December 19, 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: QUAD CITIES INSPECTION REPORT 50-254/00-15(DRP), 50-265/00-15(DRP)

Dear Mr. Kingsley:

On November 20, 2000, the NRC completed an inspection at your Quad Cities Units 1 and 2 reactor facilities. The results were discussed with Mr. Dimmette and other members of your staff. The enclosed report presents the results of that inspection.

The inspection was an examination of activities conducted under your license as they relate to safety and to compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, the inspectors identified four issues of very low risk significance (GREEN) and an adverse trend in human performance which constituted a cross cutting issue (NO COLOR). These issues contain examples of three separate violations of NRC requirements. However, because of their very low safety significance and because they have been entered into your corrective action program, the NRC is treating these issues as Non-Cited Violations in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny the Non-Cited Violations, you should provide a response with the basis for your denial within 30 days of the date of this inspection report, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with a copy to the Regional Administrator, Region III, the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001 and the NRC Resident Inspector at the Quad Cities facility.

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/NRC/ADAMS/index.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Mark A. Ring, Chief
Reactor Projects Branch 1

Docket Nos. 50-254; 50-265
License Nos. DPR-29; DPR-30

Enclosure: Inspection Report 50-254/00-15(DRP),
50-265/00-15(DRP)

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REGION III

Docket Nos:	50-254, 50-265
License Nos:	DPR-29, DPR-30
Report No:	50-254/00-15(DRP), 50-265/00-15(DRP)
Licensee:	Commonwealth Edison Company (ComEd)
Facility:	Quad Cities Nuclear Power Station, Units 1 and 2
Location:	22710 206th Avenue North Cordova, IL 61242
Dates:	October 1 through November 20, 2000
Inspectors:	C. Miller, Senior Resident Inspector J. Adams, Resident Inspector
Approved by:	Mark Ring, Chief Reactor Projects Branch 1 Division of Reactor Projects

NRC's REVISED REACTOR OVERSIGHT PROCESS

The federal Nuclear Regulatory Commission (NRC) recently revamped its inspection, assessment, and enforcement programs for commercial nuclear power plants. The new process takes into account improvements in the performance of the nuclear industry over the past 25 years and improved approaches of inspecting and assessing safety performance at NRC licensed plants.

The new process monitors licensee performance in three broad areas (called strategic performance areas): reactor safety (avoiding accidents and reducing the consequences of accidents if they occur), radiation safety (protecting plant employees and the public during routine operations), and safeguards (protecting the plant against sabotage or other security threats). The process focuses on licensee performance within each of seven cornerstones of safety in the three areas:

Reactor Safety	Radiation Safety	Safeguards
● Initiating Events	● Occupational	● Physical Protection
● Mitigating Systems	● Public	
● Barrier Integrity		
● Emergency Preparedness		

To monitor these seven cornerstones of safety, the NRC uses two processes that generate information about the safety significance of plant operations: inspections and performance indicators. Inspection findings will be evaluated according to their potential significance for safety, using the Significance Determination Process, and assigned colors of GREEN, WHITE, YELLOW or RED. GREEN findings are indicative of issues that, while they may not be desirable, represent very low safety significance. WHITE findings indicate issues that are of low to moderate safety significance. YELLOW findings are issues that are of substantial safety significance. RED findings represent issues that are of high safety significance with a significant reduction in safety margin.

Performance indicator data will be compared to established criteria for measuring licensee performance in terms of potential safety. Based on prescribed thresholds, the indicators will be classified by color representing varying levels of performance and incremental degradation in safety: GREEN, WHITE, YELLOW, and RED. GREEN indicators represent performance at a level requiring no additional NRC oversight beyond the baseline inspections. WHITE corresponds to performance that may result in increased NRC oversight. YELLOW represents performance that minimally reduces safety margin and requires even more NRC oversight. And RED indicates performance that represents a significant reduction in safety margin but still provides adequate protection to public health and safety.

The assessment process integrates performance indicators and inspection so the agency can reach objective conclusions regarding overall plant performance. The agency will use an Action Matrix to determine in a systematic, predictable manner which regulatory actions should be taken based on a licensee's performance. The NRC's actions in response to the significance (as represented by the color) of issues will be the same for performance indicators as for inspection findings. As a licensee's safety performance degrades, the NRC will take more and increasingly significant action, which can include shutting down a plant, as described in the Action Matrix.

More information can be found at: http://www.nrc.gov/NRR/OVERSIGHT/index.html.

SUMMARY OF FINDINGS

IR 05000254-00-15, 05000265-00-15 on 10/01-11/20/2000, ComEd, Quad Cities Nuclear Power Station, Units 1 & 2, Post Maintenance Testing, Refueling and Outage Activities, and Event Follow-up.

The inspection was conducted by resident inspectors. This inspection identified four GREEN issues and one NO COLOR issue, four of these issues involved three Non-Cited Violations. The significance of issues is indicated by their color (GREEN, WHITE, YELLOW, RED) and was determined by the Significance Determination Process.

Cornerstone: Mitigating Systems

- GREEN. On October 4, 2000, the licensee identified that surveillance testing for torus temperature instrumentation components required by Technical Specification 4.2.F.1 had not been performed since installation in 1990 and 1991. Condition Report Q2000-03512 was written to address the issue. Failure to perform testing of the instrumentation was considered a **Non-Cited Violation (50-254/00-15-03; 50-265/00-15-03)** of Technical Specification 4.2.F.1, consistent with Section VI.A.1 of the May 1, 2000, Enforcement Policy (Section 4OA3).

  Failure to check instrument accuracy by this 18-month surveillance for Unit 1 and Unit 2 involved very low risk (GREEN) because when the surveillance was subsequently performed, instrument accuracy of the temperature indication loop was within acceptable tolerance.

- GREEN. On November 3, 2000, the 1B channel of the reactor protective system flow biased neutron flux trip was found to be inoperable during reactor startup from the Unit 1 refueling outage 16. The licensee determined that poor wiring practices, poor second verification practices, and inadequate post maintenance testing of nuclear instrumentation wiring led to the malfunction. Maintenance workers failed to follow the wiring requirements in the work request, did not use lift and land sheets when removing and re-terminating the wires, and failed to label the wires which were lifted during the maintenance activity. Failure to follow the procedure (work request) for wiring was considered an example of a **Non-Cited Violation (50-254/00-15-01a)** of Technical Specification 6.8.A, consistent with Section VI.A.1 of the May 1, 2000, Enforcement Policy. This issue was entered into the licensee's corrective action program by Condition Reports Q2000-04070 and 04071. In addition to the initial wiring error, workers also failed to properly perform a second verification of the wiring and an erroneous assumption led to the failure to perform post maintenance testing on this circuitry. The combination of these errors led to the inoperable trip channel (Section1R19).

  The risk significance of this event was very low (GREEN) because of the short amount of time that the unit was in Mode 1, because the "A" channel of flow biased trip setpoints was still operable, and because the wiring error actually caused the flow biased neutron flux trip to be more conservative.

Cornerstone: Barrier Integrity

- GREEN. On October 14, 2000, during disassembly of the Unit 1 reactor for refueling outage 16, reactor service technicians opened a flanged connection of the reactor head vent piping with approximately 5 to 8 psig steam pressure still in the reactor vessel and initiated a steam release to the refueling floor area which lasted for several hours. Numerous procedural, process, and communication problems contributed to the event. Personnel safety, procedure adherence, procedure adequacy, and lack of control of reactor vessel disassembly activities were all concerns brought out by this event. The failure to follow procedures during vessel disassembly was considered an example of a **Non-Cited Violation (50-254/00-15-01b)** of Technical Specification 6.8.A. An inadequate procedure for vessel disassembly was considered an example of a **Non-Cited Violation (50-254/00-15-02a)** of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings" (Section 1R20).

  The risk significance was evaluated as very low (GREEN) because the amount of reactor vessel inventory released to secondary containment was very low, and secondary containment integrity requirements were met.

- GREEN. On October 22, 2000, workers attempting to replace a local power range monitor inadvertently lifted the local power range monitor tube off its seat in the reactor vessel bottom head. This caused highly contaminated radioactive water from the bottom of the reactor vessel to drain directly onto the workers. The draining stopped immediately after the local power range monitor tube was released and reseated back into the vessel. One worker was contaminated such that a meter held to his body read 5 rem per hour on contact. Extraordinary actions by radiation protection workers resulted in the removal of the majority of the highly contaminated material quickly, such that the overall external shallow dose equivalent for the individual was estimated at 2.784 rem, and the internal dose received by the worker was estimated at 45 millirem. Problems involved in this event included workers not adhering to the instructions by radiation protection technicians, workers not having procedures with them and performing steps of two different procedures concurrently, and workers not informing operators or radiation protection technicians that they were taking actions that could allow water to be drained from the reactor vessel. In addition, the procedures were not adequate to control the work. The failure to follow procedures during local power range monitor replacement was considered an example of a **Non-Cited Violation (50-254/00-15-01c)** of Technical Specification 6.8.A. An inadequate procedure for local power range monitor replacement was considered an example of a **Non-Cited Violation (50-254/00-15-02b)** of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings" (Section 1R20).

  The safety significance of this event was very low (GREEN) because sufficient makeup capacity to fill the vessel was available even if the local power range monitor failed to reseat, the local power range monitor tube was reseated quickly and the reactor vessel drainage stopped, and the contamination was mostly external and was removed quickly.

Cross-cutting Issues: Human Performance

- NO COLOR. The inspectors found that a number of human performance errors during the Q1R16 refueling outage period, October 14 to November 3, resulted in undesirable consequences and constituted an adverse trend in human performance. These errors resulted from problems with procedure adherence, control of work activities, communications, and procedure quality. Resulting problems included venting the pressurized reactor to containment near maintenance workers who were not adequately prepared for the subsequent release of steam and contamination, inadvertently draining from the reactor vessel bottom head area resulting in significant personnel contamination, and a number of wiring and second verification errors during electrical modifications and maintenance. Although most of these wiring errors were caught and corrected during testing, one error was not caught and resulted in the inoperability of one of two channels of the reactor protective system flow biased trips.

  While none of these events resulted in equipment performance outside the licensee response band (GREEN), the overall trend indicated problems with adhering to procedures, proper performance of second verification techniques, and the communication and coordination of activities (Section 4OA4).

Report Details

1. REACTOR SAFETY

Plant Status

Unit 1 began the period operating at 84 percent power due to end-of-cycle coastdown. On October 14 operators shut down Unit 1 and commenced refueling outage Q1R16. Unit 1 was synchronized to the grid on November 3 and achieved full power on November 6. Operators reduced reactor power to 95 percent on November 6 due to observed oscillations on the 1B reactor recirculation motor generator set and associated recirculation pump. On November 12 and 13 corrective maintenance activities resulted in two trips of the 1B reactor recirculation pump and single recirculation loop operation. Between November 6 and the end of the period, operators varied reactor power from 30 percent to 98 percent to support single recirculation loop operation, troubleshooting of the 1B reactor recirculation motor generator speed control circuitry, and the replacement of the associated voltage regulator. At the end of the period, Unit 1 was operating at 98 percent power with both reactor recirculation loops in operation.

Unit 2 operated throughout the period at or near 95 percent power due to oscillations of the Number 3 turbine control valve. On October 1 and November 11 operators reduced power to 30 percent to perform troubleshooting and corrective maintenance activities on the Number 3 turbine control valve. Operators maintained Unit 2 at or near 98 percent power for the remainder of the period pending resolution of the Number 3 turbine control valve oscillation problem.

1R04 Equipment Alignments (71111.04)

a. Inspection Scope

The inspectors verified the system alignments of the accessible portions of the listed systems. During the walkdowns, the inspectors verified the system lineup and system operating parameters (i.e., temperature, pressure, flow, etc.). In addition, the inspectors reviewed design and licensing information and discussed system performance with licensee personnel. The inspectors reviewed system alignments related to the Mitigating Systems Cornerstone for the following risk important systems while the alternate train was not available:

- Unit 2 emergency diesel generator; and
- Unit 2 residual heat removal service water “B” train.

b. Issues and Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05)

a. Inspection Scope

The inspectors performed walkdowns to look for fire protection impairments in the following areas related to the Mitigating System Cornerstone:

- Appendix R modifications for 125 Vdc, cable tunnels, and other turbine building locations.

b. Issues and Findings

No findings of significance were identified.

1R07 Heat Sink Performance (71111.07)

a. Inspection Scope

The inspectors observed the licensee perform an inspection of the Unit 1 Emergency Diesel Generator Heat Exchangers 1-6661-A and B. During this inspection, the inspectors observed the as-found condition of the heat exchangers and looked for deficiencies that might mask any degraded performance. Additionally, inspectors looked for conditions that could indicate a potential for common cause problems. The inspectors reviewed Quad Cities Technical Procedure 0820-10, "Heat Exchanger and Room Cooler Inspection," Revision 1, and discussed the as-found condition and historical performance of the Unit 1 emergency diesel generator heat exchangers with engineering personnel.

b. Issues and Findings

No findings of significance were identified.

1R12 Maintenance Rule Implementation (71111.12)

a. Inspection Scope

Residual Heat Removal

The inspectors reviewed the licensee's implementation of the maintenance rule requirements as applied to the Unit 1 residual heat removal system, including a review of scoping, goal setting, performance monitoring, short-term and long-term corrective actions, current equipment performance status, and changes to system performance criteria.

The inspectors reviewed the following Unit 1 residual heat removal condition reports for proper maintenance rule classifications: Q2000-03596, Q2000-03387, Q2000-03300, Q2000-00566, and Q2000-00326. The inspectors also reviewed an operability determination for Q2000-03387 and the expert panel meeting minutes for January 13, 2000. The inspectors discussed Unit 1 residual heat removal system performance with the maintenance rule coordinator.

The 4 kV Bus Tie

The inspectors reviewed the change in performance criteria for the 4kV bus-tie function which the licensee instituted following a breaker failure discussed in Condition Report Q2000-04143.

b. Issues and Findings

No findings of significance were identified.

1R13 Maintenance Risk and Emergent Work (71111.13)

a. Inspection Scope

The inspectors reviewed the licensee's evaluation of plant risk and equipment configuration associated with the performance of emergent and planned maintenance activities on the Unit 1 "B" reactor recirculation motor generator set following the observation of speed oscillations by plant operators. The inspectors observed the licensee's maintenance planning, control of troubleshooting, and corrective maintenance activities. The inspectors discussed the associated maintenance activities with electrical maintenance, work planners, system engineers, and station management.

b. Issues and Findings

No findings of significance were identified.

1R14 Nonroutine Plant Evolutions (71111.14)

.1 Vessel Disassembly

a. Inspection Scope

The inspectors reviewed the circumstances involving a breach of the primary system on October 14, 2000, with about 5 to 8 pounds of pressure in the reactor vessel.

b. Issues and Findings

Details of this event are included in Section 1R20 of this report.

.2 Operator Response to the Trip of the 1B Reactor Recirculation Pump

a. Inspection Scope

The inspectors reviewed events surrounding the trip of the 1B reactor recirculation pump on November 12. The inspectors reviewed the licensee's sequence of events report, operator logs, actions taken by the control room operators, and corrective actions. The inspectors reviewed Quad Cities Abnormal Operating Procedure 0202-04, "Loss of Flow - Single Pump," Revision 13; and Condition Report Q2000-04137, which entered the event

into the corrective action program. The inspectors discussed the event with control room operators and supervisors.

b. Issues and Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15)

a. Inspection Scope

The inspectors reviewed the following operability evaluations and condition reports associated with the Unit 1 residual heat removal and Unit 2 core spray mitigating systems:

- Periodic High Seal Flow on the 1B Residual Heat Removal Pump;
- Condition Report Q2000-04064, "Residual Heat Removal Pump High Seal Leak";
- Condition Report Q2000-03203, "1B Residual Heat Removal Pump High Seal Leak";
- Core Spray "A" Loop Torus Suction Motor Operated Isolation Valve, MO-1402-3A As-Found Thrust Values Exceeded Calculated Design Structural Limits; and
- Condition Report Q2000-03220, "As-Found Thrust Exceeded VOTES Testing Procedural Limits for Motor Operated Valve 2-1402-3A."

The inspectors also discussed the operability issues with engineering personnel.

b. Issues and Findings

No findings of significance were identified.

1R16 Cumulative Effects of Operator Work-Arounds (71111.16)

a. Inspection Scope

The inspectors performed a review of the cumulative effect of operator work-arounds and challenges with respect to the reliability and availability of mitigating systems. During the review, the inspectors considered the cumulative effect of operator work-arounds and challenges on the potential for the mis-operation of a system, for any increase in initiating event frequency, and on the ability of operators to respond in a correct and timely manner to plant transients and accidents.

b. Observations and Findings

No findings of significance were identified.

1R19 Post Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors reviewed post maintenance test packages from the following work in the Mitigating Systems Cornerstone:

- Unit 1- WR 990150722-01 Nuclear Instrumentation Power Cabling Replacement.

b. Issues and Findings

On November 3 the 1B channel of the reactor protective system flow biased neutron flux trip was found to be inoperable during reactor startup from the Unit 1 refueling outage 16. Poor wiring practices, poor second verification practices, and inadequate post maintenance testing of nuclear instrumentation wiring led to the malfunction. Maintenance workers failed to follow wiring requirements at TB-12 in Work Request 990150772-01. The work request was considered a procedure for performing maintenance as specified by Regulatory Guide 1.33, Appendix A, Section 9 and required by Quad Cities Technical Specification 6.8.A. In addition to mis-wiring the leads at the terminal, the workers did not use lift and land sheets when removing and re-terminating the wires, and failed to label the wires which were lifted during the maintenance activity. The licensee wrote Condition Reports Q2000-04070 and Q2000-04071 to address issues related to the neutron flux trip. Failure to follow Work Request **o** 990150772-01 was considered an example of a **Non-Cited Violation (50-254/00-15-01a)** of Technical Specification Section 6.8.A, consistent with Section VI.A.1 of the May 1, 2000, Enforcement Policy. In addition to these problems, workers also failed to properly perform a second verification for wiring performed by the work request and an erroneous assumption led to the failure to perform post maintenance testing. The combination of these errors led to the inoperability of the setpoints for the 1B channel of the flow biased neutron flux trip.

Operators took appropriate action after determining the flux trip channel was inoperable. However, during the time the system was inoperable, Unit 1 had changed modes from Mode 2 to Mode 1. The limiting condition for operations section of Technical Specification Table 3.1.A-1, 2.b required the flow bias neutron flux trip to be operable in Mode 1. Technical Specification 3.0.D. prohibited changing modes when the limiting condition for operation was not met. The risk significance of this event was very low (GREEN) because of the short amount of time that the unit was in Mode 1 with the wiring error, because the A channel was operable, and because the wiring error actually caused the flow biased neutron flux trip to be more conservative.

The inspectors discussed with maintenance supervision the reason the error was not discovered before the system was returned to service. Page 1 of the work request contained a field that indicated post maintenance testing was required for this work. The work involved replacing degraded wiring in the neutron monitoring circuitry. When the planner put together the work package, it was incorrectly assumed that post modification testing required for installing an oscillating power range monitor would adequately test the circuitry involved with the degraded wiring. Therefore, the planner did not include any

post maintenance verification in the package. This compounded the wiring errors and allowed the problem to go undetected until it became self-revealing during startup.

In addition to the wiring errors mentioned above, the inspectors and licensee identified similar problems with several other maintenance activities from October 14 to November 3. The licensee documented these errors on numerous condition reports. These involved wiring problems caused by design errors, errors in transferring design information to the work packages, and wiring quality errors in which leads were improperly landed, labeled or verified. These errors did not result in inoperable equipment because they were caught by post maintenance or modification testing, and corrected. Some of the wiring errors, associated condition reports and descriptions are listed below:

- Q2000-04070 average power range monitor flow biased neutron flux high setpoint not available;
- Q2000-03843 improper wiring, shutdown cooling suction valve 1-1001-47 failed to open;
- Q2000-03885 panel wiring for DCP9900528 (1A MG Set Lube Oil Mod);
- Q2000-03903 drawing 4E-1683c does not match “as built” (MOV 1-3904);
- Q2000-04022 4041 GIX wiring in 901-77 panel;
- Q2000-03835 “1A” reactor recirculation wiring problems;
- Q2000-03911 unit auxiliary transformer wiring design error;
- Q2000-04021 reactor manual control switch timer failed post maintenance test; and
- Q2000-03838 steam leak detection mod wiring.

The inspectors spoke with the plant manager on October 2 about the numerous occurrences of errors and the causes for those errors. The inspectors found that the condition reports written for many of these problems were closed to the work request to fix the wiring or to a data point if the wiring correction had already taken place. There did not appear to be a corrective action taken to review why these errors occurred, and what other circuits could be affected by similar wiring errors. Subsequently, the licensee wrote Condition Report Q2000-04094 to review refueling outage electrical workmanship and quality issues.

1R20 Refueling and Outage (71111.20)

a. Inspection Scope

The inspectors observed and/or reviewed outage activities including plant shutdown, reactor vessel disassembly, fuel movements, core verification, surveillance testing, major repair activities, startup, and startup testing activities associated with Unit 1 Refueling Outage 16.

b. Issues and Findings

Inappropriate Reactor Head Vent Piping Removal

On October 14, 2000, during disassembly of the Unit 1 reactor for Refueling Outage 16, reactor services technicians opened a flanged connection of the reactor head vent piping with approximately 5 to 8 psig steam pressure still in the reactor vessel. This action initiated a steam release to the refueling floor area, which is within the boundaries of secondary containment, lasting for several hours. Numerous procedural, process, and communication problems led to the event. The risk significance was evaluated as very low because the amount of reactor vessel inventory released to secondary containment was small, and secondary containment integrity requirements were met. However, personnel safety, procedure adherence, procedure adequacy, and lack of control of reactor vessel disassembly activities were all concerns brought out by this event.

Control room operators and radiation protection technicians interviewed by the inspectors indicated that they had recommended the flange not be opened with pressure on the reactor vessel. A radiation protection supervisor indicated during an interview that he was aware of the impending flange breach, but did not think it would take place before the reactor vessel was depressurized. An operator qualified as a shift manager expressed his concern with the impending breach to the shift outage manager, but was under the impression that a more adequate way to control the radioactive steam would be established before the venting took place. Once radiation protection technicians on the refueling floor were told that there would be a breach of the reactor head vent flange with pressure on the vessel, they made plans to minimize the contamination released. Planned efforts included breaking the piping at a smaller flanged connection, wrapping a cloth around the piping, monitoring the radiological conditions in the immediate area of the vent pipe flange opening, and opening the vent pipe flange while maintaining the ability to quickly reconnect the flange. However, reactor services workers opened the piping at a different, larger flanged connection without radiation protection worker knowledge, and created a steam leak which lasted for several hours on the refueling floor. The leak started at approximately 6:30 p.m., and was stopped at approximately 9:30 p.m.

Once the leak occurred and the high airborne contamination was found on the refueling floor, there were not enough respirator qualified maintenance workers to reconnect the reactor head vent flange connections needed to stop the leak and to reconnect thermocouples needed to monitor reactor head temperature. Radiation protection technicians were asked to make emergency connections of the flange and thermocouples. Radioactive airborne concentrations reached approximately 2 derived air concentration, surface contamination on the refuel floor reached about 20,000 disintegrations per minute, and 2 individuals contaminated by the radioactive steam received approximate surface contaminations between 100,000 and 170,000 disintegrations per minute. Overall however, the doses to workers was small.

Besides the communication errors previously mentioned, the inspectors identified procedure problems as well. Corporate procedure OP-AA-101-201, “Station Equipment Out-Of-Service,” Step 1.2.2 indicated that the out-of-service process shall be used to protect workers against potential hazards to personnel safety during physical work on a

system. Hazards to be considered included fluids, gases, and vapors as well as radioactivity. Step 4.1.1.13 required a method of capturing hazardous fluids or gases to be noted on the out of service checklist when the system is drained or vented for removal from service. Step 4.1.1.14 required that when a pressure boundary is taken out of service for internal work it must be depressurized and drained by the use of vents and drains included on an appropriate out of service checklist. Out-of-Service 990019798 was written to control the vent path for the reactor by requiring the head vent valves to be open. However, inspector interviews with station personnel indicated that the vent piping was disassembled while the out-of-service tags were still in place.

Attachment 11 of the out-of-service procedure allowed activities controlled by approved plant procedures to not require an out-of-service tagout. Quad Cities Mechanical Maintenance Procedure (QCMM) 0201-04, "Reactor Disassembly," was the procedure used to control the disassembly and was used in lieu of an out-of-service tagout for controlling activities that might otherwise need a tagout. Inspectors found that neither the out-of-service tagout 99019798 nor QCMM Procedure 0201-04 provided adequate control to protect against hazards including gases and radioactivity. Criterion V, "Instructions, Procedures, and Drawings," of 10 CFR Part 50, Appendix B required that activities affecting quality shall be prescribed by documented instructions procedures or drawings of a type appropriate to the circumstances. Inadequate procedures to control vessel disassembly and to control the release of hazardous fluids and radioactivity were considered an example of a **Non-Cited Violation (50-254/00-15-02a)** of 10 CFR Part 50 Appendix B, Criterion V, "Instructions, Procedures, and Drawings," consistent with Section VI.A.1 of the May 1, 2000, Enforcement Policy.

Procedure adherence problems also were involved. The reactor services technicians assigned to the refuel floor failed to notify radiation protection technicians when they began working on the upper flange of the reactor head vent. This violated the normal practice used for control of refueling floor activities governed by the Radiation Work Permit 003581. This radiation work permit required radiation protection technician coverage for breaches of the reactor vent flange. Procedure AD-AA-401, "Operational ALARA Planning And Controls," Step 3.4 indicated that "The individual worker is responsible for adhering to ALARA Plan, RWP requirements, and in-field application of the plan." Failure to adhere to the radiation work permit was in violation of Procedure AD-AA-401 and is considered an example of **Non-Cited Violation (50-254/00-15-01b)** of Technical Specification Section 6.8A, consistent with Section VI.A.1 of the May 1, 2000, Enforcement Policy.

The licensee wrote Condition Report 2000-03636 to document this problem. Planned corrective actions identified by the licensee were to revise the reactor vessel disassembly procedure to identify appropriate prerequisites and methods for mitigation of a release from the reactor head vent piping, and to develop a detailed sequence of activities to be added to the refueling outage schedule to coordinate prerequisite work for unbolting the vessel head flange. Personnel errors and procedural adherence problems were not addressed by the apparent cause evaluation written for Condition Report Q2000-03636.

The licensee subsequently wrote Condition Report Q2000-04337 to address the personnel errors and procedure adherence problems involved with this event.

Significant Worker Contamination During Local Power Range Monitor Replacement

On October 22, 2000, workers attempting to remove a local power range monitor string inadvertently lifted the local power range monitor tube off its seat in the reactor vessel. This caused highly contaminated radioactive water to drain from the reactor vessel directly onto the workers. The draining stopped immediately after the local power range monitor tube was released and reseated back into the vessel. One worker was highly contaminated such that a meter held to his body read 5 rem per hour on contact. Extraordinary actions by radiation protection workers resulted in the prompt removal of the majority of the highly contaminated material such that the overall external shallow dose equivalent for the individual was estimated at 2.784 rem, and the internal dose received by the worker was estimated at 45 millirem. This was below regulatory exposure limits.

Four problems either caused or contributed to the event. First, workers did not adhere to radiation protection technician instructions that were given in order to control activities in accordance with the Radiation Work Permit 003581. Second, workers did not have procedures with them and performed steps of two different procedures concurrently. Third, workers did not inform operators or radiation protection workers that they were taking actions that could allow water to be drained from the reactor vessel. Fourth, the procedure was not adequate to control the work.

The inspectors determined that the risk significance of this event was very low (GREEN). The determination was based on the following circumstances associated with this event: the local power range monitor tube reseated properly shortly after being lifted, which minimized the potential to drain the reactor vessel; secondary containment and one train of standby gas treatment remained operable; the contaminated individual was quickly decontaminated; and the contaminated fluid from the vessel bottom head was of low enough radioactive concentration that it did not result in more significant internal or external dose to the workers.

Inspectors interviewed radiation protection staff and the maintenance supervisor involved with the work, and reviewed a prompt investigation, Work Request 990155278, and Radiation Work Permit 001031 to determine what kind of controls were used to prevent potential vessel draining and to prevent significant contamination under the reactor vessel. Inspectors learned that the workers erroneously told radiation protection personnel that no work would be performed on the mechanical components and no potential for water exposure would come as a result of the local power range monitor work. Radiation protection staff relaxed the requirements in the radiation work permit for anti-contamination rubber gear because of this discussion with the workers. Once under the vessel, however, workers performed activities related to the electrical portion as well as removing a nut and washer related to the mechanical installation of a flush can for the local power range monitor. This violated the agreement with the radiation protection staff who were using the information to control activities in accordance with the radiation work permit. Procedure AD-AA-401, “Operational ALARA Planning And Controls,” Step 3.4 indicated that “The individual worker is responsible for adhering to ALARA Plan, RWP

requirements, and in-field application of the plan." Failure to adhere to the field guidance by the radiation protection technicians was in violation of Procedure AD-AA-401 and is considered an example of a **Non-Cited Violation (50-254/00-15-01c)** of Technical Specification Section 6.8A, consistent with Section VI.A.1 of the May 1, 2000, Enforcement Policy.

Removal of the nut allowed upward force applied by the workers during electrical maintenance to unseat the local power range monitor tube assembly. The inspectors found that the procedures were inadequate in that they did not coordinate the electrical portion and the mechanical portion in a manner to ensure that the potential to drain the vessel could not occur. Specifically, Quad Cities Instrument Procedure 0700-04, "LPRM Replacement," did not include instructions for sequencing electrical work separately from mechanical work to prevent an inadvertent draining from the bottom of the reactor vessel. Criterion V, "Instructions, Procedures, and Drawings," of 10 CFR Part 50, Appendix B required that activities affecting quality shall be prescribed by documented instructions procedures or drawings of a type appropriate to the circumstances. Inadequate procedures for local power range monitor replacement are considered an example of a **Non-Cited Violation (50-254/00-15-02b)** 10 CFR Part 50, Appendix B, Criterion V, consistent with Section VI.A.1 of the May 1, 2000, Enforcement Policy. The licensee wrote Condition Report Q2000-03821 to address the draining event. A root cause report investigation was started, but was put on hold and given a date for completion of about February 2001.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors observed portions of the following Quad Cities Operating Surveillance (QCOS) tests in the Mitigating Systems Cornerstone:

- QCOS 0202-05, "Jet Pump/Shroud Access Hole Cover Test for Single Loop Operation," Revision 11;
- QCOS 1300-01, "Periodic RCIC PUMP Operability Test," Revision 25
- QCOS 2300-01, "Periodic HPCI Pump Operability Test," Revision 31
- QCOS 6600-37, "Unit 1 Emergency Diesel Generator Largest Single Load Reject Test," Revision 5; and
- QCOS 6600-50, "Unit One Division II Emergency Core Cooling System Simulated Automatic Actuation and Diesel Generators Auto-Start Surveillance,"Revision 0.

The inspectors reviewed the test results to ensure that Technical Specification requirements were satisfied.

b. Issues and Findings

No findings of significance were identified.

4. OTHER ACTIVITIES (OA)

4OA3 Event Follow-up (71153)

(Closed) Licensee Event Report 50-254/00002-00 Missed Technical Specification Surveillance. On October 4, 2000, the licensee identified that surveillance testing for torus temperature instrumentation components required by Technical Specification 4.2.F.1 had not been performed since installation in 1990 and 1991. Failure to check instrument accuracy by this 18-month surveillance for Unit 1 and Unit 2 involved very low risk (GREEN) because when the surveillance test was subsequently performed, instrument accuracy of the temperature indication loop was within acceptable tolerance. Condition Report Q2000-03512 was written to address the issue. A root cause investigation was ongoing to determine how the surveillance testing was missed, and to look into why previous corrective actions and extent of condition reviews from previous missed Technical Specification surveillances in 1998 did not find this issue. The licensee planned to submit a supplemental report following completion of the root cause investigation. Failure to perform testing of the instrumentation was considered a **Non-Cited Violation (50-254/00-15-03; 50-265/00-15-03)** of Technical Specification 4.2.F.1, consistent with Section VI.A.1 of the May 1, 2000, Enforcement Policy. Revision 00 of this licensee event report is closed.

4OA4 Cross-cutting Issues

The inspectors found that a number of human performance errors during the Q1R16 refueling outage period, October 14 to November 3, resulted in undesirable consequences and appeared to constitute an adverse trend in human performance. These errors resulted from problems in procedure adherence, control of work activities, communications, and procedure quality. Resulting problems included venting the pressurized reactor vessel to the secondary containment near maintenance workers who were not adequately prepared for the subsequent release of steam and contamination, inadvertently draining from the reactor vessel bottom head area to an area within secondary containment boundaries which resulted in significant personnel contamination, and a number of wiring errors and second verification errors during electrical modifications and maintenance. Most of the wiring errors were caught during modification or maintenance testing. However, an additional error related to post maintenance testing allowed a wiring error to remain undetected, and resulted in causing one of two channels of the reactor protective system flow biased neutron flux trip to be inoperable. While none of these events resulted in equipment performance outside the licensee response band (GREEN), the overall trend indicated problems with adhering to procedures, properly performing second verification techniques, communication, and the and coordination of activities.

4OA4 Management Meetings

The inspectors presented the inspection results to Mr. Dimmette and other members of licensee management at the conclusion of the inspection on November 20, 2000. The licensee acknowledged the findings presented. No proprietary information was identified.

4OA5 Other

The inspectors reviewed the June 5, 2000, interim report for the April 2000 Plant Evaluation performed by an inspection team from the Institute of Nuclear Power Operations. No further inspection was deemed necessary by NRC inspectors, and no assessment was made of the results of the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

J. Dimmette	Site Vice President
E. Anderson	Radiation Protection Manager
R. Gideon	Work Management Manager
M. McDowell	Operations Manager
M. Perito	Maintenance Manager

NRC

M. Ring	Branch Chief, Branch 1

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-254/00-15-01a; 50-265/00-15-01a	NCV	Failure to Follow Procedure
50-254/00-15-01b	NCV	Failure to Follow Procedure
50-254/00-15-01c	NCV	Failure to Follow Procedure
50-254/00-15-02a	NCV	Inadequate Procedure
50-254/00-15-02b	NCV	Inadequate Procedure
50-254/00-15-03; 50-265/00-15-03	NCV	Failure to Perform Testing

Closed

50-254/00-15-01a; 50-265/00-15-01a	NCV	Failure to Follow Procedure
50-254/00-15-01b	NCV	Failure to Follow Procedure
50-254/00-15-01c	NCV	Failure to Follow Procedure
50-254/00-15-02a	NCV	Inadequate Procedure
50-254/00-15-02b	NCV	Inadequate Procedure
50-254/00-15-03; 50-265/00-15-03	NCV	Failure to Perform Testing
50-254/00002-00	LER	Missed Technical Specification Surveillance

Discussed

None

LIST OF BASELINE INSPECTIONS PERFORMED

The following inspectable-area procedures were used to perform inspections during the report period. Documented findings are contained in the body of the report.

Inspection Procedure		Report
Number	Title	Section
71111.04	Equipment Alignment	1R04
71111.05	Fire Protection	1R05
71111.07	Heat Sink Performance	1R07
71111.12	Maintenance Rule Implementation	1R12
71111.13	Maintenance Work Prioritization & Control	1R13
71111.14	Nonroutine Evolutions	1R14
71111.15	Operability Evaluations	1R15
71111.16	Operator Workarounds	1R16
71111.19	Post Maintenance Testing	1R19
71111.20	Refueling and Outage Activities	1R20
71111.22	Surveillance Testing	1R22
71153	Event Follow-up	4OA3
(none)	Other	4OA4
(none)	Management Meetings	4OA5

LIST OF ACRONYMS AND INITIALISMS USED

ALARA	As Low As Reasonably Achievable
APRM	Average Power Range Monitor
CFR	Code of Federal Regulations
HPCI	High pressure coolant injection
IDNS	Illinois Department of Nuclear Safety
LER	Licensee Event Report
MG	Motor generator
MOV	Motor-operated valve
NCV	Non-cited Violation
QCCM	Quad Cities Mechanical Maintenance Procedure
QCOS	Quad Cities operating surveillances
RCIC	Reactor core isolation cooling
RWP	Radiation work permit
Vdc	Volt direct current