public observation. If you decide to submit only a written response, such submittal should be sent to the NRC within 30 days of the receipt of his letter.

Please contact Mr. Kenneth Riemer, Chief, Plant Support Branch, at 630-829-9757 within 10 business days of your receipt of this letter to notify the NRC of your intentions. If we have not heard from you within 10 days, we will continue with our significance determination and enforcement decision and you will be advised by separate correspondence of the results of our deliberations on this matter.

Since the NRC has not made a final determination in this matter, no Notice of Violation is being issued for this inspection finding at this time. In addition, please be advised that the characterization of the apparent violation described in the enclosed inspection report may change as a result of further NRC review.

The enclosed report also documents one self-revealed finding of very low safety significance (Green), and which involved a violation of NRC requirements. However, because of its very low safety significance and because it has been entered into your corrective action program, the NRC is treating this finding as a Non-Cited Violation in accordance with Section VI.A.1 of the NRC Enforcement Policy.

If you contest the subject or severity of this Non-Cited Violation, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001; with copies to the Regional Administrator, Region III, 801 Warrenville Road, Lisle, IL 60532-4351; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the D.C. Cook Nuclear Power Plant.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA by Roy Caniano Acting for/

Cynthia D. Pederson, Director
Division of Reactor Safety

Docket Nos. 50-315; 50-316
License Nos. DPR-58; DPR-74

Enclosure: Inspection Report 05000315/2003016(DRS);
05000316/2003016(DRS)
w/attachment: Supplemental Information

cc w/encl: J. Jensen, Site Vice President
M. Finissi, Plant Manager
R. Whale, Michigan Public Service Commission
Michigan Department of Environmental Quality
Emergency Management Division
MI Department of State Police
D. Lochbaum, Union of Concerned Scientists

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Emergency Management Division
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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-315; 50-316
License Nos:	DPR-58; DPR-74
Report Nos:	05000315/2003016(DRS); 05000316/2003016(DRS)
Licensee:	Indiana Michigan Power Company
Facility:	D. C. Cook Nuclear Power Plant, Units 1 and 2
Location:	1 Cook Place Bridgman, MI 49106
Dates:	December 1, 2003 through January 8, 2004
Inspector:	W. Slawinski, Senior Radiation Specialist
Accompanying Personnel:	R. Ng, Reactor Engineer, Region III F. Ramirez, Nuclear Safety Intern, Region III
Approved by:	K. Riemer, Chief Plant Support Branch

Enclosure

SUMMARY OF FINDINGS

IR 05000315/2003016(DRS), IR 05000316/2003016(DRS); 12/01/2003-01/08/2004; D. C. Cook Nuclear Power Plant, Units 1 and 2; Access Control to Radiologically Significant Areas; Radioactive Material Processing and Transportation.

This report covers a six-week (one and one-half week onsite) period of announced, baseline inspection in the area of radiation protection by one Region III specialist inspector. The inspection identified one preliminary White finding and associated apparent violation (AV), and one Green finding and associated Non-Cited Violation (NCV). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be "Green" or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

A. Inspector-Identified and Self-Revealed Findings

Cornerstone: Public Radiation Safety

- To Be Determined. A self-revealed finding preliminarily assessed to be greater than Green and an associated apparent violation (AV) were identified for the failure to prepare a package of radioactive material for shipment, so that under conditions normally incident to transportation, the radiation level does not exceed 200 millirem/hour at any point on the external surface of the package. Package surface radiation levels in excess of 200 millirem/hour were identified by a waste processing contractor upon receipt of the shipment from the licensee.

  The finding was more than minor because it was associated with the "Program and Process" attribute of the Public Radiation Safety Cornerstone, and affected the cornerstone objective of ensuring adequate protection of public health and safety from exposure to radioactive materials released into the public domain. Also, the issue involved an occurrence in the licensee's radioactive material transportation program that was contrary to NRC and Department of Transportation (DOT) regulations. The finding was determined preliminarily to be of low to moderate safety significance because the transportation problem involved an external package radiation level that exceeded limits by 25 percent and because the area of elevated radiation on the package was determined to be accessible to a member of the public during conditions normally incident to transportation. To address this issue, the licensee planned to revise procedures to require load plans and to specify which survey instrumentation is to be used for package surveys, and to provide training to its staff involved in radioactive material shipments (Section 2PS2.1).

Cornerstone: Occupational Radiation Safety

- Green. A self-revealed finding of very low safety significance and an associated Non-Cited Violation (NCV) were identified when an individual continued to work through both accumulated dose and dose rate electronic dosimetry (ED) alarms, and failed to fully utilize intended radiation shielding while changing-out the Unit 2 reactor coolant filter. As a result, the worker received unintended dose for the work activity.

  The finding was more than minor because the failure to stop work upon receiving ED dose and dose rate alarms, the failure to adequately use time, distance and shielding fundamentals in the execution of the filter change-out work coupled with inadequate radiation protection technician job coverage were associated with the "Human Performance" attribute of the Occupational Radiation Safety Cornerstone. The finding affected the cornerstone objective of ensuring adequate protection of worker health and safety from exposure to radiation. The finding was of very low safety significance because the worker's radiation exposure was low relative to regulatory limits, and because there was not a substantial potential for a worker overexposure; nor was the licensee's ability to assess worker dose compromised. To address this issue, the licensee implemented several corrective actions to ensure improved in-field oversight of work in high radiological risk areas, and to ensure workers better understand their responsibilities as radiation workers (Section 2OS1.4).

B. Licensee-Identified Violations

None.

REPORT DETAILS

2. RADIATION SAFETY

Cornerstone: Occupational Radiation Safety

2OS1 Access Control to Radiologically Significant Areas (71121.01)

.1 Review of Licensee Performance Indicators for the Occupational Exposure Cornerstone

a. Inspection Scope

The inspector reviewed licensee event reports, corrective action documents, dosimetry transaction data for radiologically controlled area egress, and data reported on the NRC's web site relative to the licensee's occupational exposure control performance indicator to determine whether or not the conditions surrounding any actual or potential performance indicator occurrences had been evaluated, and identified problems had been entered into the corrective action program for resolution. Performance indicator data collection and analysis methods were also evaluated by the inspector as described in Section 4OA1.

This review represented one inspection sample.

b. Findings

No findings of significance were identified.

.2 Plant Walkdowns/Boundary Verifications and Radiation Work Permit Reviews

a. Inspection Scope

The inspector reviewed several current and recently completed radiation work permit (RWP) packages including As Low As Is Reasonably Achievable (ALARA) plans, radiation surveys, and total effective dose equivalent (TEDE) ALARA evaluations for activities performed in radiologically significant areas within high and locked high radiation areas of the plant. The inspector evaluated the adequacy of the radiological controls to determine if these controls including postings and access control barricades were acceptable.

The inspector reviewed the RWPs and work packages which governed access into these areas to identify the work control instructions and control barriers that had been specified. Electronic dosimeter alarm set points for both integrated dose and dose rate were evaluated for conformity with survey indications and plant policy. Workers were interviewed to verify that they were aware of the actions required when their electronic dosimeters noticeably malfunctioned or alarmed.

The inspector walked down and surveyed (using an NRC survey meter) these areas and other selected areas in the Unit 1 and Unit 2 Auxiliary Building to verify that the prescribed radiological controls were in place, and that licensee postings were complete and accurate. During the walkdowns, the inspector challenged access control boundaries to verify that locked high radiation area (LHRA) access was controlled consistent with the licensee's procedures, Technical Specifications, and the requirements of 10 CFR 20.1601.

The inspector reviewed RWP packages for selected activities completed in 2003 to verify barrier integrity and engineering controls performance (e.g., filtered ventilation system operation) and to determine if there was a potential for individual worker internal exposures of greater than 50 millirem committed effective dose equivalent. Radiological surveys and total effective dose equivalent (TEDE) ALARA evaluations for work areas having the potential for airborne transuranics were reviewed to verify that the licensee had considered the potential for transuranic isotopes and provided appropriate worker protection.

The inspector reviewed the licensee's procedures and evaluated its methods for the assessment of internal dose as required by 10 CFR 20.1204. Specifically, the inspector reviewed the licensee's internal dose assessment for two intakes (both less than 50 millirem committed effective dose equivalent) that occurred during the 2003 Unit 2 refueling outage, to ensure the doses were calculated correctly and included an assessment of the impact of hard to detect radionuclides such as pure beta and alpha emitters, as applicable.

The inspector reviewed the licensee's physical and programmatic controls for highly activated and/or contaminated materials (non-fuel) stored within the spent fuel storage pool. Specifically, radiation protection (RP) and foreign material exclusion procedures were reviewed, RP staff were interviewed, the most recent inventory record for the spent fuel pool was reviewed and a walkdown of the refuel floor was conducted. In particular, the radiological controls for non-fuel materials stored in the spent fuel pool were evaluated to ensure adequate barriers were in-place to reduce the potential for the inadvertent movement of highly irradiated material stored in the pool.

These reviews represented six inspection samples.

b. Findings

No findings of significance were identified.

.3 Problem Identification and Resolution

a. Inspection Scope

The inspector reviewed licensee audits and self-assessments, field observations, and event reports related to the access control program to verify that identified problems were entered into the corrective action program for resolution.

The inspector reviewed six corrective action reports related to access controls including three high radiation area (HRA) radiological incidents (non-PI occurrences identified by the licensee in high radiation areas less than 1 rem per hour). Radiation protection staff were interviewed and corrective action documents were reviewed to verify that follow-up activities were being conducted in an effective and timely manner commensurate with their importance to safety and risk based on the following:

1. Initial problem identification, characterization, and tracking;
2. Disposition of operability/reportability issues;
3. Evaluation of safety significance/risk and priority for resolution;
4. Identification of repetitive problems;
5. Identification of contributing causes; and
6. Identification and implementation of corrective actions.

The inspector evaluated the licensee's process for problem identification, characterization and prioritization, and verified that problems were entered into the corrective action program and resolved. For repetitive deficiencies, the inspector verified that the licensee's self-assessment activities were capable of identifying and addressing these deficiencies.

The inspector reviewed licensee documentation packages for all performance indicator (PI) or potential PI events occurring since the last inspection to determine if any of these events involved dose rates greater than 25 rem per hour at 30 centimeters or greater than 500 rem per hour at 1 meter, or involved unintended exposures greater than 100 millirem total effective dose equivalent (or greater than 5 rem shallow dose equivalent or greater than 1.5 rem lens dose equivalent). One unintended exposure greater than 100 millirem TEDE occurred as described in Section 2OS1.4 below.

Additionally, the inspector reviewed the licensee's root cause investigation and common cause analysis prompted by the reactor coolant filter change-out event (discussed in the subsection below), to assess the adequacy of the licensee's problem identification, characterization, and corrective action for the specific incident and for any associated programmatic deficiencies.

These reviews represented four inspection samples. Specifically, the samples pertained to the licensee's self-assessment capabilities, its problem identification and resolution program for radiological issues, a review of the licensee's ability to identify and address repetitive deficiencies and a review of those potential PI occurrences of greatest radiological risk.

b. Findings

No findings of significance were identified.

.4 Job-In-Progress Reviews and Review of Work Practices in Radiologically Significant Areas

a. Inspection Scope

The inspector observed the following two jobs that were being performed in high or locked high radiation areas during the inspection:

- Reactor Stud Plug Decontamination in Permacon Building (RWP 031031-01)
- Unit 2 Containment Activities (pressure gauge surveillance) During Power Operations (RWP 031080-04)

The inspector reviewed radiological job requirements for these activities including the RWP requirements and those provided in the ALARA plan, if applicable. The inspector attended the pre-job briefing for the work and assessed the adequacy of the information exchanged.

Job performance was observed to verify that radiological conditions in the work area were adequately communicated to workers through the pre-job briefing and postings. The inspector also verified the adequacy of radiological controls provided by the radiation protection staff including the radiological surveys, LHRA access controls and radiation protection technician job coverage.

Reactor stud plug decontamination and previously completed work in high radiation work areas that had potentially significant dose rate gradients were reviewed to evaluate the application of dosimetry to effectively monitor exposure to personnel and to verify that licensee controls were adequate. This work included areas where the dose rate gradients were subject to significant change (i.e., diving activities and steam generator entries) which involved the use of multiple dosimeters and enhanced job controls. The inspector also reviewed the licensee's procedure and generic practices for dosimetry placement, use of multiple dosimetry and for extremity monitoring for work in areas having significant dose gradients for compliance with the requirements of 10 CFR 20.1201(c) and applicable NRC and Institute for Nuclear Power Operations Guidelines.

Additionally, the inspector reviewed the circumstances associated with a radiological event that occurred on June 14, 2003, during removal of the Unit 2 reactor coolant filter. Specifically, the inspector reviewed the licensee's condition evaluation and rapid event response report for the event, the RWP and ALARA plan developed for the work activity, and the procedures governing radiation worker practices. Also, some of the workers involved in the filter change-out were interviewed by the inspector and by the accompanying NRC personnel that participated in the inspection. A common cause analysis which the licensee had completed following the filter change-out event to assess other potentially similar unplanned exposure events was also evaluated by the inspector.

These reviews represented four inspection samples.

b. Findings

Introduction: A self-revealing Green finding and an associated Non-Cited Violation (NCV) were identified when an individual continued to work through both accumulated dose and dose rate electronic dosimetry (ED) alarms while changing-out the Unit 2 reactor coolant filter.

Description: On June 14, 2003, a maintenance worker was assigned to change-out the Unit 2 reactor coolant filter, an activity performed in the seal water filter cubicle of the Auxiliary Building which was an area controlled as a LHRA. The work activity was governed by RWP No. 032179-02 and the radiological controls listed therein were supplemented by an ALARA plan developed for the job. Continuous RP coverage was provided by a contract radiation protection technician (RPT) who worked inside the cubicle along with the maintenance worker, while an RP supervisor was stationed just outside the LHRA gate that led into the cubicle.

The maintenance worker and the RPT attended a pre-job briefing that was given by the RP supervisor, at which time the radiological controls and stop work conditions provided in the ALARA plan and RWP were discussed along with the ED setpoints established for each worker. Stop work conditions included any ED alarm, higher than expected accumulated dose, and any unanticipated conditions. Accumulated dose and dose rate alarm setpoints for the maintenance worker were 50 millirem and 5000 millirem/hour, respectively, based on the results of a pre-job filter housing survey and historical exposure data for similar work. The filter change was a routine task which involved removal of the filter from its housing using an overhead crane, wrapping a plastic bag around the filter to control contamination, and then fully lowering it into a shielded transport container. Much of the work was to be performed behind the concrete shield walls of the filter cubicle and historically most of the dose was received during the bagging/wrapping of the filter.

During the early phases of the work, the filter was observed to be partially crushed as it was lifted from its housing. Attempts to lower the filter into the shielded cask or reinsert it back inside the filter housing were unsuccessful due to its deformity. The filter remained suspended from the crane hook partially above the filter housing and the work was temporarily suspended. The workers retreated to the LHRA gate and discussed alternative plans with the RP supervisor. According to the ALARA plan, the work should have stopped and the crew exited the Auxiliary Building and sought assistance as unexpected conditions were encountered beyond the scope of the plan and the pre-job briefing. Instead, the workers agreed upon an alternate plan to lower the filter directly into double bags that rested on the floor of an adjoining cubicle. Following that, the bags would be cinched-up and the filter temporarily stored in the area. The workers reportedly discussed how to detach the filter from the lift hook and the best use of the shield wall and the bagging technique to achieve the lowest dose. The job then continued assuming the filter's radiation levels were consistent with those determined prior to the job, as discussed during the original pre-job briefing. That assumption, however, was incorrect because dose rates on portions of the filter were later found to be about twice that expected.

During the double bagging process, the maintenance worker received six ED dose rate alarms and subsequently an accumulated dose alarm. These alarms were heard by the worker and the RPT but not the RP supervisor stationed outside the work area. Following the work, the licensee determined that the maximum dose rate recorded by the maintenance worker's ED was 9620 millirem/hour and the accumulated whole body dose was 162 millirem, which equated to an unintended dose of 112 millirem for the job. The licensee's follow-up investigation determined that the excessive dose and dose rates occurred because the maintenance worker failed to utilize the cubicle's shield walls to the extent discussed and because the worker apparently stood near the unshielded filter and held the double bags as the filter was being lowered into them. Although job coverage was provided by a contract RPT and both the technician and maintenance worker heard the ED alarms, the job continued as each apparently believed their work practices were acceptable. As the new filter was installed and the filter housing secured, the RP supervisor (still positioned outside the gate) heard an ED alarm (the accumulated dose continuous alarm) and questioned the workers from outside the room. The RP supervisor permitted the job to be completed as the maintenance worker was in the process of tightening the final bolt on the filter housing.

The next day, the license initiated a rapid event response investigation to evaluate the circumstances and promptly interview all involved workers. That investigation identified several problems that contributed to the event including poor decision making and self-checking, lack of three way communication, poor radworker practices and RP work coverage, and working beyond the scope of the ALARA plan and job briefing. Subsequently, a radiation protection department root cause evaluation and common cause analysis, which evaluated corrective action program documents over approximately the two-year period that preceded the incident, identified similar radiological issues. Specifically, the licensee's review identified that radiological work on other occasions was allowed to continue beyond the scope of the ALARA plan and/or pre-job briefing when conditions significantly different than expected were encountered. In particular, similar to the reactor coolant filter incident, work had been temporarily halted in the recent past, but RP staff allowed it to continue after in-field adjustments were made to the original work plan. Additional dose was also received for these previous activities but of lesser magnitude than the filter incident.

Analysis: The inspector determined that the performance deficiency of the worker's failure to stop work upon receiving ED dose and dose rate alarms, the failure to adequately use time, distance and shielding fundamentals in the execution of the filter change-out work coupled with poor RP staff job coverage were associated with the "Human Performance" attribute of the Occupational Radiation Safety Cornerstone. The performance deficiency affected the cornerstone objective of ensuring adequate protection of worker health and safety from the exposure to radiation from radioactive material. Also, the issue involved the occurrence of a worker's unplanned, unintended dose resulting from actions contrary to licensee technical specifications (procedures) and RWP requirements. Therefore, the issue was more than minor and represents a finding which was evaluated using the significance determination process (SDP) for the Occupational Radiation Safety Cornerstone. The maintenance worker received an unintended whole body dose of 112 millirem due to these failures. As documented in

Section 4OA1, the unintended dose was reported as a performance indicator occurrence for the second calendar quarter of 2003.

The inspector determined that the worker's failure to stop work upon receiving ED alarms coupled with inadequate RPT job coverage were failures of the primary radiological barriers to protect worker health and safety. As such, the inspector determined utilizing NRC Manual Chapter 0609, Appendix C, "Occupational Radiation Safety SDP," that the finding did not involve ALARA/work controls as collective job dose was not an issue, and there was not an overexposure. Further, given the maximum radiation levels on the filter and the limited duration of the job, there was not a substantial potential for an overexposure nor was the licensee's ability to assess dose to the worker compromised. Consequently, the inspector concluded that the SDP assessment for this finding was of very low safety significance (Green).

Enforcement: Technical Specification 6.11, "Radiation Protection Program," requires that procedures for personnel radiation protection be prepared consistent with the requirements of 10 CFR Part 20 and be approved, maintained, and adhered to for all operations involving personnel radiation exposure. Radiation protection procedure PMP-6010-RPP-001 (Revision 1), "General Radiation Worker Instructions," implements Technical Specification 6.11. Section 3.1 of the procedure requires, in part, that radiation workers comply with the RWP and avoid exceeding dose limits. Section 3.2.12 of the procedure further requires that the worker leave the area immediately if an ED alarms for any reason. Radiation work permit No. 032179, task No. 02 (revision 02), "LHRA Maintenance, Tours, Inspections, Filter Changes, and Support Activities," requires that the work crew perform as much of the filter change evolution as possible from atop/behind the shield wall, and that the shield wall be used when moving the spent filter from its housing. The worker's failure to utilize the shield wall as much as possible and as intended, leave the work area immediately when the ED alarmed, and the failure to avoid exceeding the RWP 50 millirem dose limit during change-out of the reactor coolant filter on June 14, 2003, is a violation of Technical Specification 6.11. However, since the licensee documented this issue in its corrective action program (CR 03165037 and in root cause evaluation CR 03176031) and because the violation is of very low safety significance, it is being treated as a NCV (NCV 50-315/03-16-02 and 50-316/03-16-02).

.5 High Risk Significant, High Dose Rate HRA and VHRA Access Controls

a. Inspection Scope

The inspector reviewed the licensee's procedures and RP guidelines, and evaluated RP practices for the control of access to radiologically significant areas (high, locked high, and very high radiation areas) for compliance with the licensee's Technical Specifications and the applicable requirements of 10 CFR Part 20. In particular, the inspector evaluated the licensee's control of keys to LHRAs and VHRAs, the use of access control guards to control entry into such areas, and methods and practices for independently verifying proper closure and locking of access doors upon area egress. The inspector selectively reviewed LHRA/VHRA key log and key inventory records and door lock/barrier integrity surveillance documents for the fourth quarter of 2003, to verify

the adequacy of accountability/verification practices and documentation. The inspector also reviewed records and evaluated the licensee's practices for approval of access to VHRAs to verify compliance with procedure requirements and those of 10 CFR 20.1602.

The inspector discussed with RP supervisors the controls that were in place for areas that had the potential to become very high radiation areas during certain plant operations, to determine if these plant operations required communication beforehand with the RP group, to allow corresponding timely actions to properly post and control the radiation hazards.

The inspector conducted plant walkdowns to verify the posting and locking of entrances to several LHRAs, and for most high dose rate HRAs and very high radiation areas.

These reviews represented three inspection samples.

b. Findings

No findings of significance were identified

.6 Radiation Worker Performance

a. Inspection Scope

During job performance observations, the inspector evaluated radiation worker performance with respect to stated radiation protection work requirements and evaluated whether workers were aware of the radiological conditions in their workplace, the RWP controls and limits in place, and that their performance had accounted for the level of radiological hazards present.

The inspector reviewed radiological problem reports which found that the cause of the event was due to radiation worker errors to determine if there was a pattern traceable to a similar cause, and to determine if this perspective matched the corrective action approach taken by the licensee to resolve the reported problems.

These reviews represented two inspection samples.

b. Findings

No findings of significance were identified.

.7 Radiation Protection Technician Proficiency

a. Inspection Scope

During job observations, the inspector evaluated radiation protection supervisory and technician performance with respect to radiation protection work requirements and evaluated whether they were aware of the radiological conditions in their workplace, the

RWP controls and limits in place, and if their performance was consistent with the radiological hazards that existed.

The inspector reviewed several radiological problem reports generated in 2003 to determine the extent of any specific problems or trends caused by RP technician errors or human performance deficiencies, and to determine if the corrective action approach taken by the licensee to resolve the reported problems was appropriate.

These reviews represented two inspection samples.

b. Findings

No findings of significance were identified.

2OS3 Radiation Monitoring Instrumentation and Protective Equipment (71121.03)

.1 Rescue Capabilities During Use of One-Piece Atmosphere Supplying Respiratory Protection Devices

a. Inspection Scope

The inspector reviewed the licensee's respiratory protection procedures and discussed their implementation relative to the requirements of 10 CFR 20.1703(f) for standby rescue persons should one-piece atmosphere supplying suits, or any combination of respiratory protection and personnel protective equipment be needed which the wearer may have difficulty extricating himself or herself. Given that the licensee has not used respiratory protection equipment that warranted standby rescue persons, the requirements of 10 CFR 20.1703(f) did not apply. However, the inspector discussed with RP management the actions that would be taken to ensure compliance should the use of such equipment be necessary.

This review represented one (industry event prompted) inspection sample.

b. Findings

No findings of significance were identified.

Cornerstone: Public Radiation Safety

2PS2 Radioactive Material Processing and Transportation (71122.02)

.1 Review of Radioactive Waste Shipment Problem

a. Inspection Scope

The inspector reviewed the circumstances surrounding an October 7, 2003 shipment of radioactive waste from the D. C. Cook plant to a waste processing contractor located in Memphis, Tennessee. Shipment receipt surveys performed by the contractor on

October 8, 2003, identified that one of the shipment's two packages exceeded the Department of Transportation (DOT) external radiation level limit.

The inspector reviewed the licensee's apparent cause evaluation report, shipment-related documents and photographs including the outgoing and receipt radiation survey records, and discussed the event with individuals involved in the licensee's shipment program.

b. Findings

Introduction: A self-revealing finding preliminarily assessed to be greater than Green and an associated apparent violation (AV) were identified for the failure to prepare a package of radioactive material for shipment, so that under conditions normally incident to transportation, the radiation level does not exceed 200 millirem/hour at any point on the external surface of the package.

Description: On October 7, 2003, a low level radioactive waste shipment consisting of two box containers (volume of approximately 1400 cubic-foot each) was prepared by the licensee and offered to a carrier for transport to a waste processing contractor (Radiological Application Consulting and Engineering (RACE)) located in Memphis, Tennessee. Each of the sea-land (box) containers housed plastic bagged waste with one containing "Green is Clean" potentially contaminated dry waste and the other dry active waste (DAW). The sea-land containers were loaded back-to-back on an open, flat bed trailer with the DAW container loaded toward the rear of the vehicle. The shipment (D.C. Cook # RMC 03-103) was consigned as exclusive use and categorized as class 7 (radioactive) material, low specific activity, containing a total activity of about 67 millicuries of primarily mixed activation products. The shipment departed the D. C. Cook facility at approximately 2:00 p.m. on October 7, 2003, and arrived at the RACE facility about 10 hours later.

On October 8, 2003, radiation measurements performed by RACE personnel on the exterior surface of the packages (the sea-land containers) identified a highly localized area of elevated radiation on the external surface of the DAW container that exceeded the Department of Transportation (DOT) limit provided in 49 CFR 173.441. Specifically, a coin-sized (one-inch diameter) spot measuring 250 millirem/hour was identified on the external surface of the sea-land container's rear door, about three and one-half feet up from the bottom of the package and one and one-half inches lateral to a vertical metal bar used to latch the container's door. The applicable DOT limit on the exterior surfaces of a package transported as exclusive use in an open vehicle is 200 millirem/hour. Package and vehicle surveys performed by the licensee prior to the shipment's departure on October 7, 2003, documented a maximum package surface radiation level of 33 millirem/hour on the DAW filled container that was located in the same general location as the coin-sized "hot" spot identified at RACE. All other package surface and vehicle radiation levels measured upon receipt of the shipment at RACE were consistent with those measured by the licensee prior to departure. RACE quarantined the trailer and notified the licensee on October 8, 2003. That same day, the licensee's shipping specialist was dispatched to the RACE facility to investigate the incident. The licensee performed confirmatory surveys of the package as part of its investigation and verified

the accuracy of the 250 millirem/hour radiation level that was measured by RACE personnel upon its receipt of the shipment, as reported.

The DAW filled sea-land container housed approximately 350 plastic bags including 24 bags that were labeled as containing "potential particle source material" (i.e., discrete radioactive particles). Of these 24 bags, 6 had measured surface radiation levels of 100 millirem/hour or greater (i.e., potentially higher activity discrete radioactive particles). A "potential particle source material" trash bag that was surveyed and tagged by the licensee's radiation protection staff in June 2003, with a contact radiation level of 100 millirem/hour, was the primary source of the "hot" spot on the exterior surface of the sea-land door when the shipment arrived at RACE. That trash bag contained high efficiency particulate air (HEPA) vacuum debris (dust and larger granules) from refueling outage work and consequently discrete radioactive particles of varying activity. The suspect bag measured 400 millirem/hour (contact) when off-loaded at the RACE facility on October 8, 2003, four times greater than when measured and tagged by the licensee months earlier.

The licensee's investigation concluded that the suspect bag did not shift significantly, if at all, within the sea-land container during the shipment; however, it appeared that the contents of the bag settled during transit and one or more higher activity discrete radioactive particles migrated to the external surfaces of the bag. The licensee's investigation also determined that the survey instrument used by its staff to perform the package departure surveys on October 7, 2003 (Bicron Model Tech 50), may not have identified the "hot" spot given the reduced efficiency of the survey instrument if the active center of its two small (one-inch and two-inch length respectively), internally mounted Geiger-Mueller probes (detectors) were not positioned over the coin-sized spot. The container's protruding metal closure bar partially obstructed positioning of the survey instrument directly over the spot if held in the typical manner during the package survey. The RACE staff used an externally connected Geiger-Mueller probe (1.2 inches in diameter and 6.5 inches long) to conduct its receipt surveys, which allowed the center of the probe to be readily positioned directly on the "hot" spot, unlike the instrument used by the licensee. Moreover, the survey instrument used by the licensee did not have an audible response capability, which was the feature the RACE staff utilized to actually identify the spot.

The conveyance was not involved in an accident during the 10 hour trip from D.C. Cook to Tennessee nor were any unusual transport conditions reported to have been encountered. Therefore, the shipment conditions were consistent with those normally incident to transportation.

The scenario that created the problem was not definitively determined since it was uncertain if the "hot" spot may have existed prior to shipment departure or if the spot emerged during transit as the contents of the waste bag settled. Nevertheless, based on the information disclosed through the licensee's investigation and the inspector's assessment of that information, the following preliminary conclusions are made:

Root Cause - Container Loading: The loading of the plastic bags into the sea-land container was inadequate because a high radiation level (100 millirem/hour) waste bag

containing discrete radioactive particles was positioned at the exterior portion of the load against the back door of the container. This resulted in inadequate shielding of the particles within the bag as they settled and migrated during transit.

Contributing Cause No. 1 - Inadequate Instrumentation and/or Inadequate Survey: If the "hot" spot existed prior to shipment, it may not have been identified because the survey instrument used for the outgoing package survey was not optimal for detection of the small spot due to the obstruction of the container's closure bar and the lack of an audible feature on the instrument. Given that, if the survey instrument was not rotated 90 degrees from its normal survey position and the survey performed slowly and methodically, the spot may not have been detected.

Contributing Cause No. 2 - Inadequate Knowledge and Assessment: If the "hot" spot did not exist prior to shipment, then it likely emerged as the contents of the waste bag settled during transit. In that case, the licensee failed to consider the physical and radiological characteristics of the waste and its potential settling/slumping during transit.

Contributing Cause No. 3 - Procedure Deficiencies: The licensee's package preparation and survey procedures did not require verification surveys on the individual waste bags as they were loaded into the container to ensure previously measured and labeled radiological information was accurate. Procedures did not require a load plan for higher radiation level waste bags or for waste containing discrete radioactive particles. Also, procedures did not provide guidance for the type of survey instrument to be used for package surveys should physical obstructions of the package interfere with the positioning of the survey instrument.

Analysis: The inspector determined that the issue represented a performance deficiency because the licensee failed to satisfy the requirements of 10 CFR 71.5 and 49 CFR 173.441. Also, the cause of the problem was within the licensee's ability to foresee and could have been prevented had the container been loaded to ensure those waste bags exhibiting higher radiation levels been positioned towards the center of the load and secured to prevent shifting. Moreover, the instruments used to perform the package surveys did not permit isolated "hot" spots to be readily identified if package design features physically obstructed proper positioning of the survey meter. The inspector determined that the issue was associated with the "Program and Process" attribute of the Public Radiation Safety Cornerstone, and affected the cornerstone objective of ensuring adequate protection of the public from the exposure to radioactive materials released into the public domain. Also, the issue involved an occurrence in the licensee's radioactive material transportation program that was contrary to NRC and DOT regulations. Therefore, the issue was more than minor and represented a finding which was evaluated using the SDP for the Public Radiation Safety Cornerstone.

The inspector determined, utilizing Manual Chapter 0609, Appendix D, "Public Radiation Safety SDP," that the finding was a transportation problem that involved an external radiation level limit that was exceeded on a package prepared by the licensee and offered for transport to a carrier. The external package radiation level limit was exceeded by 25 percent but did not exceed two times the limit. Further, since the DOT radiation level limit was exceeded on a portion of the package other than its underside

(that rested directly on the trailer) and since some portion of the whole body could have come into contact with the spot of elevated radiation, that area on the package was deemed accessible to the public. Consequently, the finding was determined preliminarily to be of low to moderate safety significance (White).

Enforcement: 10 CFR 71.5 requires each licensee who transports licensed material outside of the site of usage, as defined in the NRC license, or where transport is on public highways, or who delivers licensed material to a carrier for transport, shall comply with the applicable requirements of the Department of Transportation regulations in 49 CFR Parts 170 through 189 appropriate to the mode of transport.

49 CFR 173.441(a) requires, in part, that each package of Class 7 (radioactive) material offered for transportation be designed and prepared for shipment, so that under conditions normally incident to transportation, the radiation level does not exceed 200 millirem per hour at any point on the external surface of the package. However, on October 7, 2003, the licensee offered for transportation to a carrier a Class 7 (radioactive) material package that was not prepared for shipment so that, under conditions normally incident to transportation, the radiation level did not exceed 200 millirem per hour at any point on the external surface of the package. Given the location and small size of the spot of elevated radiation on the package, the radiation levels present, and on individual's limited accessibility to the spot, the shipment did not present an immediate safety concern to members of the public. Pending the outcome of a final safety significance review, this issue is identified as an apparent violation (AV 50-315/03-16-01; 50-316/03-16-01). The licensee entered this AV into its corrective action program as CR No. 03281042.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151)

.2 Radiation Safety Strategic Area

a. Inspection Scope

The inspector sampled licensee submittals for the performance indicator (PI) listed below for the period August 2002 through November 2003. To verify the accuracy of the PI data reported during that period, PI definitions and guidance contained in Revision 1 of Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," were used. The following PI was reviewed:

- Occupational Exposure Control Effectiveness

  For the time period reviewed, one reportable event was identified and reported by the licensee which occurred during the second quarter of calendar year 2003, as described in Section 2OS1.4 of this report. To assess the adequacy of the licensee's PI data collection and analyses, the inspector independently reviewed electronic dosimetry dose alarm investigation reports, radiation exposure investigation reports, RP log book entries and the licensee's condition report

(CR) database along with individual CRs generated during the period to verify there were no unrecognized occurrences. Additionally, as discussed in Section 2OS1, the inspector walked down the boundaries of selected LHRAs and VHRAs to verify the adequacy of posting and access controls.

b. Findings

No findings of significance were identified.

4OA3 Event Followup

Section 2PS2 describes the circumstances associated with a radioactive waste package shipped offsite that failed to meet DOT external radiation level limits.

4OA4 Identification and Resolution of Problems - Cross Cutting Aspects of Finding

A finding described in Section 2OS1.4 of this report had as its primary cause human performance deficiencies, in that, individuals from the radiation protection and maintenance departments worked outside the bounds of an ALARA plan and pre-job briefing when unexpected conditions were encountered, and continued to work through multiple electronic dosimetry alarms. The licensee's root cause evaluation disclosed previous similar problems when other work continued despite encountering radiological conditions that had changed significantly from that expected.

4OA6 Meetings

.1 Exit Meetings

On December 12, 2003, the inspector presented the preliminary inspection results to Mr. J. Jensen and other members of licensee management and staff. The licensee acknowledged the findings presented. The licensee did not identify any of the information reviewed by the inspector as proprietary.

On January 8, 2004, the inspector and Mr. K. Riemer of the Region III staff re-exited with Messrs. D. Wood and T. Woods by telephone, to present the NRC's preliminary significance determination for the transportation issue.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee
D. Bronicki, Radiation Protection Supervisor
J. Cassidy, Radiation Protection General Supervisor - Support
L. Dean, Radiation Protection Performance Improvement Supervisor
J. Jensen, Site Vice President
J. Long, Senior Nuclear Specialist
R. Serocke, Radiation Protection Superintendent
D. Wood, Radiation Protection/Environmental Manager
T. Woods, Regulatory Affairs, Licensing/Technical Specification Supervisor

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-315; 50-316/03-16-02	NCV	Failure to follow the RWP and the procedure governing radiation worker practices during reactor coolant filter change-out work (Section 2OS1.4)
50-315; 50-316/03-16-01	AV	Failure to prepare a shipment of radioactive waste to satisfy DOT external package radiation level limits (Section 2PS2.1)

Closed

50-315; 50-316/03-16-02	NCV	Failure to follow the RWP and the procedure governing radiation worker practices during reactor coolant filter change-out work (Section 2OS1.4)

Discussed

None

LIST OF DOCUMENTS REVIEWED

2OS1 Access Control to Radiologically Significant Areas

PMP-6010-RPP-003; High, Locked High and Very High Radiation Area Access; Revision 12

THG-026; Locked High Radiation Area and Very High Radiation Area Shiftly Verification Process; Revision 2

Radiation Protection Department Key Inventory and Issuance/Return Logs; Selected Logs for October - December 2003

RWP 031080; U-2 Containment Activities During Power Operations; Revision 2

RWP 031031 and Associated TEDE ALARA Evaluation; Permacon Building Decontamination Activities; Revision 1

RWP 031081; U-2 Containment Accumulator Room Locked High Radiation Area Inspections; Revision 2

12-THP-6010-RPP-206; Internal Dose Assessment and Calculation; Revision 3

Waste Stream Scaling Factor Table; September 2003

12-THP-6010-RPP-206; Internal Dose Assignment Data Sheets and Associated Whole Body Count Analyses Results for Selected Workers in 2003

12-THP-6010-RPP-413; Radiological Controls for Nuclear Diving Operations; Revision 4

PMP-6010-RPP-200; Internal Radiation Dose Monitoring; Revision 6

RWP 032179 and Associated ALARA Plan; Unit-2 C14 Outage Reactor Coolant Filter/Seal Water Return Filter LHRA Activities; Revisions 2, 3 and 5

PMP-6010-RPP-001; General Radiation Worker Instructions; Revisions 1 and 2

PMP-6010-ALA-001; ALARA Program - Review of Plant Work Activities; Revision 12

CR 03176031; Root Cause Report and Associated Corrective Action Matrix; June 25, 2003

CR 02133073; Radworker Exceeded Dose Setting; May 13, 2002

CR 02171029; Dose Alarm During Cap of Resin Liner; June 19, 2002

Rapid Event Response Report; Worker Exceeded Both Dose Rate and Dose Alarm While Changing Unit-2 Reactor Coolant Filter; June 15, 2003

12-THP-6010-RPP-104; Issue and Control of Special Dosimetry; Revision 4

PMP-2220-001-001; Foreign Material Exclusion; Revision 4

Spent Fuel Pool (Non-Fuel) Inventory; December 2003

Performance Assurance Field Observation FO-03-A-0004; Reactor Coolant Pump Repair ALARA Planning; January 8-14, 2003

Performance Assurance Field Observation FO-03-F-010; Radworker & RP Practices at U-2 Lower Containment Access Ramp; June 7, 2003

Performance Assurance Field Observation FO-03-K-0004; Pre-Job Briefing for Reactor Head Inspection; October 30, 2003

Performance Assurance Audit Report PA-03-07; Radiation Protection; January 17 - February 14, 2003

TEDE ALARA Evaluations for RWP 032106; Reactor Vessel Head Inspections; May 2 and 24, 2003

CR 03261039; Visitor Entered a HRA When Unauthorized; September 18, 2003

CR 03099034; LHRA Barriers in CVCS Holdup Tank Rooms Unsafe and Not Easy to Install

CR 03139047; Electronic Dosimetry Dose Rate Alarm; May 19, 2003

CR 02342008; Spent Fuel Pit VHRA Demineralizer Gate Opened with Use of Cardreader; December 8, 2002

CR 03130056; Worker Accessed HRA Without Authorization; May 10, 2003

2OS3 Radiation Monitoring Instrumentation & Protective Equipment

PMP-2281-RES-001; Control and Use of Respiratory Protection Devices

SPP-2281-RES-203; Breathing Air Systems

2PS2 Radioactive Material Processing and Transportation

Uniform Low-Level Radioactive Waste Manifest; Shipment RMC 03-103; October 7, 2003

Radioactive Container and Vehicle Survey Records for Shipment RMC 03-103; October 3 and October 7, 2003

Apparent Cause Evaluation Report (CR 03281042); Shipment of Low-Level Waste With Local Spot Reading 250 millirem/hour; October 8, 2003

Technical Manual for Survey Meter Model TECH-50; Revision C

Technical Manual for Survey Meter Model ESP-2 with HP-270 GM Detector; March 1993

Training Records for Licensee Environmental Staff Involved in Radioactive Material Shipment Processing; Records for 2002 & 2003

12-THP-6010-RPP-900; Preparation of Radioactive Shipments; Revision 9

12-THP-6010-RPP-905; Solid Waste Handling and Packaging; Revision 4b

Radiological Application Consulting and Engineering Quality Assurance Procedure Problem Report; Dose Rate on Container TL-007 Greater Than 200 millirem/hour; October 8, 2003

Radiological Application Consulting and Engineering RP Procedure RP-D1, Attachment 2, QA Checklist for Receipt of Radioactive Material; October 8, 2003

Radiological Application Consulting and Engineering RP Procedure RP-D2, Attachments 8 & 15; Container Inspection and Survey Form & Vehicle Survey Record; October 8, 2003

4OA1 Performance Indicator Verification

CR 03141049; Whole Body Count Showed Internal Activity; May 21, 2003

CR 03124013; Termination Whole Body Count Shows Suspected Internal Radioactive Material; May 4, 2003

Radiation Protection Electronic Log; Selective Entries for 2003

PMP-7110-PIP-001; Regulatory Oversight Program Performance Indicators; Revision 1

Electronic Dosimetry Egress Transactions; Selected Transactions for 2003

LIST OF ACRONYMS USED

ALARA	As Low As Is Reasonably Achievable
AV	Apparent Violation
CFR	Code of Federal Regulations
CR	Condition Report
DAW	Dry Active Waste
DOT	Department of Transportation
ED	Electronic Dosimetry
HEPA	High Efficiency Particulate Air
HRA	High Radiation Area
LHRA	Lock High Radiation Area
NCV	Non-Cited Violation
PI	Performance Indicator
RACE	Radiological Application Consulting and Engineering
RP	Radiation Protection
RPT	Radiation Protection Technician
RWP	Radiation Work Permit
SDP	Significance Determination Process
TEDE	Total Effective Dose Equivalent
VHRA	Very High Radiation Area