# U.S. NUCLEAR REGULATORY COMMISSION

## REGION III

Report Nos. 50-254/94028(DRP); 50-265/94028(DRP)

Docket Nos. 50-254; 50-265

License Nos. DPR-29; DPR-30

Licensee: Commonwealth Edison Company Executive Towers West III 1400 Opus Place, Suite 300 Downers Grove, IL 60515

Facility Name: Quad Cities Nuclear Power Station, Units 1 and 2

Inspection At: Quad Cities Site, Cordova, Illinois

Inspection Conducted: November 11 through December 15, 1994

Inspectors:

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Inspection Summary (Report Numbers 50-254/94028(DRP); 50-265/94028(DRP))

Routine, unannounced safety inspection by the resident inspectors during the period November 11 through December 15, 1994, covering followup of events; operational safety verification; monthly maintenance observation; monthly surveillance observation; engineering and technical support; regional request; and licensee action on previously identified items. The results of the inspection are listed in the executive summary.

### 1. EXECUTIVE SUMMARY

# Overview

Units 1 and 2 were shut down since October 2 and 3, 1994, respectively, in part due to management concerns with personnel and plant performance. Unit 1 remained shut down the entire inspection period. Operators began Unit 2 start-up on December 14, and the reactor was brought critical on December 15. Actions in preparation for start-up appeared conservative.

#### Operations

- Non-routine operator performance was good, but weaknesses were noted in routine performance and administration (paragraph 3).
- Operations management continued to struggle with poor self-check performance. A second instance within a short period of time of a reactor recirculation motor-generator (MG) set oil cooler being improperly valved in occurred (paragraph 3.a).
- Unit 2 exceeded a 50°F loop differential temperature limit while shutdown, even though a previous similar event led to the shutdown of Unit 1 (paragraph 3.b).

#### Maintenance and Surveillance

- Foreign material found in three HCUs appeared to have been in the system for some time (paragraph 4.a).
- Maintenance performed on the Unit 1/2 emergency diesel generator (EDG) cooling water pump significantly reduced pump vibrations (paragraph 4.b).
- A surveillance test was performed on the wrong unit. Neither the maintenance workers nor the control room personnel detected the error prior to completing the test. A non-cited violation was identified (paragraph 5.a).

# Engineering and Technical Support

- Reactor engineering persistently pursued several issues. The licensee moved a damaged fuel assembly which was temporarily stored in a fuel preparation machine to the spent fuel pool racks. Testing or Unit 2 turbine bypass valves revealed slower opening times than required for transient analyses. The licensee imposed a stricter core operating limit until the bypass valve timing issue could be resolved (paragraphs 6.a and 6.d).
- Engineering found that control rods had been withdrawn outside the required withdrawal sequence. An unresolved item was identified pending

licensee investigation into the root cause, risk perspective, and corrective actions (paragraph  $6.\iota$ ).

- Engineering response was adequate to the HPCI exhaust line swing check valve stem cracking issue and main steam line radiation monitor spurious alarms (paragraphs 4.c and 6.c).
- The inspectors identified recurring deficiencies following engineering and operations walkdowns (paragraph 6.e).
- The absence of acceptance criteria for RHRSW pump vault cooler operability will be reviewed and tracked as an unresolved item (paragraph 6.f).

## Plant Support

 Successful efforts to reduce contaminated square footage suffered a setback from poor ventilation caused by continued inoperability of the 1/2 "A" boiler (paragraph 7).

# 2. Follow-up of Events (93702)

During the inspection period, the licensee experienced several events, some of which required prompt notification of the NRC via the Emergency Notification System pursuant to 10 CFR 50.72, and other requirements. The specific events were as follows:

- November 23 Shared EDG cooling water pump suction line was not seismically supported.
- November 28 A licensee employee failed fitness-for-duty random test.
- December 2 Tape was found in the Unit 2 scram inlet check valve 115 for HCU 26-07.
- December 5 Control rod withdrawal was not in accordance with required sequence.

Unit 2 turbine bypass valve stroke time was found to be outside design limits.

December 6 A cigarette butt was found in the Unit 1 HCU 54-15 scram inlet valve and a small O-ring in the top of an accumulator removed from the Unit 2 HCU 26-11.

No violations or deviations were identified.

### 3. Operational Safety Verification (71707)

The inspection period commenced with both units shut down. Unit 1 remained shut down the entire inspection period; Unit 2 was brought critical on December 15.

Operator attention to detail still remained an issue. Operator performance under close management oversight and during non-routine events was good. However, during routine operations, some weaknesses in communication, annunciator response, panel walkdown, and turnover were noted. In addition, routine administrative tasks such as interim procedure implementation and required reading training were not performed well.

# a. Improper 2B Reactor Recirculation MG Set Cooler Lineup

Operations personnel continued to struggle with self-check practices during routine tasks. Operators misaligned cooling water to the 2B reactor recirculation MG set oil cooler. A similar improper lineup event occurred recently on the 2A recirculation MG set oil cooler, as detailed in Inspection Report 50-254/265-94017. As in the previous event, lack of self-check and a procedural deficiency were the major contributors. Also, plant material condition was a factor: a sticking temperature control valve (TCV) and hard-to-operate service water isolation valves were added distractions.

An equipment operator (EO) valved in service water to the D MG set oil cooler. Because of previous experience of the TCV sticking, the EO stood by to watch local temperature indication. When oil temperature reached 135#F, the EO notified the control room and opened the TCV bypass valve. After the oil temperature continued to increase to 160#F, the EO contacted the control room and checked the oil cooler lineup. The EO found the oil was lined up to the C cooler instead of the D cooler and took actions to restore proper cooling and reduce oil temperature.

The licensee investigation identified a problem with the procedure, which did not have a step to verify recirculation MG set oil flow to the proper cooler. This procedure was reviewed as part of corrective actions for the previous event described in Inspection Report 50-254/265-94017. Although the operators were aggressive in pursuing the problem with this "balance of plant" system, self-check methods and procedure corrections from the previous recirculation MG set oil cooler problem were not sufficient to prevent recurrence.

#### b. Temperature Concern Between Recirculation Loops While Shutdown

Since Unit 2 was shut down in early October, three instances were identified where greater than 50#F temperature differential occurred between the recirculation loops. Engineering had previously identified that this could result in thermal stresses on piping and supports. Later, an engineering analysis showed that the event posed no safety concern. However, the recurrence showed a lack of heightened awareness and poor corrective action from a similar recent event which led to the Unit 1 shutdown.

The first event took place on Unit 1 while at power. In the later events, Unit 2 was affected while in cold shutdown. Following the engineering evaluation performed after the Unit 1 event, procedures were revised to state that the 50#F between loops shall not be exceeded. However, procedures pertaining to cold shutdown were not changed to reflect the 50#F loop differential temperature concern.

Operators believed that loop differential temperature was a concern only when restoring an idle loop. Operators did not consider the stresses being imparted to the reactor vessel when the reactor was in cold shutdown. After discovery of this problem, operating personnel were instructed to maintain the loops within 50#F at all times. The licensee planned to change the procedures to address operations while in cold shutdown.

No violations or deviations were identified.

## 4. Maintenance (62703)

The inspectors observed and reviewed the following maintenance activities:

Unit 1/2

 Adjust Piping and Supports to 1/2 Emergency Diesel Generator (EDG) Cooling Water Pump

Unit 1

- Repair Seal Ring Leak on IC Reactor Feed Pump Discharge Valve
- HCU 42-55 Repairs
- Perform Checks on Unit 1 EDG Output Breaker Check Trip Bypass Feature for Simulated Auto-Start
- Construction Test for New Bypass on Unit 1 EDG Room Fire Protection for HVAC Supply Fan

Unit 2

- Inspect/Clean/Grease 2A Recirculation Motor Generator Set Scoop Tube Positioner
- Inspect Scram Discharge Volume Drain valve 2-302-22C
- HCU 26-51 Repairs
- a. Control Rod Drive Repairs

The inspectors observed repairs of control rod drive hydraulic control units. Problems found during maintenance activities included tape found on the flange mating surface for the Unit 2 HCU 26-07 charging water check valve, other foreign material, and degraded scram inlet and outlet control valve bladders. The tape on the HCU 26-07 appeared to have been used as an FME cover from previous maintenance and was never removed. The licensee's investigation appeared limited and did not include a detailed search of maintenance records.

Maintenance personnel discovered a cigarette butt in the air operator of the scram outlet valve to HCU 54-15. Maintenance records did not indicate that the HCU scram valve was previously disassembled, but poor maintenance records have made historical searches unreliable. Previous testing indicated that the foreign material had not affected the ability of the HCU to trip the rod.

The licensee also discovered an O-ring in an HCU accumulator which did not belong to the HCU. These three foreign material intrusion instances were treated by the licensee as isolated instances.

Inspections of scram valves showed degradation in teflon seats for several valves, which caused leakage past the valve seats. The licensee had a long term replacement plan for the bladders but not for the teflon seats. The inspectors will continue to monitor the licensee's effectiveness in resolving control rod drive system problems.

## b. Shared Emergency Diesel Generator Cooling Water Pump Work

In an effort to reduce equipment vibrations, the licensee removed the shared EDG cooling water pump to repair the bedplate. During the removal, workers discovered that a pipe support upstream of the pump was not adequately supporting the pipe. This could have resulted in the pump nozzle being overstressed during a seismic event. It was determined upon reinstallation of the pump that the pipe had sprung and may have relieved tension on the support. The pipe hanger was adjusted to ensure that it was carrying proper load. A pipe brace was installed on the suction side of the pump in an effort to reduce pipe spring.

An examination of the bed plate revealed a cavity in the bedplate believed to have existed since original construction. The licensee added about 6 quarts of grout under the pump bedplate to stiffen the base. Pump vibrations were substantially reduced by the maintenance activities.

### c. HPCI Check Valves

Maintenance and engineering departments pursued problems with check valves on the Unit 1 and Unit 2 HPCI steam exhaust line vacuum breaker check valves. There were four 4-inch Anchor Darling swing check valves per HPCI exhaust line. Of the eight valves, the licensee discovered stem cracks on two valves and disc arm stop cracks on three valves. Stem nut pins came out on two valves, allowing the stem nut to fully back out on one valve and partially back out on another. The backed out stem nut allowed the disc to drop into the valve. The nut and washer from the dropped disc migrated upstream, affecting performance of the upstream vacuum breaker isolation valve.

The check valves had been in service 3 to 4 years. The licensee indicated a potential causal factor of the cracking was the rapid cycling of the valves (one to three times per second) during HPCI operation. A recent Unit 1 modification on the HPCI sparger significantly reduced this valve cycling during HPCI operation. This modification was planned for the Unit 2 HPCI in 1995.

Another potential cause for the stem cracking was an additional hole drilled through the stem on four valves. The second hole appeared to have been used for a stem nut locking pin at one time. The licensee was investigating the reason for the additional hole and reviewing 10 CFR 21 reporting requirements. All valves had been repaired, but not completely tested at the close of the period.

No violations or deviations were identified.

5. Surveillance (61725)

The inspectors witnessed or reviewed portions of the following test activities:

Unit 1 QCIS 200-8 Monthly Reactor 2/3 Core Water Level Functional Test QCOS 6600-1 Emergency Diesel Generator Monthly Test QCOS 1400-1 Quarterly C/S Pump Flow Rate Test PFC 887 Startup of "A" RPS MG Set

<u>Unit 2</u> QCTS 820-4 Local Leak Rate Test Scram Discharge Volume Drain Valves QCTS 930-7 Control Rod Scram Timing in Cold Condition QCIS 1000-3 Drywell High Pressure QCOS 2300-1 HPCI Pump Operability

## a. Surveillance Performed on Wrong Unit

On November 16, Quad Cities Instrument Surveillance (QCIS) 200-8, "Monthly Reactor 2/3 Core Water Level Functional Test," was scheduled to be performed on Unit 2. The instrument maintenance (IM) crew entered the control room and received permission from the Unit 1 supervisor and reactor operator to perform the test on Unit 1. The test was performed on Unit 1 and not on Unit 2, as required by the schedule.

The plant conditions required to perform the test were reviewed and considered acceptable to operations. The test was performed satisfactorily. After the test was completed, the workers returned to the control room, and the error was discovered. The individuals involved were counselled.

The inspectors were concerned that the IM supervisor, technicians, and control room operators failed to detect the error from the schedule. Failure to perform the surveillance on the proper unit was considered a Violation of 10 CFR 50, Appendix B, Criterion V. However, the violation is not being cited because the criteria specified in 10 CFR 2, Appendix C, VII.B of the "General St \*\*ment of Policy and Procedure for NRC Enforcement Action" were me

One non-cited violation was identified regarding performance of a surveillance on the wrong unit.

- 6. Engineering and Technical Support (37551)
  - a. Fuel Assembly in Fuel Preparation Machine (FPM)

On June 25, 1994, a bail handle on a spent fuel assembly was damaged during fuel handling operations (see Inspection Report 50-254/265-94016). The fuel bundle was temporarily placed in an FPM until it could be permanently stored in the fuel pool racks. The FPM was tagged out-of-service in the full down position to prevent its operation. This condition existed until December 1, when the licensee moved the assembly to the spent fuel pool racks.

Long term storage in the FPM was considered a problem since the FPM was not seismically qualified. Failure of the FPM resulting in a possible bundle drop and release of fission product gases was within design basis accident analysis. The licensee stated that secondary containment and standby gas treatment, systems required to mitigate the event, were operable during the time in question. However, since this condition was not specifically tracked by operations, it was possible these systems could have been taken out-of-service.

The inspectors were concerned that the licensee initially failed to evaluate the temporary storage condition. However, the discovery of the problem by system engineering and the subsequent corrective action were appropriate.

#### b. Control Rod Withdraw Sequence Error

On December 5 the licensee discovered that some control rods were withdrawn in an incorrect sequence during reactor start-ups since October 1991. Specifically, a peripheral rod group was incorrectly split into two groups and withdrawn separately. Subsequent rod movements during start-ups returned the rod sequence to its intended pattern. Rod movements made outside the required sequence appeared to be outside the system design basis. Guidance for rod withdrawal sequence was provided by a vendor document and entered into a sequence builder program on a computer, which was reviewed by both corporate and site personnel. At the end of the report period, the licensee continued to investigate the safety significance of the rod withdrawals made during past start-ups and the failure to detect the computer program error. This is considered an Unresolved Item (50-254/265-94028-01(DRS)) pending further review of the licensee's investigation.

### c. Main Steam Line Radiation Monitor Indication Problems

The inspectors reviewed the licensee's investigation of a problem with the main steam line radiation monitors on Unit 1. All four channels tracked downscale and remained downscale for 15-20 minutes for no apparent reason. This event happened twice on the same day, three hours apart. Upon investigation, the licensee determined that similar events had occurred on several previous occasions.

The system engineer concluded that the instruments operated within the design accuracy, but the instruments were more sensitive to circuit noise and minor fluctuations in background radiation levels with the reactor shut down and the instruments at the low end of the scale. This circuit noise coupled with actual changes in the sensed radiation levels was the expected cause of the observed phenomena.

The licensee's investigation eliminated many possible causes of the downscale spiking, including: cycling of equipment in the area. step changes to the high voltage power supply, use of twoway radios in the area, and cable and common ground faults. The licensee performed a special one-time test and weekly functional testing to demonstrate the instruments were operable. The inspectors evaluated the process of the investigation, including vendor communications to the licensee, and determined that the methods and processes were adequate.

#### d. Turbine Bypass Valves Response Time Slow

A PIF written by nuclear fuel services (NFS) identified a discrepancy found during a review of transient analysis data. The feedwater controller failure (FWCF) analysis is one of several transients analyzed each operating cycle to determine the minimum critical power ratio (MCPR) operating limit for that cycle. It was discovered that there was no documentation of the opening times of the turbine bypass valves following a turbine trip, and that this response time had not been tested since initial operations for each unić. This response time was a key input into the FWCF transient analysis. Upon a turbine trip on high water level due to a FWCF, the bypass valves were required to pass 80% of full capacity within 0.3 seconds to validate the original analysis.

As a result of this discovery, an administrative limit was imposed on the operating limit MCPR (OLMCPR). This limit was calculated using a preliminary estimate of the FWCF event without taking credit for bypass valve operation. General Electric reviewed calculations for an official administrative limit on the OLMCPR and confirmed the ComEd calculations were conservative.

Bypass valve timing tests conducted on Unit 2 indicated that the valves did not achieve the opening time required to satisfy the conditions of the analysis. The licensee planned to use the conservative OLMCPR for the remainder of the fuel cycle and was investigating the reason for the slow times on Unit 2. On December 5, testing was performed on Unit 1 and the results were within the required criteria. The data were transmitted to NFS for evaluation.

The licensee's response and corrective actions were adequate and timely, and conservative action had prevented operation outside the analysis after the time of discovery

# e. Inspector Walkdowns

Inspector walkdowns following engineering and operator walkdowns on Unit 2 identified some discrepancies. These included debris in the Unit 2 drywell prior to drywell closeout, RCIC room debris, a loose RCIC pipe support, a PWCU area temperature probe coated with paint, and scaffolding concerns on the Unit 2 HPCI system and torus. The licensee addressed most of the deficiencies prior to the Unit 2 start-up. Licensee drywell closeout inspections have been a recurring problem, and weaknesses in communication were apparent in the failure to correct some of these issues.

f. <u>Inadequate Residual Heat Removal Service Water Operability</u> Surveillance

On December 7, the inspectors observed the operation of the Unit 2 C and D residual heat removal service water (RHRSW) pumps. The differential pressure across the room cooler for the D pump was about 20 psig. The differential pressure across the room cooler for the C pump was about 55 psig. The inspectors reviewed Quad Cities Operational Surveillance (QCOS) 1000-4, "Quarterly RHRSW Pump Operability Surveillance," for an acceptable value of room cooler differential pressure. The surveillance stated that no acceptance criteria existed, and one would be established at a later date. The room coolers were required for operability of the RHRSW pumps. Without acceptance criteria for room cooler differential pressure, the surveillance did not verify proper operation of equipment necessary for the operability of the RHRSW pumps. This is considered an Unresolved Item (50-265/94028-02(DRP)) pending NRC and licensee review of acceptance criteria.

No violations were identified in this area. Two unresolved items were identified for the control rod withdrawal sequence error and testing adequacy of the RHRSW room coolers.

7. Plant Support (71707)

#### Contaminated Square Footage

The licensee continued to reduce contaminated plant square footage. Although the area was reduced from 26% to 12% recently, about 3% was lost at the close of the period due to poor ventilation resulting from continued inoperability of the "1/2 A" heating boiler.

No violations or deviations were identified.

### 8. Issue Resolution (92701, 92702)

The following item is considered closed:

(<u>Closed</u>) Unresolved Item 50-254/265-94004-56(<u>DRP</u>): Ceramic fill and coating compounds not controlled. The licensee identified every

application of these materials to plant apparatus and identified 62 cases (including four on the primary side) in which the material had not been removed as a result of a permanent repair. The licensee performed an engineering evaluation (SESR 4-1814) of the viability of each of the 62 remaining applications for the period of remaining use and found continued use to be acceptable. The inspectors reviewed a sample of the applications listed, including all four on the primary side, and took no exception to those findings.

No violations or deviations were identified.

# 9. Regional Request (2515/121)

(Closed) Temporary Instruction 2515 12: Verification of Mark I Hardened Vent Modifications: In response to Generic Letter 89-16, "Installation of Hardened Wet Well Vent," the licensee installed an augmented primary containment vent system (APCVS). The major advantage of the modification was to allow for a high temperature, high pressure containment release path in the event of a design basis accident. The original release paths of the standby gas treatment system and reactor building ventilation were unsuitable for both high temperature and high pressure.

The APCVS was designed to pass sufficient flow with a constant heat input from the reactor of 1% of rated thermal power at the primary containment pressure limit. Valve operating override capabilities from the primary containment isolation system (PCIS) were provided via a mode switch on control room panels. This design allowed venting from the wetwell during a PCIS signal. Drywell venting in this mode was also possible but procedurally restricted. A release path from the suppression pool provided the advantage of a "scrubbing" effect due to the vents directing the release underwater prior to being removed by the APCVS.

The modification, performed on both units, included common exhaust piping to the main station off-gas stack. Operator training for the system was provided, and station procedures were updated to reflect the operation of the APCVS. Training records, operating procedures, and the 10 CFR 50.59 evaluation used to install the modification were reviewed, and the APCVS was walked down by the inspectors. No discrepancies were identified.

No violations or deviations were identified.

#### 10. Management Meeting

A meeting was held on November 17, 1994, between the ComEd Chief Nuclear Officer, the Director of Nuclear Reactor Regulation, the Region III Deputy Regional Administrator, and other members of their respective staffs. The purpose of the meeting was for the licensee to provide an update on the status of Units 1 and 2 with regards to unit start-up. No violations or deviations were identified.

## 11. Umresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, items of noncompliance, or deviations. Unresolved items disclosed during this inspection are discussed in paragraphs 6.b, and 6.f.

### 12. Exit Interview

The inspectors met with various licensee representatives during the inspection period and at the conclusion of the inspection on December 15. The inspectors summarized the scope and results of the inspection and discussed the likely content of this inspection report. The licensee acknowledged the information and did not indicate that any of the information disclosed during the inspection could be considered proprietary in nature.

The following management representatives attended the exit meeting conducted on December 15, 1994, along with others.

## ComEd

- E. Kraft, Site Vice President
- J. Kudalis, Support Services Director
- A. Lewis, Staff Assistant
- G. Powell, Lead Radiation Protection Representative