



UNITED STATES
NUCLEAR REGULATORY COMMISSION

REGION III
801 WARRENVILLE ROAD
LISLE, ILLINOIS 60532-4351

March 28, 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 50-254/200001(DRP);
50-265/200001(DRP)

Dear Mr. Kingsley:

On February 29, 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. Within these areas the inspection consisted of a selective examination of procedures and representative records, observations of activities, and interviews with personnel. Specifically, this inspection focused on resident inspection activities.

Based on the results of this inspection, the NRC identified several issues which were categorized as being of very low risk significance. These issues involved moving fuel without the required number of intermediate range nuclear instruments and without an operable emergency diesel generator, failing to follow maintenance procedures which made the high pressure coolant injection system inoperable, taking the automatic depressurization system valves out-of-service when they were required to be operable, failure of the safe shutdown makeup pump discharge valve, and human performance errors primarily associated with maintenance activities. These issues have been entered into your corrective action program. Three of these issues involved non-cited violations of regulatory requirements. These issues are listed in the summary of findings and are discussed in the report.

If you contest a violation or the severity level of the non-cited violations, 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 20555-001, with a copy to the Regional Administrator, Region III, Resident Inspector and the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-001.

IEΦJ

O. Kingsley

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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 provide one, will be placed in the NRC Public Document Room.

Sincerely,

/s/ M. Ring

Mark A. Ring, Chief
Reactor Projects Branch 1

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

Enclosure: Inspection Report 50-254/200001(DRP);
50-265/200001(DRP)

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Sincerely,



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U. S. NUCLEAR REGULATORY COMMISSION

REGION III

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

Report No: 50-254/00001(DRP); 50-265/00001(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: January 20 through February 29, 2000

Inspectors: C. Miller, Senior Resident Inspector
K. Walton, Resident Inspector
L. Collins, 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
<ul style="list-style-type: none">• Initiating Events• Mitigating Systems• Barrier Integrity• Emergency Preparedness	<ul style="list-style-type: none">• Occupational• Public	<ul style="list-style-type: none">• Physical Protection

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

Quad Cities Nuclear Power Station, Units 1 & 2 NRC Inspection Report 50-254/200001(DRP); 50-265/200001(DRP)

The report covers a 6-week period of resident inspection.

Initiating Events

- GREEN. Failure of the ice melt valve on January 22, 2000, resulted in some ice formation in the intake area. Operator detection and compensatory measures prevented the ice from affecting the water level in the intake. The valve gate had become detached from the stem.

The failure of the ice melt valve was of very low risk significance because it did not result in an increased initiating event frequency for loss of both normal and ultimate heat sinks. The inspectors compared an estimated valve failure rate to the licensee's evaluation. The licensee's evaluation excluded this initiating event from the probabilistic risk assessment because no precursor event had occurred in the history of the station. (Section 1R07)

Mitigating Systems

- GREEN. On January 19, 2000, during planned maintenance activities, maintenance workers determined that the safe shutdown makeup pump system was inoperable due to a Unit 2 safe shutdown makeup pump injection valve failure to operate.

The valve failure was evaluated using the Significance Determination Process and was found to be of very low risk significance because all other mitigating systems were available (Section 1R03).

- GREEN. On January 28, 2000, with Unit 1 operating at full power and with Unit 2 in Mode 5 (refuel), an operator identified that the Unit 2 emergency diesel generator room ventilation fan power select switch was selected to the Unit 1 power supply. The Unit 2 emergency diesel generator was inoperable, but remained available for service. Since the shared emergency diesel generator was already inoperable to Unit 2, this condition left no operable emergency diesel generators for Unit 2. This issue is considered a non-cited violation consistent with the Interim Enforcement Policy for pilot plants.

This issue was considered to be of very low safety significance because the Unit 1 diesel generator would not have been overloaded by the Unit 2 emergency diesel generator room ventilation fan. The Unit 2 emergency diesel generator was also available. (Section 1R04).

- GREEN. On February 10, 2000, with Unit 2 in startup mode, the high pressure coolant injection pump failed to start during testing due to incomplete maintenance. A

- maintenance foreman erroneously signed off the work package as being completed when it was not. This issue is considered a non-cited violation consistent with the Interim Enforcement Policy for pilot plants.

This issue was of very low risk significance since the system pressure was low, decay heat was low, and redundant methods of inventory injection were either operating or available. (Section R19)

- GREEN. On January 22, 2000, operators did not recognize entry into a Technical Specification action statement when relief valves were removed from service with the reactor in Mode 3. Upon discovery, about 4-1/2 hours later, the valves were returned to service. The Technical Specification action statement was not exceeded.

The unavailability of the relief valves was evaluated by the NRC's Senior Reactor Analyst as part of the Significance Determination Process for shutdown issues. This issue was determined to be of very low risk significance because the reactor was in hot shutdown with vessel pressure at approximately 50 psig. (Section 1R20.2).

- GREEN. From February 1 through 5, 2000, Unit 2 had less than the number of operable intermediate range nuclear instruments per channel (three) for the reactor protective system required by Technical Specification 3.1.A. Only two of four instruments were operable on the "B" channel and three of four were operable on the "A" channel. During this time, the reactor was in Mode 5 (refuel) and operators performed core alterations by moving irradiated fuel in the vessel. This issue is considered a non-cited violation consistent with the Interim Enforcement Policy for pilot plants

Unit 2 was in cold shutdown with all control rods inserted. This issue was determined to be of very low risk significance because shutdown margin calculations and refueling interlocks provided assurance of adequate shutdown margin. Source range nuclear instruments provided a rod block function during refueling. Intermediate range nuclear instrument indication would not have been available until after the point where a reactivity excursion had occurred because the neutron level during refueling operations was too low for the intermediate range nuclear instruments. (Section 1R20.4).

Human Performance

- NO COLOR. Inspectors found that errors in review, coordination, and implementation of maintenance activities during or near Unit 2 refueling outage number 16 (January and February 2000) led to inoperable safety systems. Operators were unaware that Technical Specification or administrative limiting condition for operation action statements were entered or exceeded. Required nuclear instruments and emergency diesel generators were not operable during some fuel moves (Sections 1R04 and 1R20.4), automatic depressurization system valves were taken out of service while required (Section 1R20.2), the high pressure coolant injection system was inoperable due to incomplete maintenance (Section 1R19.1), and safe shutdown requirements were not properly addressed (Section 1R20.5). Other events included technician errors in which

- electrical jumpers were installed in incorrect locations for logic used by the reactor protective system and by the emergency core cooling system. While the risk of the individual events was very low, an increase in maintenance activity problems was evident (Section 1R20.5).

Report Details

1. REACTOR SAFETY

Plant Status (71150)

Unit 1 was maintained at or near full power operations during the period. Operators shut down Unit 2 on January 21, 2000, for a planned refueling outage. Operators returned Unit 2 to full power operation on February 14. Operators maintained Unit 2 at or near full power operations for the remainder of the period.

1R03 Emergent Work

.1 Safe Shutdown Makeup Pump Valve Failure

a. Inspection Scope (71111-03)

The inspectors reviewed the licensee's control of maintenance activities and the risk evaluation for the unplanned system inoperability when the safe shutdown makeup pump system was declared inoperable to both Unit 1 and Unit 2.

b. Observations and Findings

On January 19, 2000, during planned maintenance on the safe shutdown makeup pump injection valve to Unit 2 (2-2901-8), maintenance workers found that the valve was degraded. During maintenance to adjust the limit switch, the valve was stroked successfully several times and then failed to operate. The bushing on the valve yoke had rotated out of position and impeded valve movement. With the valve partially open, the ability to inject to Unit 1 was degraded because less than the required flow would have been available. Operators declared the system inoperable and entered a 14-day limiting condition for operation as required by Technical Specifications. The valve was repaired and the system returned to an operable status within 2 days. The cause of the valve failure was determined to be inadequate staking of the bushing to the valve yoke during bushing replacement in 1993.

The injection valve was tested and operated properly in November 1999. During the planned maintenance activity in January 2000, maintenance workers operated the valve several times successfully prior to the valve failing to operate. Since the valve initially operated properly during maintenance, the valve, while degraded, may have functioned if called upon to operate during a transient or accident condition. However, since the valve was clearly degraded, and successful operation was not proven through testing prior to the planned maintenance, the inspectors used a conservative assumption that the valve was unavailable for the purposes of using the Significance Determination Process. The inspectors assumed that the safe shutdown makeup pump system was unavailable for a period of greater than 3 days but less than 30 days. Since no other systems were affected by this valve problem, the Significance Determination Process evaluated the condition to be of low risk significance (Green). The licensee entered this issue into the corrective action program under Problem Identification Form Q2000-00241.

During this emergent work, the inspectors asked the licensee about a potential increase in risk due to fires because the safe shutdown makeup pump system was designed to mitigate accidents involving fires. The inspectors found that the licensee had discontinued the process for evaluating the effect of on-line maintenance activities on the risk due to internal fires. While this evaluation was not an NRC requirement or an industry standard, the inspectors had considered this program a unique benefit to the station and a state-of-the-art tool for risk-informing on-line maintenance activities.

The program had been discontinued because a revised internal fire probabilistic risk assessment determined that the fire risk at Quad Cities was less than previously reported because a number of changes had been made. As a result, the fire risk assessment tool was no longer accurate. The inspectors noted that the risk due to fire related scenarios was still an important part of the overall risk at Quad Cities.

1R04 Equipment Alignments

.1 Emergency Diesel Generator Ventilation Power Supply Switch Out of Position

a. Inspection Scope (71111-04, 71153)

The inspectors reviewed the prompt investigation results associated with Problem Identification Form Q2000-00441, the associated root cause report, and the event notification work sheets. The inspectors also reviewed the design requirements, reportability guidelines, and Technical Specifications.

b. Observations and Findings

On January 28, 2000, with Unit 1 operating at full power and with Unit 2 in Mode 5 handling irradiated fuel in secondary containment, an equipment operator identified that the Unit 2 emergency diesel generator room ventilation power select switch was selected to the Unit 1 source of power and not to the normal Unit 2 source. Operators considered the Unit 2 emergency diesel generator to be inoperable until the switch was moved back to its normal position. After identifying the switch was out of position, the licensee started the ventilation fan from its alternate source to verify that the fan would operate properly. The switch was then returned to the normal position. A licensee investigation could not determine the exact cause of the mis-positioned switch, or when the switch was placed in the wrong position. The licensee initiated an emergency notification to the NRC, then later retracted the call after determining that operators could have repositioned the switch to make the emergency diesel generator available if needed.

Previously, the shared emergency diesel generator was considered to be inoperable to Unit 2 (but operable to Unit 1) due to work on Unit 2 electrical switchgear. These conditions resulted in no operable emergency diesel generators for Unit 2 for an unknown time with irradiated fuel being handled in secondary containment. This was considered to be a violation of Technical Specification 3.9.B.2. However, this violation is considered a **Non-cited Violation (50-265/00001-01)**, consistent with the Interim

Enforcement Policy for pilot plants. This violation is in the licensee's corrective action program as Problem Identification Form Q2000-00441.

Risk Significance

The inspectors used the Significance Determination Process to evaluate the risk significance of this event had there been a loss of offsite power initiating event. The inspectors assumed that the Unit 2 emergency diesel generator room ventilation fan switch being out of position was not an actual loss of a safety function and that the fan was available during this postulated event. The inspectors determined that the Unit 1 diesel generator would not have been overloaded by the Unit 2 emergency diesel generator room ventilation fan. In addition, the station blackout diesel generators were also available.

For the operating unit, this event resulted in being screened out in a Phase 1 Significance Determination Process since the Unit 1 equipment was considered operable. Since a shutdown Significance Determination Process was not currently available, the regional senior reactor analyst assisted the inspectors in determining the impact on the shutdown unit. This issue was determined to be of very low safety significance as the emergency diesel was still available to support the shutdown unit (Green). Licensee Event Report 50-265/00002-00 was issued to report this event. The Licensee Event Report is closed in Section 4OA3.4 of this report.

1R07 Heat Sink Performance

.1 Ice Melt Valve Failure

a. Inspection Scope (71111-07)

The inspectors reviewed the compensatory measures and plant effects after ice formation occurred in the circulating water intake area.

b. Observations and Findings

On January 24, 2000, an operator identified some ice formation and the lack of turbulence normally observed in the intake area. Investigation revealed that the ice melt valve, which circulates warm water from the outlet of the condenser back to the intake area, had failed closed on January 22, 2000, but had continued to indicate open. The licensee established compensatory measures which initially included recirculating water into the intake structure with a fire truck hose and a portable diesel-driven pump. Later more substantial compensatory measures were added, including three portable high flow, diesel-driven pumps. Ultimately, the ice melt valve was reopened and was scheduled for maintenance during the next Unit 1 refueling outage. After initial discovery, operators began checks every 2-hours of adequate levels and differential pressure across the trash rack and traveling screens. The ice formation did not result in lowering levels in any of the intake bays.

The inspectors evaluated the ice melt valve to determine if this failure could increase the initiating event frequency for loss of both normal and ultimate heat sinks. The licensee

had previously excluded such an initiating event from the probabilistic risk assessment because no precursor event had occurred in the history of the station. Even assuming one precursor event in 25 years, the station estimated the frequency of a loss of all station cooling to be approximately $4.0\text{E-}4/\text{yr}$. Since no other ice melt valve failures had occurred previously and since the valves failure only had the potential to impact the station during the coldest part of the year, the inspectors concluded that the initiating event frequency for loss of both normal and ultimate heat sinks was not increased. As a result, this failure was determined to be of very low risk significance (Green).

1R09 Inservice Testing

a. Inspection Scope (71111-09)

The inspectors reviewed Work Request 990078224 to inspect and repair the 2-2301-7 high pressure coolant injection check valve. The inspectors observed the valve disassembly and inservice testing. The inspectors also reviewed the inservice testing program for this valve.

b. Observations and Findings

There were no observations or findings associated with this inspection.

1R12 Maintenance Rule Implementation

a. Inspection Scope (71111-12)

The inspectors reviewed the functional failure evaluation for the safe shutdown makeup pump system injection valve failure to Unit 2 on January 19, 2000. The inspectors also reviewed whether the ice melt valve was within the scope of the maintenance rule.

b. Observations and Findings

There were no findings during this inspection.

1R15 Operability Evaluations

- .1 (Closed) Unresolved Item 50-254/99025-04: High Pressure Injection System Wall Thinning Operability Assessment. After further review and discussions with licensee engineers, the inspectors determined that the operability assessment incorrectly stated that the nonsafety-related piping was part of the seismic evaluation of the safety-related components. In fact, the section of pipe evaluated was not part of the seismic evaluation of the safety-related piping. Since the piping was neither safety-related nor within the seismic boundaries of the safety-related piping, the failure to meet the minimum thickness based on the various code stress requirements as presented in the operability assessment, was no longer an operability concern. Additionally, the inspectors concluded that these deficiencies were not required to be reported under 10 CFR 50.72 and 10 CFR 50.73. The inspectors found that during the evaluation of the wall thinning of the nonsafety-related, non-seismic piping, the licensee did not follow applicable procedures, including NES-MS-03.1, "Piping Minimum Wall Thickness Calculation," and

NES-MS-03.2, "Evaluation of Discrepant Piping and Support Systems." However, because this piping was not considered to be subject to the requirements of 10 CFR Part 50, Appendix B, this issue was not considered to be a violation of requirements.

1R17 Permanent Plant Modifications

a. Inspection Scope (71111-17)

The inspectors walked down the following permanent plant modifications installed during the Unit 2 refuel outage. The inspectors reviewed the modification packages and associated 10 CFR 50.59 evaluations for the following modifications:

Design Change Package 9900061, "Relocate Safe Shutdown Makeup Pump Injection Line," and
Design Change Package 9900212, "Removal of Turbine Electro-Hydraulic Control Low Pressure Scram Function."

b. Observations and Findings

The inspectors did not identify any observations or findings during this inspection.

1R19 Post Maintenance Testing

a. Inspection Scope (71111-19)

The inspectors observed surveillance testing and reviewed the following Quad Cities Operating Surveillance (QCOS) tests performed during Unit 2 startup activities:

QCOS 1300-01, "Reactor Core Isolation Cooling Low Pressure Operability Test,"
QCOS 1300-04, "Reactor Core Isolation Cooling Over Speed Trip Test,"
QCOS 1300-17, "Reactor Core Isolation Cooling Slow Roll Test,"
QCOS 2300-01, "High Pressure Coolant Injection Low Pressure Operability Test,"
QCOS 2300-13, "High Pressure Coolant Injection Manual Initiation Test."

The inspectors verified the test success criteria addressed in the procedures was in compliance with Technical Specification requirements.

b. Observations and Findings

On February 10, 2000, with Unit 2 at 150 psig during startup, the licensee attempted to start the high pressure coolant injection pump for a low pressure operability test. However, the pump would not start. A review of closed work packages performed on the high pressure coolant injection system revealed that work steps for the interlock dump valve were not completed during the outage. Instead, a maintenance supervisor annotated in the work package that the work would be completed by another procedure. The maintenance supervisor then signed the package as being completed. However, the work was not completed on the interlock dump valve prior to reactor startup.

Failure to complete the maintenance activity on this safety-related equipment in accordance with the work request was considered to be a violation of Technical Specifications and Regulatory Guide 1.33, Appendix A, Section 9. However, this condition is considered a **Non-cited Violation (50-265/00001-02)** consistent with the Interim Enforcement Policy for pilot plants. This violation is in the licensee's corrective action program as Problem Identification Form Q2000-00742.

A senior reactor analyst evaluated this event using the Significance Determination Process and found the significance of this event was minimal. Unit 2 reactor pressure was low, decay heat was low, and redundant methods of inventory injection were either operating or available. The inspectors concluded the safety significance of this issue was very low (Green.)

1R20 Refueling and Outage

.1 Refueling Outage Inspections

a. Inspection Scope (71111-20)

The inspectors reviewed the following activities related to the Unit 2 refueling outage

- reactor shutdown
- reactor cooldown and initiation of the shutdown cooling system
- refueling operations
- shutdown risk evaluations
- electrical lineup during Transformer 22 outage
- containment closeout
- reactor startup
- outage-related surveillance tests
 - ▶ QCTS 0240-04, "Unit 2 Service Test 250 VDC Safety-Related Battery"
 - ▶ QCTS 0600-05, "Unit 2 Main Steam Line Isolation Valve Leakage Test"
 - ▶ QCTS 0920-01, "Shutdown Margin Determination"
 - ▶ QCTS 0920-02, "Estimated Critical Rod Pattern Determination and Evaluation"
 - ▶ QCOS 6600-47, "Unit Two Division I Emergency Core Cooling System Simulated Automatic Actuation and Diesel Generators Auto-start Surveillance."

b. Observations and Findings

There were no findings during these inspections.

2 Unit 2 Automatic Depressurization System Valves Taken Out-of-Service in Mode 3

a. Inspection Scope (71111-20)

The inspectors reviewed Problem Identification Form Q2000-00297, the apparent cause evaluation, and the corrective actions after operators discovered that the automatic depressurization system valves were taken out-of-service with the reactor still in Mode 3.

b. Observations and Findings

On January 22, 2000, with the Unit 2 reactor in Mode 3 at approximately 50 psig, operators discovered during turnover that the 5 automatic depressurization system valves had been inappropriately removed from service about 4-1/2 hours earlier. Technical Specification 3.5.A.4 required the automatic depressurization system function to be operable with reactor pressure greater than 150 psig. Since the reactor was below this pressure, this Technical Specification no longer applied. However, Technical Specification 3.6.F required the relief function of the 5 valves to be operable in Mode 3. The action statement for more than one valve inoperable required the reactor to be in hot shutdown within 12 hours and cold shutdown within the following 24 hours. However, operators were not aware that this Technical Specification requirement applied when the valves were taken out of service and did not know that the unit was in an action statement for the reactor to be in cold shutdown within 24 hours. Upon discovery, operators restored the valves to service. The Technical Specification action statement was not exceeded.

The unavailability of the relief valves while the reactor was in hot shutdown with vessel pressure at approximately 50 psig was evaluated by a senior reactor analyst as part of the Significance Determination Process for shutdown issues. This issue was determined to be of very low risk significance (Green.)

3 Alternate Decay Heat Removal

a. Inspection Scope (71111-20)

The inspectors reviewed Quad Cities Operating Procedure 1000-44, "Alternate Decay Heat Removal," the associated 10 CFR 50.59 screening and supporting calculations, and attended the licensee's onsite review committee meeting for procedure approval. The inspectors also attended the operations brief prior to starting the procedure and reviewed the procedure results prior to removing the normal method of decay heat removal. The inspectors ensured the licensee was in compliance with Technical Specifications and ensured that facility design requirements were met.

b. Observations and Findings

There were no observations or findings associated with this inspection activity.

4. Too Few Intermediate Range Nuclear Instruments During Refueling

a. Inspection Scope (71111-20)

The inspectors observed operators performing refueling operations for Unit 2 in the control room and at the refueling bridge. In addition, the inspectors reviewed the root cause report for a condition where not enough intermediate range nuclear instruments were operable during fuel movements.

b. Observations and Findings

From February 1 at 5:45 p.m. to February 5, 2000, at 9:17 a.m., Unit 2 had less than the number of operable intermediate range nuclear instruments per channel (three) for the reactor protective system required by Technical Specification 3.1.A. This was detected by the licensee reviewing work documentation after the fuel moves. Only two of four instruments were operable on the "B" channel and three of four were operable on the "A" channel. Operators believed only one instrument on the "B" channel was inoperable at the time the mode switch was in "refuel" position for fuel moves, but found later that another two, one on channel A and one on channel B, were inoperable. During this time, the reactor was in Mode 5 (Refuel) and operators performed core alterations by moving fuel in the vessel.

Unit 2 was in cold shutdown with control rods inserted for refueling while the condition existed. The Technical Specification bases indicated shutdown margin calculations and refueling interlocks provided assurance that adequate shutdown margin was available. The bases section further indicated that intermediate range nuclear instruments provide backup protection for any significant reactivity excursions. Protection against excursions was intended to be provided by the intermediate range nuclear instruments in the form of signals generated to provide control rod blocks, reactor protection system trips, or indication for operator action. The function of a reactor protective system trip would be to insert all control rods if a trip signal were generated. All control rods were already inserted during the time the intermediate range nuclear instruments were inoperable. Source range nuclear instruments provided a rod block function during refueling operations. Intermediate range nuclear instrument indication would not have been available until after the point where a reactivity excursion had occurred because the neutron level during refueling operations was too low for the intermediate range nuclear instruments. For these reasons, the risk for having too few intermediate range nuclear instruments was considered very low and was characterized as Green.

Technical Specification Table 3.1.A-1 required 3 intermediate range nuclear instruments per trip channel to be operable while in Mode 5 (refuel). Table 3.1.A-1, Action 13 required all core alterations to be suspended within 1 hour when the above Technical Specification was not met. Failure to meet this action statement requirement was a violation of Technical Specifications. However, this issue is considered a **Non-cited**

Violation (50-265/00001-03) consistent with the Interim Enforcement Policy for pilot plants. This violation is in the licensee's corrective action program as Problem Identification Form Q2000-00636.

The licensee performed a root cause evaluation for this problem as part of Problem Identification Form Q2000-00636. Causes included inadequate communications between work groups such that operators did not know the detector for an intermediate range nuclear instrument would be disconnected, inadequate instructions in the work package, and work not authorized in the work package being performed on the detector. Corrective actions were documented in the root cause report.

5. Human Performance Problems

a. Inspection Scope (71111-20)

The inspectors observed operators performing maintenance during refueling operations for Unit 2. In addition, the inspectors reviewed corrective actions for errors occurring during or near the time of the Unit 2 refueling outage.

b. Observations and Findings

The inspectors found that due to errors in review, coordination, and implementation of planned maintenance activities, situations occurred this period in which operators were unaware that Technical Specifications or administrative limiting condition for operation action statements were entered or exceeded. In addition to the previous section (1R20.4) involving too few nuclear instruments, automatic depressurization valves were taken out of service while required to be operable (Section 1R20.2), a high pressure coolant injection system was inoperable during startup because maintenance was not completed (Section 1R19.1), and a required emergency diesel generator was not operable during fuel movements (Section 1R04). Another similar problem involving breaker maintenance where safe shutdown administrative requirements were not addressed was documented in Problem Identification Form Q2000-00537. This item was also of very low risk significance because the requirements were fortuitously accomplished because of another activity.

Other events involved maintenance problems caused by technicians. These included one case where an incorrect procedure led to installation of electrical jumpers for emergency core cooling logic in the wrong location (Problem Identification Form Q2000-00129), and one case where an electrical jumper was installed in the reactor protective system in the wrong location (Problem Identification Form Q2000-00771.) There was no equipment risk significance for the specific jumper placements because the logic for the systems was unaffected. The Quad Cities Individual Plant Evaluation did not address the risk assessment with these types of errors since the scope of possibilities for improper jumper location was not bounded.

While the risk of the individual events was very low, the number of maintenance-related incidents indicated a problem with control, review, and performance of maintenance activities. These problems could not be easily evaluated by present risk analysis methods since failures to follow specific program guidance such as Technical Specification compliance or maintenance procedures was not modeled in the Quad Cities Individual Plant Evaluation.

1R23 Temporary Plant Modifications

a. Inspection Scope (71111-23)

The inspectors reviewed the installation and removal of a temporary plant modification to the reactor protective system. The inspectors reviewed Quad Cities Operating Procedure 0500-07, "Bypassing the Reactor Mode Switch."

b. Observations and Findings

There were no findings or observations from this inspection.

4. **OTHER ACTIVITIES (OA)**

4OA3 Event Follow-up

1. (Closed) Licensee Event Report 50-254/98022-00: Reactor Water Low Level Scram During an Out-of-Service. This event was due to operator knowledge deficiencies of the feedwater level control system and the effect of a leaking isolated flow transmitter. The resultant scram of Unit 1 was uncomplicated except that the reactor feed pumps were tripped automatically on high reactor water level. Corrective actions were appropriate and were verified to be complete. This event was of low risk significance due to the uncomplicated nature of the scram and availability of mitigating equipment. This item is closed.
2. (Closed) Licensee Event Report 50-265/99004-00: Failed Surveillance Test on High Pressure Coolant Injection Vacuum Breaker Valve. The licensee identified a safety-related primary containment isolation check valve failed to meet leakage acceptance criteria. The licensee declared the valve inoperable, disassembled the valve, but could not definitely determine the cause of failure. The licensee reassembled and tested the valve satisfactorily, and flushed the line during Q2R15 refueling outage. The inspectors and senior reactor analyst determined that this event was of low safety significance due to the existence of an operable redundant check valve in the piping. This licensee event report is closed.
3. (Closed) Licensee Event Report 50-265/00001-00: Safe Shutdown Makeup Pump Injection Valve Inoperable. This failure is discussed under Section 1R03. The failure was determined to have low risk significance using the Significance Determination Process. The issue was entered into the licensee's corrective action system under Problem Identification Form Q2000-00241. This licensee event report is closed.

- .4 (Closed) Licensee Event Report 50-265/00002-00: Emergency Diesel Generator Inoperable Due to Inadvertent Bumping of Ventilation Fan Power Select Switch. (See Section 1R04 for more detail and for risk significance.) The licensee determined that the root cause of the problem was due to inadequate communication of expectations to keep unnecessary personnel out of areas important to safety. The inspectors reviewed the licensee's corrective actions and found them to be appropriate. This item is closed.

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 February 29, 2000. The licensee acknowledged the findings presented. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

J. Dimmette, Site Vice President
M. McDowell, Operating Manager
C. Peterson, Regulatory Assurance Manager
M. Perito, Maintenance Manager
E. Anderson, Radiation Protection Manager
G. Boerschig, Engineering Manager

NRC

M. Ring, Branch Chief, Division of Reactor Projects

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-265/00001-01	NCV	Emergency Diesel Generator Ventilation Power Supply Switch Out of Position
50-265/00001-02	NCV	Post Maintenance Testing
50-265/00001-03	NCV	Too Few Intermediate Range Nuclear Instruments During Refueling

Closed

50-265/00001-01	NCV	Emergency Diesel Generator Ventilation Power Supply Switch Out of Position
50-265/00001-02	NCV	Post Maintenance Testing
50-265/00001-03	NCV	Too Few Intermediate Range Nuclear Instruments During Refueling
50-254/99025-04	URI	High Pressure Injection System Wall Thinning Operability Assessment
50-254/98022-00	LER	Reactor Water Low Level Scram During An Out-of-Service
50-265/99004-00	LER	Failed Surveillance Test on High Pressure Coolant Injection Vacuum Breaker Valve
50-265/00001-00	LER	Safe Shutdown Makeup Pump Injection Valve Inoperable
50-265/00002-00	LER	Emergency Diesel Generator Inoperable Due to Inadvertent Bumping of Ventilation Fan Power Select Switch

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
<u>Number</u>	<u>Title</u>	<u>Section</u>
71111-03	Emergent Work	1R03
71111-04	Equipment Alignment	1R04
71111-07	Heat Sink Performance	1R07
71111-09	Inservice Testing of Pumps and Valves	1R09
71111-12	Maintenance Rule Implementation	1R12
71111-17	Permanent Plant Modifications	1R17
71111-19	Post Maintenance Testing	1R19
71111-20	Refueling and Outage Activities	1R20
71111-23	Temporary Plant Modifications	1R23
71150	Plant Status	
71153	Event Follow-up	4OA3
(none)	Other	4OA4
(none)	Management Meetings	4OA5

O. Kingsley

-3-

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