May 24, 2000

Mr. Oliver D. Kingsley
President, Nuclear Generation Group
Commonwealth Edison Company
ATTN: Regulatory Services
Executive Towers West III
1400 Opus Place, Suite 500
Downers Grove, IL 60515

SUBJECT: NRC RADIATION PROTECTION INSPECTION REPORT
50-456/2000004(DRS); 50-457/2000004(DRS)

Dear Mr. Kingsley:

On May 12, 2000, the NRC completed an inspection of your Braidwood Nuclear Generating Station, Units 1 and 2. A meeting was conducted at the Braidwood Station at the conclusion of the onsite inspection on March 24, 2000, and the preliminary inspection findings were discussed. Your staff provided additional information and documentation between March 29 and May 10, 2000, which was reviewed in the Region III office. On May 12, 2000, a telephone conversation was conducted with Mr. Allan Haeger to discuss the results of that review. The enclosed report summarizes the results of that inspection.

The inspection was an examination of activities conducted under your license as they relate to radiation safety and to compliance with the Commission's rules and regulations and with the conditions of your license. Specifically, the inspection focused on the implementation of the radiation protection program during the Unit 1 refueling outage (A1R08) and included a review of outage radiological planning and dose management, implementation of the as-low-as-is-reasonably-achievable (ALARA) program, the control and oversight of radiological work, radiation worker performance, and radiation protection program assessment activities. An incident involving unplanned uptakes of radioactive material that occurred at the end of the outage was also reviewed. Within these areas, the inspection consisted of selective examinations of procedures and representative records, observations, independent measurements and interviews with station and contractor personnel.

Overall, the radiation protection program was generally implemented effectively during the refueling outage. In most instances, ALARA initiatives, job planning, and control of radiological work generally contributed to improved outage dose management. We also concluded that radiation protection staff performance was generally consistent throughout the outage. However, the planning for the reactor cavity decontamination work demonstrated a weakness in your ALARA program. Specifically, cavity decontamination work was conducted without well defined radiological conditions, consequently, radiological controls were not adequate. As a result, 13 workers involved in the work received small uptakes of radioactive material and 21 workers were externally contaminated. While the event did not produce significant dose consequences, workers were subject to increased radiological risk.

Based on the results of this inspection, the NRC has determined that one violation of NRC requirements occurred concerning the failure to perform an adequate radiological survey as required by 10 CFR 20.1501. This violation is being treated as a Non-Cited Violation (NCV), consistent with Section VII.B.1 of the NRC Enforcement Policy that was in effect at the

beginning of the inspection. The NCV is described in the subject inspection report. If you contest the violation or the severity level of this NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, Region III, and the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

In accordance with 10 CFR 2.790 of the NRC'S "Rules of Practice," a copy of this letter, its enclosure, and your response if you choose to respond, will be placed in the NRC Public Electronic Reading Room (PERR) link at the NRC home page, namely http://www.nrc.gov/NRC/ADAMS/index.html.

We will gladly discuss any questions you have concerning this inspection.

Sincerely,

/RA/

Wayne Slawinski, Acting Chief
Plant Support Branch

Docket Nos. 50-456; 50-457
License Nos. NPF-72; NPF-77

Enclosure: Inspection Report 50-456/2000004(DRS);
50-457/2000004(DRS)

cc w/encl: D. Helwig, Senior Vice President, Nuclear Services
C. Crane, Senior Vice President, Nuclear Operations
H. Stanley, Vice President, Nuclear Operations
R. Krich, Vice President, Regulatory Services
DCD - Licensing
T. Tulon, Site Vice President
K. Schwartz, Station Manager
T. Simpkin, Regulatory Assurance Supervisor
M. Aguilar, Assistant Attorney General
State Liaison Officer
Chairman, Illinois Commerce Commission

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-456; 50-457
License Nos:	NPF-72; NPF-77
Report No:	50-456/2000004(DRS); 50-457/2000004(DRS)
Licensee:	Commonwealth Edison Company
Facility:	Braidwood Nuclear Plant, Units 1 and 2
Location:	35100 South Route 53 Suite 84 Braceville, IL 60407-9617
Inspection Dates:	March 20 to 24, 2000, (onsite) with continued in-office review through May 12, 2000
Inspectors:	John House, Senior Radiation Specialist Mark Mitchell, Radiation Specialist
Approved by:	Wayne Slawinski, Acting Chief, Plant Support Branch Division of Reactor Safety

EXECUTIVE SUMMARY

Braidwood Generating Station, Units 1 & 2
NRC Inspection Report 50-456/2000004(DRS); 50-457/2000004(DRS)

This routine, announced inspection evaluated the effectiveness of the licensee's radiation protection (RP) program during the Unit 1 refueling outage and focused on dose management and implementation of the as-low-as-is-reasonably-achievable (ALARA) program, the control and oversight of radiological work, radiation worker (radworker) performance and source term reduction initiatives. An intake incident that occurred late in the outage was also reviewed. The following conclusions were made in these areas:

Plant Support

- The RP department was actively involved in the work planning process, and a generally effective interface with outage planning and the outage control center (OCC) existed. Outage dose was maintained reasonably close to the goal. Effective dose management practices and ALARA initiatives contributed to outage performance (Section R1.1).

- Reactor cavity decontamination work was allowed to take place without well defined radiological conditions. One non-cited violation was identified concerning an inadequate evaluation of the airborne concentrations in the reactor cavity during decontamination of the cavity walls and reactor vessel flange. This resulted in uptakes of radioactive material to 13 workers and 21 workers were externally contaminated (Section R1.2).

- The ALARA program was generally implemented effectively, as ALARA planning was well developed and ALARA initiatives and associated engineering controls were properly established in most instances. Efforts to minimize dose, prevent the intake of radioactive materials and limit personnel contamination events were generally successful (Section R1.3).

- Radiation protection staff oversight and control of radiological work and management of RP resources for the outage was effective (Section R1.4).

- Source term reduction strategies continued to be implemented effectively. Radiation protection staff response to elevated activity levels in the primary system following shut down was timely and appropriate (Section R1.5).

- Radworker performance was adequate and consistent. Minor problems were properly addressed by the RP staff (Section R4.1).

- Radiological postings were well maintained and accurately reflected the area radiological conditions. High and locked high radiation areas were controlled consistent with station procedures and regulatory requirements. Appropriate contamination control practices were in use, and radiological controls for work activities were adequate (Section R4.2).

- The licensee provided adequate training for contract RP technicians, which supplemented its staff for the outage. In addition, the licensee's rigorous selection process ensured that required qualifications were met (Section R5.1).

- The RP self assessment was detailed, and findings were incorporated into RP coverage for the outage. Nuclear Oversight assessment activities for the outage were effective in identifying and following the resolution of RP issues (Section R7.1).

Report Details

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Radiological Planning for the Refueling Outage

a. Inspection Scope (83750)

The inspectors evaluated the radiological planning and dose goal development for the ongoing refueling outage (A1R08). The assessment consisted of discussions with the radiation protection (RP) staff; a review of the outage work scope issues, dose projections, work scheduling information and planning practices; and observations of work control processes.

b. Observations and Findings

Radiation protection department outage planning was integrated into the daily planning organization for the outage. Work requests were adequately screened by the RP department and the outage planning organization. Radiation dose estimates were generated from job history files, plant radiological information and industry data. A dose reduction plan, termed “Gap Analysis”, was employed in the job planning process. Work projects were reviewed by the as-low-as-is-reasonably-achievable (ALARA) staff, and an extensive dose estimation and refinement process (gap analysis) was applied to the work projects. Emergent work or changes in job conditions required that the RP department work together with the outage planning organization to ensure that radiological aspects of the job were evaluated prior to initiation. This was evidenced by the additional shielding placed on the refuel bridge following the elevated dose rates that occurred as a result of problems experienced with the shut down chemistry process (Section 1.5). The inspectors noted that, in general, an adequate radiological interface existed between RP and the outage planning organization and that appropriate radiological involvement in job planning existed. In addition, the RP staff was an integral part of the outage control center (OCC) which provided for the exchange of radiological information and ensured that the radiological impact of proposed activities was considered before work was directed to take place. This process was effective for most of the outage.

One exception to the overall outage planning effectiveness was the decontamination (decon) of the reactor vessel flange and reactor cavity following drain down. The planning of this evolution failed to account for airborne contamination, and several workers received unplanned uptakes of radioactive material (Section 1.2).

The licensee’s dose goal for A1R08 was 89 rem, which was a challenging goal given the scope of primary side steam generator inspection work. The most radiologically significant outage activity was the inspection of the primary side of the steam generators which had a target dose goal of 26 rem. Other significant jobs included containment maintenance (7.4 rem) general scaffold work (6.2 rem) and RP surveillance activities

(6.0 rem). The total dose for the outage was 96.7 rem which was above the outage goal. The inspectors found that, in general, the RP department's ALARA planning and work control practices had minimized dose.

c. Conclusions

The RP department was actively involved in the work planning process, and a generally effective interface with outage planning and the OCC existed. Outage dose was maintained reasonably close to the goal. Effective dose management practices and ALARA initiatives contributed to outage performance. However, the RP organization and the OCC did not adequately plan for the reactor cavity decon job.

R1.2 Review of Reactor Cavity Decontamination Uptake Incident

a. Inspection Scope (IP 83750)

The inspectors reviewed the circumstances surrounding personnel contaminations and uptakes of radioactive material that took place late in the Unit 1 refueling outage on March 29, 2000, while workers were decontaminating the reactor cavity and the reactor vessel flange. The inspectors reviewed the licensee's investigation of the event; evaluated the post incident total effective dose equivalent (TEDE) ALARA evaluation; reviewed supporting documentation; and discussed the event with RP management.

b. Observations and Findings

On Wednesday, March 29, 2000, at approximately 0815 hours, two ComEd radiation protection technicians (RPTs) entered the reactor cavity to perform a radiological survey and to begin cleaning the vessel flange. The reactor coolant level was just below the reactor vessel flange, and the reactor head was suspended approximately two feet above the flange. A maintenance supervisor and a quality control (QC) inspector then inspected the flange for cleanliness. The reactor head was set on the flange, and two laborers entered the cavity to decontaminate (decon) the lower walls of the reactor cavity. At approximately 0920 hours, the vessel coolant level reduction began for subsequent maintenance work. Other personnel then entered the cavity to remove equipment and to begin pressure washing portions of the cavity. After completing one rinse of the upper portion of the cavity, the RP supervisor (RPS) contacted the station ALARA analyst to report that the rinse did not appear to be reducing dose rates and that dose rates following the first rinse were approximately twice normal. At approximately 1020 hours, the two RPTs had reached 80 per cent of their daily exposure allowed by the radiation work permit (RWP) and exited the cavity. At 1030 hours, the ALARA analyst notified the radiation protection manager (RPM) about the higher than expected dose rates following the first cavity wall rinse. The RPS and the RPM discussed the potential reasons for the higher than expected dose rates, which included reduced vessel level and elevated contamination levels. It was subsequently decided to observe the effects of further draining and decon efforts in order to determine the cause. At approximately 1115 hours, the RPS was notified that internal radioactive contamination had been detected in the two RPTs that entered the cavity earlier. Over the next 30 minutes, other workers involved in cavity work activities were reported to have external and/or internal contamination. At 1150 hours, based on the contamination events and

the unknown radiological conditions, the RPS contacted the RPM and stopped work in the cavity.

Upon exiting the reactor cavity after performing post drain down cavity decon, several individuals alarmed the portal contamination monitors at containment access control. Facial contamination was found on the individuals, and whole body counts were started. Individuals were body counted and an internal dose assessment was performed using the highest whole body count, resulting in the most conservative dose estimate. Based on the dose assessment performed by the licensee's corporate HP staff and an evaluation of the radiological work conditions, the individuals were allowed to return to the cavity to finish their work. The RWP was revised to require the use of respirators. The licensee initially estimated that the total collective dose for all uptakes was less than 38 millirem.

This event continues to be reviewed by the licensee and a root cause investigation has been initiated. Preliminary information indicated that there was a failure to adequately address and evaluate the radiological conditions in the reactor cavity prior to the decontamination effort. For example, there was insufficient smear survey data for beta/gamma emitting radioisotopes present in the reactor cavity. Also, there were no radiological surveys analyzed for potential airborne alpha contamination which would verify the absence of transuranic elements. Following the personnel uptakes of radioactive material, the licensee performed a TEDE ALARA evaluation of the radiological conditions in the cavity. Using very conservative data and taking no credit for engineering controls, this evaluation indicated that airborne concentrations of 62.5 derived air concentrations (DACs) could have been present during the cavity work. However, the evaluation was based on radioisotopes (activation products) known to be present during previous outage conditions and did not consider the possibility of transuranic radioisotopes. The evaluation determined that respiratory protection equipment should have been used.

The licensee based their decision to not analyze smear surveys for alpha emitting radioisotopes on their fuel integrity program. A licensee representative stated that there had been no indication of failed fuel for several operating cycles and that smears taken as part of the RP monthly plant survey did not show the presence of alpha activity. The licensee's weekly reactor coolant analyses for alpha activity had also been negative. The NRC inspectors performed an independent review of the licensee's smear survey analyses for gamma emitters and could find no evidence of any isotope that would indicate the presence of transuranic elements. Based on this evidence, the inspectors concluded that the probability of airborne transuranic radioisotopes being present during the cavity work was extremely small, and that there had been no substantial potential for worker overexposure.

Allowing work in the reactor cavity where the radiological conditions were not well defined resulted in low level radioactive material uptakes by 13 persons plus 21 personnel contaminations. Although the event did not result in significant uptakes of radioactive material, the workers were subject to increased radiological risk. The licensee's ALARA program functioned well during most of the outage, however, the failure to perform an adequate survey prior to the cavity decon work represented a major breakdown in this program. The licensee's failure to fully assess the potential

presence of transuranic elements further exacerbated the situation.

10 CFR 20.1501 requires that each licensee make or cause to be made surveys that may be necessary for the licensee to comply with the regulations in Part 20 and that are reasonable under the circumstances to evaluate the extent of radiation levels, concentrations or quantities of radioactive materials, and to the potential radiological hazards that could be present. Pursuant to 10 CFR 20.1003, *survey* means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation. The failure to adequately evaluate the airborne concentrations of radioisotopes in the cavity prior to the decon work was a violation of 10 CFR 20.1501, to demonstrate compliance with the dose limits in 10 CFR 20.1201(a)(1)(i). This Severity Level IV violation is being treated as a Non-Cited Violation (NCV), consistent with Section VII.B.1 of the NRC Enforcement Policy (NCV 50-456/2000004-01(DRS); (NCV 50-457/2000004-01(DRS).

This failure to perform an adequate survey was licensee identified, documented in problem identification form A2000-01611 and was subjected to a root cause analysis. Based on the results of the licensee investigation and the ongoing root cause analysis and the corrective actions, this item is closed.

c. Conclusions

One non-cited violation was identified concerning an inadequate evaluation of the airborne concentrations in the reactor cavity during decontamination of the cavity walls and reactor vessel flange. This resulted in worker uptakes of radioactive material.

R1.3 ALARA Program Implementation

a. Inspection Scope (83750)

The inspectors evaluated the effectiveness of the licensee's radiological engineering controls and work practices and the results of efforts to reduce dose and implement the ALARA program for A1R08. The inspectors interviewed radiation workers (radworkers) and members of the RP staff; reviewed job planning and associated total effective dose equivalent (TEDE) ALARA evaluations, radiation work permits (RWPs) and applicable procedures; and observed ongoing work throughout the station.

b. Observations and Findings

Radiation work permits, TEDE ALARA evaluations and dose expenditure information for the following outage work activities were reviewed:

- Steam Generator Eddy Current Testing Set-up,
- Steam Generator Diaphragm Removal,
- Steam Generator Nozzle Dam Cover Placement, and
- Assorted Primary System Valve Repairs and Replacements.

Job planning and associated ALARA evaluations were generally thorough and

addressed the potential job hazards. Lessons learned and industry experiences were used in ALARA plans, including industry operating experiences. For example, problems experienced in steam generator platform contamination, identified during the Byron station's last outage, were addressed as a lesson learned in the ALARA planning for this outage. The inspectors noted that ALARA plans for large or diverse scope activities and high risk work were divided into individual jobs or job segments and that specific ALARA controls were delineated for each segment, as had been successfully done during prior outages. The RP ALARA planning staff used historical information in job planning. Total effective dose equivalent reduction concepts were used which included planned personnel contaminations.

The inspectors observed the use of engineering controls to reduce general area dose rates which included hydrolazing, use of temporary shielding, and water mixed with other products for use as wetting agents to control the dispersal of surface area contamination. The use of specialty surface coatings and high efficiency particulate air (HEPA) filter equipped portable ventilation systems were effective in controlling airborne contaminants. Specifically, additional HEPA units were used on the steam generator platforms, and industry experience assisted in establishing proper flow and operating conditions. Remote monitoring systems were in use for tracking high dose/risk jobs and general plant work areas. Initially the staff had difficulty establishing video connections inside the radiologically protected area (RPA) (containment) because the communications staff was diverted to audio communications troubleshooting early in the outage. As the outage progressed, the system provided good coverage of these elevated risk areas. Video images were very sharp, and the cameras could be moved by remote control. As this was the first outage with the use of extensive general area monitoring at the RP access desk, RP personnel had not yet fully established the monitoring program roles for this outage.

The inspectors attended pre-job briefings for several work activities and noted that the briefings were sufficiently thorough and provided the work crew with information necessary to safely complete the job. The radiological technician staff and project supervisors that provided the briefings were knowledgeable of the area work environment and the planned work evolutions. When questions were noted during the briefings regarding methods to be used, the issues were resolved by the RP staff before the job commenced. The contractor ALARA coordinator for the steam generator (S/G) inspection work (vendor performed) had experience in ALARA planning for S/G replacement projects (ComEd) and was very knowledgeable of the S/G inspection process. This was advantageous for pre-job briefings and communication with the station's ALARA personnel.

c. Conclusions

The ALARA program was generally implemented effectively, as ALARA planning was well developed and ALARA initiatives and associated engineering controls were properly established in most instances. Efforts to minimize dose, prevent the intake of radioactive materials and limit personnel contamination events were generally successful.

R1.4 Control and Oversight of Radiological Work

a. Inspection Scope (83750)

The inspectors observed the RP staff's control and oversight of radiological work early in the outage, and attended several RP, steam generator and mechanical maintenance shift turnover meetings.

b. Observations and Findings

Radiological work oversight and job coverage was effective as evidenced by proper implementation of ALARA initiatives, and generally good contamination control and radiation worker (radworker) practices. With the exception of the reactor cavity decon job, there were no significant radiological work related problems that were attributed to inadequate RP staff work control. Radiation protection technicians (RPTs) were observed properly controlling jobs and coaching workers. Control points inside the RPA provided an effective means of communicating with work crews as was evidenced by specific RP control points at the containment entry and missile barrier entrance which were observed by the inspectors.

Radiation protection shift turnover meetings were conducted by the RP outage shift manager twice each day. These meetings effectively conveyed the status of radiological work and clearly established staff priorities for dose reduction and work control. Job activities in each defined work area of the station were discussed during the meetings by the RP supervisor or ALARA engineer responsible for each work area, and turnover issues and specific responsibilities were well defined for the next shift.

The inspectors noted that RP staff questioned workers regarding knowledge of their RWP number and the radiological work conditions associated with it, and the location of low dose waiting areas. No major communication problems were noted between the OCC, refuel floor, containment and the RP staff.

c. Conclusions

Radiation protection staff oversight and control of radiological work and management of RP resources for the outage was effective.

R1.5 Source Term Reduction Program

a. Inspection Scope (83750)

The inspectors reviewed the licensee's plans for area dose rate reduction and evaluated the source term reduction program. The inspectors interviewed RP and chemistry supervisors, reviewed source term data and performed plant walk-downs.

b. Observations and Findings

The RP organization had recently (December 1999) named a new coordinator for the source term reduction program, who was reorganizing the program. For the outage, source term reduction included the shutdown chemistry process, hydrolazing one line,

flushing piping systems and components to reduce hot spots and the use of temporary shielding on equipment including the pressurizer surge line and S/G bowls. A new type of temporary shielding had been acquired. This material, termed "radclad", was in the form of malleable sheets instead of pellets. A licensee representative stated that it provided superior attenuation with less weight.

The licensee's shutdown chemistry evolution did not achieve the reactor coolant activity levels that were anticipated, as the activity levels were not reduced as projected. The Electric Power Research Institute (EPRI) guidelines recommended 0.05 micro-curies per gram (uCi/gm) of coolant activity. The licensee had established a target of 0.065 uCi/gm when the cavity flood up began, but were only able to reduce activity concentrations to approximately 0.090 uCi/gm. The elevated activity resulted in higher dose rates on the refueling floor and, in particular, to operators on the refueling bridge. Although additional filtration was employed in the reactor cavity, the dose rates at the refueling bridge were between 10 and 15 millirem per hour. The RP ALARA planning staff recalculated the dose estimates for the refueling project and, in conjunction with the engineering group, developed a plan for using lead blankets for dose reduction without overloading the refueling bridge. The licensee reacted quickly and performed well in recovering from this problem.

c. Conclusions

Source term reduction strategies continued to be implemented effectively. Radiation protection staff response to elevated activity levels in the primary system following shut down was timely and appropriate.

R4 Staff Knowledge and Performance in RP&C

4.1 Evaluation of Radiation Worker Performance

a. Inspection Scope (83750)

The inspectors evaluated radiation worker (radworker) performance during the refueling outage through direct observation of work practices, discussions with work crews and RP staff, and a review of selected problem identification forms (PIFs).

b. Observations and Findings

The inspectors observed work practices in the containment building, auxiliary building and fuel handling building and found that radworker performance was generally adequate and consistent. Workers properly removed protective clothing or were otherwise coached by members of the RP staff, who were stationed at contaminated area egress locations. Workers also demonstrated proper knowledge of electronic dosimetry alarm set points and awareness of radiological work conditions when questioned by the inspectors. However, the inspectors observed one instance of worker inattentiveness which involved a worker sleeping in an assigned low dose area. Radiation protection management reviewed this isolated incident, made appropriate corrective actions and reviewed the station expectations with outage staff. No violations

of regulatory requirements or station procedures were identified.

The inspectors reviewed selected PIFs generated during the first week of the outage to determine the scope and depth of radiation protection problems identified by the licensee. The review disclosed no negative trends or significant radworker performance problems. Most worker performance problems were minor and caused by knowledge based errors, and corrective actions taken by the RP staff were timely and appeared appropriate.

The licensee used the "greeter" program to ensure that radworkers, especially contractors, were aware of radiological requirements. Workers at containment access were questioned by roving "greeters" (RPTs) about their RWP number, electronic dosimetry set points and radiological work conditions. The "greeters" were an integral part of RP control of workers entering an leaving the main containment access area.

The inspectors reviewed the licensee's response, analysis and corrective actions associated with a sight-glass failure during a charcoal transfer in the radioactive waste building. The event resulted in contaminating the area and a minor personnel contamination. The RP staff response to the event including the associated PIF was adequate.

c. Conclusions

Radworker performance was adequate and consistent. Minor problems were properly identified and addressed by the RP staff.

R4.2 Plant Walk Downs and Other Observations

a. Inspection Scope (83750)

The inspectors conducted several walk downs of the containment, auxiliary and radwaste buildings during the inspection, and reviewed radiological posting and labeling, housekeeping and work control practices.

b. Observations and Findings

Radiological postings for both Units were well maintained. The inspectors determined through independent measurements that radiation and high radiation areas were posted to accurately reflect radiological conditions and that high and locked high radiation areas were controlled consistent with station procedures and regulatory requirements.

Appropriate contamination control practices were established at job sites in the auxiliary building and containment, and ALARA controls for selected jobs witnessed by the inspectors were as prescribed by the RWP. Radiological housekeeping was generally adequate. Hoses and other items that crossed contamination area boundaries were secured properly, and contaminated items were usually bagged and labeled as required. Tools and equipment used in the RPA were controlled consistent with station procedures. Although the containment access control area was crowded with workers at times, the inspectors noted that the RPTs maintained good control.

c. Conclusions

Radiological postings were well maintained and accurately reflected the area radiological conditions. High and locked high radiation areas were controlled consistent with station procedures and regulatory requirements. Appropriate contamination control practices were in use, and radiological controls for work activities were adequate.

R5 Staff Training and Qualifications in RP&C

R5.1 Outage Staffing, Training and Qualifications for the Radiation Protection Organization

a. Inspection Scope (83750)

The inspectors reviewed the qualifications and training of contract RP staff. The inspectors interviewed radiation protection personnel and discussed the training program with the licensee's staff.

b. Observations and Findings

The licensee supplemented the in-house RP staff with 10 contract radiation protection technicians (CRPTs). The CRPTs were assigned to the steam generator inspection project. The RP organization had 35 station HP technicians and 35 technicians from other Commonwealth Edison sites.

Prior to hiring CRPTs, RP supervision reviewed candidate resumes and contacted previous employers to verify experience and references. Industry standardized qualification criteria was established for senior and junior CRPTs. Training requirements included a minimum score of 80 percent on the standardized Northeast Utilities Health Physics Theory Exam and validation of radiological work skills. As part of the on-the-job-training process, CRPTs were required to demonstrate basic RP job skills. Hiring preference was given to HP technicians that had ComEd experience so that the CRPTs would be familiar with licensee practices, procedures and management expectations.

c. Conclusions

The licensee provided adequate training for contract RP technicians, which supplemented its staff for the outage. In addition, the licensee's rigorous selection process ensured that required qualifications were met.

R7 Quality Assurance in RP&C Activities

R7.1 Nuclear Oversight and Self-Assessment Plans for the Outage

a. Inspection Scope (83750)

The inspectors reviewed a Focus Area Self-Assessment for Occupational Exposure, and

discussed Nuclear Oversight's (NO) assessment plans for outage coverage with the Corporate Nuclear Oversight auditor for the radiation protection and chemistry programs.

b. Observations and Findings

The Focus Area Self-Assessment was conducted from February 24 to March 3, 2000, by RP personnel from Corporate RP, the Byron station and by a Braidwood specialist. The assessment concentrated on planning and preparation, training and personnel qualification, external and internal exposure controls, and station readiness in radiation protection for the outage. The assessment found no program deficiencies but did have a number of recommendations for program improvements. Based on the assessment's findings, nine corrective actions were taken to improve RP coverage during the outage.

A Corporate Nuclear Oversight auditor was on site during part of the outage. The Corporate specialist reviewed RP issues that had occurred early in the outage, including worker congestion problems at access control and contractor training on the use of personnel monitors. This followed an observation by NRC inspectors that a contractor employee did not know how to properly exit through the monitor. The shut down chemistry process which resulted in higher reactor coolant activity than expected, and its consequences, (Section 1.5) was also under review by NO.

c. Conclusions

The RP self-assessment was detailed, and findings were incorporated into RP coverage for the outage. Nuclear Oversight assessment activities for the outage were effective in identifying and following the resolution of RP issues.

V. Management Meetings

XI Exit Meeting Summary

The inspectors presented the inspection results to Mr. Schwartz and other licensee management and staff at the conclusion of the site inspection on March 24, 2000. The licensee acknowledged the inspection findings and identified no proprietary information. The inspectors obtained and reviewed additional outage performance information subsequent to the site inspection and further discussed the inspection findings in a teleconference with licensee personnel on May 12, 2000.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

R. Blaine, Radiation Protection Group Leader
M. Cassidy, Regulatory Assurance - NRC Coordinator
J. Eggart, Shielding Coordinator
M. Finney, Radiation Protection Group Leader
A. Haeger, Radiation Protection Manager (Outage Manager)
N. Hightower, Corporate Radiation Protection
W. Israel, Corporate Nuclear Oversight
A. Perez, Outage Scheduler
B. Schramer, Chemistry Manager
K. Schwartz, Station Manager
R. Thacker, Radiation Protection Outage Manager
T. Tulon, Site Vice-President
P. Vitalis, Duty Health Physicist

INSPECTION PROCEDURES USED

IP 83750	Occupational Radiation Exposure

ITEMS OPENED AND CLOSED

Opened and Closed

50-456/2000004-01	NCV	Failure to perform an adequate survey of the reactor cavity.
50-457/2000004-01	NCV	Failure to perform an adequate survey of the reactor cavity.

LIST OF ACRONYMS USED

ALARA	As-Low-As-Is-Reasonably-Achievable
CFR	Code of Federal Regulations
CRPT	Contractor Radiation Protection Technician
DRS	Division of Reactor Safety
EPRI	Electric Power Research Institute
HEPA	High Efficiency Particle
NCV	Non Cited Violation
NO	Nuclear Oversight
NRC	Nuclear Regulatory Commission
OCC	Outage Control Center
PIF	Problem Identification Form
QA	Quality Assurance
RP	Radiation Protection
RPA	Radiologically Protected Area
RPM	Radiation Protection Manager
RPS	Radiation Protection Supervisor
RPT	Radiation Protection Technician
RWP	Radiation Work Permit
S/G	Steam Generator
TEDE	Total Effective Dose Equivalent

PARTIAL LIST OF DOCUMENTS REVIEWED

Station Procedures

BwRP5000-4: "Procedure for Processing of Contract Radiation Protection Technicians," Revision 2, February 1997
NRP 5000-4: "Procedure for Processing of Contract Radiation Protection Technicians," Revision 2, February 1997
BwCP PD-1, "Braidwood Station Primary Chemistry Surveillance Program," Revision 10, May 11, 1999

RWPs and ALARA Plans

RWP 00-4076 ALARA Action Review/Pre-Job Briefing: Steam Generator Eddy Current Testing and Robotic Repair
RWP 004042 Action Planning and Review Form: Unit 1 Containment 412' Charging Area Valve Work, March 17, 2000
Example of Gap Analysis for A1R08 Dose Reduction Plan
ALARA Action Plans for A1R08

Investigation Reports and PIFs

Chronology of Events, Reactor Cavity Decontamination
PIF A2000-01611, Unplanned Internal Contamination During Cavity Decontamination, March 29, 2000.
TEDE-ALARA Evaluation For Second Cavity Entry, March 29, 2000.
Root Cause Report "Unplanned Intakes and Personnel Contaminations During Cavity Decon Due to a Failure to Adequately Characterize Radiological Conditions," Revision 2, May 8, 2000.

Other Documents

Braidwood Station Policy Memorandum No. BR-011, Attentiveness To Duty, Revision 0, February 23, 2000.
ComEd's Nuclear Fitness For Duty Program, Revision 3, August 22, 1984.
"Focus Area Self-Assessment, Occupational Exposure," March 23, 2000.
"Initiative RD-3: Reduce The Source," Revision 1, November 8, 1999.
Braidwood Source Term Reduction Plan.