

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report Nos. 50-254/95005(DRP); 50-265/95005(DRP)

Docket Nos. 50-254; 50-265

License Nos. DPR-29; DPR-30

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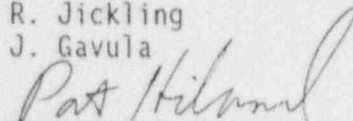
Facility Name: Quad Cities Nuclear Power Station, Units 1 and 2

Inspection At: Quad Cities Site, Cordova, Illinois

Inspection Conducted: June 3 through July 22, 1995

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Inspection Summary

Inspection from June 3 through July 22, 1995
(Report Numbers 50-254/95005(DRP); 50-265/95005(DRP))

Areas Inspected: Routine, unannounced inspection of operations; maintenance; engineering and technical support; plant support; and issue resolution.

1.0. Executive Summary

Overview

Unit 1 remained at or near full power throughout the majority of the period. On July 20 operators took Unit 2 critical following Q2R13 refuel outage maintenance. The licensee continued to exhibit weaknesses in communications and maintenance work practices.

Operations

- A non-cited violation was identified regarding a unit supervisor leaving the control room without a proper relief. Communication about the issue was weak (section 2.2).
- The inspectors identified communication weaknesses between operations and other departments which hindered proper maintenance and operations (section 2.3).
- The licensee identified improperly sized fuses installed in a safety-related circuit (section 2.4).
- The inspectors identified continuing instances of poor control room logs (section 2.5).

Maintenance and Surveillance

- Repetitive poor material condition problems hindered operations performance (section 3.1).
- A violation was identified for failure to follow procedures due to an inexperienced crew working without proper supervision on a control rod drive (section 3.2).
- A violation was identified for failure to follow procedure requirements during maintenance on High Pressure Coolant Injection system components (section 3.3).
- A violation of Technical Specifications occurred when a hose was routed through a water tight door, without consideration for proper configuration (section 3.4).
- An oil leak of 20-40 gallons of oil resulted from a loose bolt on the HPCI speed reducer housing after maintenance (section 3.5).
- The inspector identified weaknesses in work packages for the air operated scram valves (section 3.6).
- The inspectors identified maintenance work request tag deficiencies (section 3.7).
- The rework performance monitoring parameter was not yet effective (section 3.8).

- Implementation of a new work management process was slow and ineffective due to the Unit 2 refuel outage delay (section 3.9).

Engineering and Technical Support

- Management followup to several reactor recirculation issues was considered weak. An inspector followup item (IFI) was issued (section 4.1)
- Some RHR injection and shutdown cooling capability was lost for a brief period due to a condition previously identified by the licensee in which motor-operated valves (MOV's) would develop an over current condition (section 4.2).
- Engineering's failure to identify the interference between the shroud head assembly and new shroud repair hardware demonstrated poor design verification. The lack of rigor and detail in the subsequent evaluations of the shroud repair hardware and separator impact, and separator lifting lug modification were considered design control weaknesses (section 4.3).
- Positive changes in the design change and nuclear tracking system (NTS) were observed. A heightened level of awareness to communication problems were also observed. However, communication problems were still prevalent (section 4.4).
- SCRAM valve position switch mispositioning had not been identified for corrective maintenance (section 4.5).
- Engineering failed to properly disposition Information Notice (IN) 91-78, "Status Indication of Control Power for Circuit Breakers Used in Safety Related Applications." An IFI was issued (section 4.6).

Plant Support

- A violation was issued regarding the failure to take timely corrective actions for problems identified in the fire protection program (section 5.1).
- Management support to the emergency preparedness program was considered very good. Two IFIs were issued to track OSC reorganization and information regarding response with other federal agencies (section 5.2).

DETAILS

2.0. OPERATIONS (71707)

Operations performance was considered adequate, however poor communication interfered with otherwise good planning and corrective action efforts.

2.1. Follow-up of Events (93702)

During this inspection period, the licensee experienced events, some of which required a prompt notification of the NRC pursuant to 10 CFR 50.72. The following events were reviewed for reporting timeliness and immediate licensee response.

June 9	A Unit 1 main steam line radiation monitor power supply failed resulting in partial group 1, 2, and 3 primary containment isolation system (PCIS) actuations.
June 14	Unit 2 moisture separator interfered with and impacted the core shroud modification.
June 29	Both loops of Unit 2 residual heat removal (RHR) inoperable due to failure of motor operated valves.
July 8	Maintenance workers damaged a control rod drive and drive cart during removal of a drive.
July 20	Operators took Unit 2 critical after completion of Q2R13 refuel outage.

2.2. Unit Supervisor Out of Control Room

On July 8 the Unit 1 "acting" Unit Supervisor (US) left the control room without a proper relief. The Shift Engineer (SE) had temporarily relieved the US. The SE left the control room and returned about four minutes later. The SE later realized Unit 1 had been left without a US for a period, and documented it on a problem identification form (PIF).

The inspectors determined the licensee's initial corrective action was good, but communication of the event was poor. Much of the operations and station management, including the event screening committee which reviewed the event, were not aware that the unit was actually without a unit supervisor for a brief period. The event brief led many to believe that the only problem was a poor turnover. Information to brief other shift members of the details of the problem were not included in the shift order book or training materials, rather it was sent by electronic mail to a limited number of individuals. No followup on personnel manning in the control room during the incident was performed until after the inspector asked for the results about two weeks later.

Leaving the control room without a proper relief was a violation of Quad Cities Administrative Procedure (QCAP) 300-1 and Technical Specification 6.2.A. The licensee's initial action was to modify senior reactor operator security badges as a reminder of watch station. This licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII of the NRC Enforcement Policy.

2.3. Communication Weaknesses

The inspectors observed refueling operations, including replacement of a potentially damaged control rod blade and noted two communication weaknesses. The inspectors identified other communication weaknesses involving remote cameras and radiation monitors.

In one instance, the inspectors observed fuel handlers moving a fuel support piece (FSP) over the fuel in the reactor vessel. The inspectors observed good control room coverage of the evolution. However, the fuel handlers indicated guidance was not provided on keeping the FSP away from the top of the fuel. The inspectors later discovered that reactor engineering had specifically set up the sequence of fuel moves so that the FSP would not have to be moved over the fuel in the vessel.

In another instance the inspectors observed problems with the refueling bridge which caused the mast to move downward with a fuel bundle, without corresponding operator action. The fuel bundle traveled down to where it could have impacted a control rod blade before the bridge operator arrested the travel. The inspectors later found that maintenance had taken some corrective actions, but had not communicated the extent of repairs to management or system engineering. Electrical maintenance workers changed the control console with the console from the Unit 1 refuel bridge. Earlier that day the jog switch was replaced due to sluggish response. Cognizant operators and system engineering personnel questioned were not aware of the status of repairs to the bridge prior to resumption of fuel moves. No PIF had been written to document or trend the problem. After the inspectors discussed this issue with management, the licensee initiated a PIF. At the end of the period the root cause(s) for the refueling bridge problems had not been determined.

The inspectors identified that operators failed to properly notify Radiation Protection concerning failed mounting of installed cameras to monitor the four residual heat removal (RHR) pump upper and lower motor bearing oil levels. The cameras were for ALARA considerations. During a tour of the RHR rooms, the inspectors found the camera monitoring the 1B pump dislodged from the camera mounting, hanging by the cord and pointing at the floor. Operations had been aware of the problem.

On June 9 the 1A1 reactor protection system electrical protection assembly (EPA) tripped on undervoltage causing a half scram (PIF 95-1775). The probable cause was attributed to the 1A main steam line radiation power supply failure. The problems associated with the half scram were not communicated to the system engineering organization.

2.4. Improper Fuse Configuration in Safety Related Cabinet

A licensee investigation revealed a discrepancy between a fuse installed in a safety system and the fuse drawing. The problems identified were further examples of out-of-service implementation problems, and controlled drawing use.

On June 19 operators identified a three amp fuse installed in the Unit 2 automatic depressurization system (ADS) instead of a ten amp fuse as

required by the fuse drawing. The licensee documented the deficiency on a PIF. The licensee visually inspected the remaining fuses in the affected electrical cabinet and identified a ten amp fuse installed where a three amp fuse was required. The licensee believed these errors were caused by operators mistakenly exchanging the fuses while returning equipment to service. The licensee corrected the condition.

To determine if operators installed other fuses improperly, the licensee performed visual inspections of fuses installed in various electrical cabinets in both units. Minor discrepancies were identified and corrected.

The licensee utilized several aids to control the type and size of fuses used in the facility. There were discrepancies between these aids, and the operators did not use the aids during return-to-services. The inspectors noted that this event was indicative of continuing problems with the licensees' out-of-service program and problems with configuration control. After this event, the licensee upgraded the fuse list to a critical document. Operators were required to utilize the fuse list drawing during fuse installation.

2.5. Poor Control Room Logs

The inspectors observed weaknesses in documentation of the Unit 2 control room log. On July 12 the licensee performed Quad Cities Operating Surveillance (QCOS) procedure 500-5, "Scram Solenoid Valves Test at Cold Shutdown." When problems occurred, operators performed the surveillance several more times for troubleshooting. However, the unit operators documented only the completion of the surveillance. Operators did not document troubleshooting activities in the control room log or initiate a PIF. The shift engineer's log had more details of the event. The inspectors noted other occurrences of failure to document changes in major equipment and surveillances and considered this a continuing weakness.

3.0. MAINTENANCE (62703)

Maintenance activities were considered poor due to failure to follow procedures and expected practices which led to several equipment problems. Planned improvements in work planning and scheduling were delayed due to extension of the refueling outage. Many repeat equipment problems had not yet been adequately addressed.

3.1. Material Condition

During the period several events and/or precursors hindered operations.

- Two HPCI manual starts were terminated due to problems with auxiliaries including gland exhaust fan and condensate pump.
- Two reactor recirculation speed increases occurred without operator demand. Both increases were terminated by operator action. One small increase raised thermal power a few megawatts above rated for a short period. This had occurred previously; the most recent event was in May 1995. The eight hour rated thermal

power average remained below technical specification requirements. The second increase resulted when one reactor recirculation pump on Unit 2 increased speed from 32% to 60%, causing a power increase of about 1% with the reactor in start-up mode. This was due to test equipment interference.

- A small fire in switchgear was due to a control power transformer problem. This was the third fire in twelve months due to control power transformers.
- Operators were required to enter emergency procedures at least twice this period due to minor flooding in emergency core cooling system (ECCS) pump rooms with inoperable floor drain check valves.
- A one-half logic primary containment isolation system (main steam isolation valve) isolation was caused by technicians bumping sensitive main steam line flow instruments. This was similar to a reactor trip caused by the same circumstances in August 1994.
- Unit 1 lost annunciator horns on several control room panels. This repeat problem last occurred in February 1995 along with other problems associated with the sequence of events recorder (SER) computer.
- At least three half scrams resulted from spiking local power range monitors (LPRMs). Routine preventive maintenance was not in place to prevent these occurrences.
- Both Unit 1 and Unit 2 "B" reactor feed pumps were degraded for long periods following maintenance.
- The Unit 2 hydrostatic test showed many leaks on components on which maintenance had been performed during the outage.
- Sheared pins on Units 1 and 2 circulating water travelling screens caused condenser vacuum concerns.
- Both Unit 1 stator water cooling pumps were degraded.

Although the licensee took good short term corrective actions initially, repetitive problems continued to affect unit performance. The problems identified show continuing weaknesses in maintenance and engineering's ability to fix identified problems and to track and correct negative trends in equipment performance, and rework.

3.2. Control Rod Drive Dropped During Maintenance

The use of inexperienced workers in a high radiation area resulted in workers damaging a control rod drive (CRD) cart and a CRD, and resulted in additional exposure to workers.

On July 8 maintenance workers uncoupled Unit 2 Control Rod J-7 from the CRD. Previously, the workers moved a CRD transport cart under CRD J-7 and tested the equipment prior to commencing work. An experienced

supervisor was assigned to the job and elected not to enter the under vessel area. The less experienced workers performed the task without direct supervisory oversight. The workers performing the task were not familiar with the equipment operation and failed to properly engage the cart locking mechanism. The weight of the CRD on the unlocked cart caused the cart to move and the CRD to drop about three feet. The licensee believed that both the cart and the CRD were damaged by the event. The licensee later reinstalled a different CRD for rod J-7.

The inspectors noted the following deficiencies:

- Training - The licensee did not ensure personnel received sufficient training on equipment needed to handle safety related equipment. Prior training was given to two crews but not to the inexperienced crew which caused the CRD drop. Also, a job assignment matrix for the CRD drive removal was not used in selecting all the crews.
- Equipment - The maintenance crew positioned the latch actuator lever to the "latch" position but the mechanism did not properly engage. Experienced crews had previously worked around problems with the cart. The inexperienced workers failed to properly set the locking mechanism and check for proper locking, resulting in damage to the CRD and the CRD cart.
- Exposure - Workers recovering from the dropped CRD received an additional exposure of about 2000 millirem over planned dose for the job.

Maintenance Procedure QCMM 300-4, "CRD Handling Equipment Positioning Using EPRI/Dominion Engineering, CRD Equipment," Rev. 0, Step I.1.e. required engaging the latches to lock the carriage and winch cart units together. On July 8 maintenance workers failed to ensure the CRD cart and carriage were properly latched together. This is a procedural adherence violation (254/265-95005-01a).

3.3. HPCI Maintenance Problems

The inspectors noted some weaknesses while observing maintenance troubleshooting on the Unit 2 HPCI gland exhauster fan on July 22.

- Maintenance staff investigating the cause of overcurrent trips of the exhauster had problems identifying recent past maintenance on the same equipment.
- Electricians took current readings at several different locations without documenting the location or passing the information on to the next crew.
- Foremen did not fill out risk evaluation "red sheets" to brief unit supervisors on the significance of the maintenance activity.

The inspectors identified that a maintenance history search was performed; however, no recent maintenance history on the equipment had been found. The inspectors researched and found a PIF which documented a similar problem only a few weeks before. Maintenance workers trying to help return HPCI to service were dealing with identical issues to the previous incident without the benefit of adequate maintenance history.

Maintenance workers over several shifts took current readings to monitor equipment with an overcurrent condition. The troubleshooting was hindered because the readings varied significantly. The licensee later identified that the workers were taking current readings at different locations without documenting the location of the readings. Work package guidance and documentation of results were poor.

The inspectors observed that red sheets for risk screening were incomplete for work activities on the HPCI gland exhaustor, and for the 1/2 instrument air compressor. The intent of the red sheet was to sensitize personnel to maintenance work which can cause engineered safeguard features actuations, transients, or trips. Quad Cities Administrative Procedure (QCAP) 200-15, "Work Activity Screening," step D.1, required the red sheet checklist form to be completed by the individual directly in charge of the job immediately prior to performing the work and presented to the unit supervisor or shift engineer for approval.

The inspectors identified that in both cases the red sheet was incomplete, with maintenance in progress. In one case, the inspector found that section 3 of the red sheet had been filled out to identify that the work affected an ECCS and a DC distribution system. However, sections 4 and 5 of the red sheet had not been filled out to identify potential problems with this work or obtain approval as required by step D.4. and D.1. of the procedure. Failure to follow the requirements of QCAP 200-15 is a violation of Technical Specification 6.2.A. which required that written procedures, including those affecting maintenance, be established and implemented (254/265-95005-01b).

3.4 Poor Control of Water Tight Door Configuration

On June 22 the inspectors observed that mechanical maintenance workers routed a hose through the 1A RHR room water tight submarine door for an extended period of time. The licensee found no documentation that declared the LPCI mode of RHR inoperable during the extended period of time, nor were both core spray sub-systems and the containment cooling mode of the RHR immediately demonstrated to be operable. Technical specification (TS) 3.7.C.2 stated that, "The doors of the RHR pump compartments shall be closed at all times except during passage in order to consider the LPCI mode of the RHR system operable." Technical Specification 4.5.A.5 stated, "When it is determined that the LPCI mode of the RHR system is inoperable, both core spray sub-systems, the containment cooling mode of the RHR shall be demonstrated to be operable immediately." Failure to maintain the 1A RHR room door closed is a violation of TS (Violation 50-254-95005-02). Another example of poor door control is discussed in section 3.7.

3.5. HPCI Oil Leak

On July 5 the Unit 2 HPCI auxiliary oil pump started automatically, and the inspectors observed about 20-40 gallons of oil discharged onto the HPCI room floor. The pump start was an expected part of the ECCS logic test. The oil leak resulted from a loose bolt in the speed reducer housing. The bolt was loosened as part of a work package to install a pump alignment device. The package did not specify that the installation would make HPCI inoperable, or that an additional OOS was needed. Operations relied on an existing OOS tagout to cover system and personnel protection. A maintenance foreman communicated to supervision that only a few minor adjustments were needed to the alignment equipment, so a general foreman cleared the OOS tags for the work. This action should have allowed the HPCI lineup to be in a condition acceptable for the ECCS test. The foreman had not verified the status of the work before indicating that only minor adjustments were necessary.

The inspectors were concerned that no one involved in the OOS process had walked down the job sufficiently to ascertain the effect maintenance would have on the HPCI system. The licensee's initial investigation focused on a personal error by the maintenance foreman, but failed to address the problems with the OOS tagout and work package. The actions to further investigate the problem and communicate lessons learned to the rest of the station were slow. The inspectors noted that other incidents in the last year in which the status of maintenance and system configuration was not adequately captured by the OOS system. These included a service water pipe in the Offgas Building which was cut while service water was running through the piping, and a feedwater heater string which was isolated by an OOS but thought to be operable by operators during a unit start-up.

3.6. Scram Valve Maintenance

The inspectors identified leakage from several packing glands on Unit 2 air operated scram valves. Maintenance repacked the valves during the Unit 2 refueling outage. Noticing the gland followers at different heights, the inspectors reviewed the vendor manual which specified that five rings of packing should be installed. The work package did not specify how many rings of packing to use. The bill of materials list showed that between three and five rings of packing were used, without justification to deviate from vendor recommendations. The licensee eventually repaired the leaks by consistent gland nut torquing and stroking of the valves.

3.7. Poor deficiency Tag Tracking

The inspectors reviewed several older deficiency tags to determine the status of the component repairs. That review indicated that approximately 40 percent of the sampled older tags could not be traced to active work requests.

The condition of the 1B core spray pump room door demonstrated how known material condition problems deteriorated and led to failure of necessary equipment and created operator work-arounds. The inspectors noted three

separate deficiency tags hanging on the water tight door to the 1B Core Spray Pump Room. The oldest tag identified worn door hinges and the need for maintenance, the second tag identified that the handle was loose, and the third tag that the door handle had fallen off. The inspector observed an operator enter the room and leave the door open while conducting rounds, as opening and closing the door was difficult with the handle off.

3.8. Limited Licensee Rework Assessment

The inspectors reviewed the licensee's effort for monitoring rework items and maintenance effectiveness. On April 26 the licensee issued Memo No. 400-03, "Rework and Repetitive Maintenance Indicator/Process," in which a new definition for rework item was provided. Any additional corrective maintenance performed due to failed post-maintenance verification or post-maintenance testing was considered rework.

The inspectors noted repeat maintenance during the outage, some of which had not been characterized as rework. The licensee was tracking rework items with the PIF system. Therefore, rework items which were not reported through the PIF system were not taken into account. The licensee identified that 77 rework PIFs in the second quarter of 1995 should have been classified as rework PIFs but were not. To ensure proper characterization of rework PIFs, maintenance staff planned to become involved in the event screening committee (ESC) process by attending ESC meetings. In addition, because only Level III and above PIFs had root cause codes assigned to them, the root causes for Level IV PIFs had to be hand-searched. The licensee had yet to correlate root cause to rework items. Licensee assessment on the state of rework and maintenance effectiveness was limited.

3.9. Work Management

During the week of June 12 the licensee implemented the first week of a 12-week rolling maintenance schedule. The licensee planned maintenance activities in several system windows in each of the 12 weeks.

Due to the extension of the Unit 2 refuel outage and the amount of emergent work, the implementation of the 12-week schedule was less than successful. For the week of July 3, there were 104 items scheduled. However, the licensee was able to complete only 4 out of the 104 work items. In addition, there were 51 emergent work items in the same work week, of which the licensee completed 28 items. The canceled work was scheduled into the next system window for maintenance. The licensee recognized the weaknesses and planned to use several performance indicators to assess the process effectiveness. The indicators included percent emergent work, backlog control, system window effectiveness, forced outage planning, 12 week planning effectiveness, and operational risk.

The inspector also noted that surveillances were tracked under the general surveillance (GSURV) program, which differed from the 12-week schedule. The licensee planned to have both systems compliment each other by either rescheduling surveillances or a system window to best

minimize system outage time. The inspectors will monitor the progress on work management issues.

4.0. ENGINEERING (37551)

4.1. Reactor Recirculation Pump Issues

Management followup to several reactor recirculation issues was considered weak. Outstanding issues included; response to vendor communications, a temporary relief request for inspecting leakage around pump bolting, and use of temporary repair sealant for an extended period.

Vendor Communications

General Electric (GE) issued Service Information Letter (SIL) 459 in 1987 that discussed recirculation pump shaft and cover cracking. Supplement 2 to SIL 459 was issued in 1991 and identified the root cause of the shaft cracking as fatigue initiated by thermal stresses. Plants that change electrical load to follow system demand, such as Quad Cities, were considered susceptible to shaft cracking. The supplement mentioned that all shafts that had been removed showed signs of cracking. The original SIL recommended installing on line vibration monitoring instrumentation. At other plants, vibration monitoring successfully detected problems before shaft failure occurred. A corporate engineering evaluation, performed in 1988, recommended a vibration monitoring modification. The present status of the modification was still in the discussion stage.

Information Notification (IN) 89-20, "Weld Failures In A Pump of Byron Jackson Design," discussed failures in the attachment weld of a ring that surrounds the reactor recirculation pump bearing housing component. The licensee's review of this item concluded the subject weld failure could cause vibrations during pump operation that could be detected by an on-line vibration monitoring system.

Temporary Sealant Repair

In December 1993, engineering recommended a permanent repair for a leaking reactor recirculation pump flange during refueling outage Q2R13 (Spring '95). The 2A reactor recirculation pump had been temporarily repaired using "Furmanite." The pump flange was originally Furmanited in 1990, then again in 1993.

Management decided in late 1994 not to repair the pump flange during Q2R13, primarily due to resources not being properly planned for the job. The flange was pumped with Furmanite a third time during Q2R13. The inspectors had previously discussed the use of Furmanite as more than a temporary repair with licensee management. Previously, engineering justified continued usage of the Furmanite until refueling outage Q2R13 and stated the use of Furmanite was not intended as a permanent repair by the licensee or the vendor. The inspectors discussed the continued long term use of Furmanite with the licensee and will followup licensee action on this issue as IFI 50-254/265-95005-03.

Bolt Inspection Relief

Inspection of the bolts at the 2A recirculation pump flange joint were required by ASME Code due to leakage that occurred at the bolts during reactor vessel hydrostatic test. The licensee removed three bolts at a cost in exposure of about 284 mrem per bolt before asking for a temporary code relief request from bolt inspection. The NRC granted relief request.

4.2. Loss of Residual Heat Removal Capabilities (Unit 2)

Due to problems with motor operated valves (MOV's), a reduction in the ability to remove decay heat from Unit 2 during shutdown occurred. The licensee's investigations into the MOV failures was thorough. The licensee previously identified an over current condition in MOV's resulting in the electrical breaker tripping. The licensee implemented corrective actions for some MOV breakers, but interim administrative compensatory measures were lacking for the remaining MOV's susceptible to this condition.

On June 28, after completion of a flush on the "B" train of residual heat removal service water (RHRSW) system, operators identified that Valve 2-1001-5B would not fully close. Operations declared the "B" train of RHR inoperable to allow maintenance of the valve operator. Maintenance determined that the valve failed to close due to a broken anti-rotation device. During the recent outage, the valve vendor improperly staked a set screw used to hold the device in place. The device was replaced, and no other problems were found with similar devices.

Before operations returned the "B" train of RHR to service, operators attempted to initiate shutdown cooling using the "A" RHR system. Operators opened RHR Valve 2-1001-29A from the control room. As soon as the valve reached the full open position, the valve started to close. The power supply breaker to the MOV then tripped open, stopping valve travel. With both trains of RHR inoperable, the licensee notified the NRC. During the 4 hours that shutdown cooling was unavailable, reactor water clean up (RWCU) system maintained system temperatures to a 2°F increase.

Engineering formed a team to investigate the failure of the 2-1001-29A valve. The team determined that on June 15, during a primary containment isolation system (PCIS) logic test, a relay was energized that sealed in a close demand signal for the valve. The condition was not cleared at the conclusion of the test.

On June 29 operators attempted to restart shutdown cooling per procedure QCOP 1000-5, "Shutdown Cooling Operation." Section F.2. of the procedure did not require operators clear the PCIS signal for valve 2-1001-29A. There was no indication in the control room that the relay was energized. With the relay energized, the valve received a close signal after operators opened the valve.

The power supply breaker opened when the valve moved in the close direction due to a rapid reversal of electrical current to the MOV. The licensee recognized this behavior from previous events and initiated

repairs to reset some electrical breakers susceptible to this condition. After this event, the licensee reset the breaker over-current trip set points for Valves 2-1001-29A and B. The licensee planned to make procedural changes to clear the PCIS isolation signal prior to operating any 1001-29 valve and at the conclusion of the PCIS logic test.

A licensee evaluation (dated November 11, 1993) utilized a PRA approach to justify delaying the resetting of electrical breakers susceptible to rapid reversal. The evaluation also adopted a General Electric position that this MOV behavior was outside design basis and therefore not an operability concern. The inspectors consider this an Unresolved Item (50-254/265-95005-04) pending inspector review of industry documents. The licensee's corrective actions for MOVs still susceptible to this behavior was weak. Engineering did not identify to operators compensatory actions for operation of these MOVs, nor which MOVs were susceptible to this condition prior to inspector involvement.

4.3. Core Shroud Repairs

While re-assembling the reactor vessel internals, the licensee identified that the lifting lug legs for the shroud head and moisture separator assembly interfered with newly installed hardware. The licensee initiated a PIF to determine why this design deficiency was not discovered during engineering reviews of the shroud repair. Preliminary results indicated that GE Nuclear Energy had not included the shroud repair hardware in the interference model. The inspectors learned that ComEd had previously identified the interference problem with the shroud repair modification, but had not followed through with any additional reviews. The inspectors considered the failure to identify this deficiency as poor design verification.

Because two of the shroud head support legs struck part of the shroud repair hardware during vessel reassembly, the licensee evaluated whether any components had been overstressed due to the impact load. NRR technical staff reviewed the calculations for this aspect and eventually concluded that the stresses to the core shroud hardware, resulting from the inadvertent loading condition, met the allowable stress limits. However, the initial calculation submitted by the licensee did not properly represent the deformation of the shroud repair component subjected to impact, and the subsequent calculation did not reflect the precise boundary conditions and actual impact load. The inspectors considered the lack of rigor associated with these calculations to be a design control weakness.

In addition, the licensee modified the two shroud head support legs and lifting lugs to resolve the interference problem. The support legs were removed, the lower portion of the lifting lugs were trimmed to provide sufficient clearance, and additional welds were added to the sides of the lugs to replace the weld partially removed during the trimming process. The licensee provided calculation GENE-771-112-0695 Revision 2, demonstrating that the modified lifting lugs had adequate capacity to support the separator assembly during moving operations. Region III technical staff reviewed this calculation and after discussions with the licensee concluded that the new weld configuration was sufficient; however, it was not sufficiently documented in the calculation. The

technical bases for using a simplified weld analysis method was not given for the unconventional weld configuration and lack of as-built machining dimensions caused the lower weld size to be questioned. The inspectors considered the lack of detail in the calculation to be a design control weakness.

4.4. Engineering and Technical Support Followup

A followup engineering and technical support (E&TS) inspection was conducted during June 19-30 to review the licensee's E&TS activities and to assess the organization's effectiveness. The previous E&TS inspection, conducted during September 1994, concluded that the control and implementation of Quad Cities E&TS activities were considered poor and Quad Cities' engineering organization's effectiveness showed minimal improvement since the 1993 Diagnostic Evaluation Team Inspection.

Subsequent to the September 1994 inspection, extensive organizational restructuring, the hiring of additional experienced engineers, the clarification of engineering roles and performance expectations were observed. Positive changes in the design change and nuclear tracking system (NTS) were observed. A heightened level of awareness to communication problems were also observed. However, communication problems were still prevalent.

4.5. Mis-aligned SCRAM Valve Position Switches

During the September 1994 E&TS inspection, inspectors discussed a potential problem with mis-aligned SCRAM valve position switches on the hydraulic control units (HCUs). These switches provided light indications on the main control board informing operators of the SCRAM valve's opening.

During this inspection, the inspectors toured the Unit 1 and 2 HCUs and found several SCRAM valve position switches still mis-aligned. The inspectors were concerned that no maintenance action had been identified to correct the problem.

4.6. Incomplete Disposition of IN 91-78, "Status Indication of Control Power for Circuit Breakers used in Safety Related Applications"

Following review of IN 91-78, the licensee documented on March 5, 1992, that "Quad Cities Nuclear Power Station knows of no circuits with the mentioned design at this location." On May 5, 1992, an entry in the NTS stated "To conform to NRC IN 91-78, Dresden and Quad Cities auto-close safety related circuit breakers should be modified to monitor the close control power so that station personnel are made aware when the safety equipment becomes inoperable. Quad Cities Nuclear Power Station must evaluate this proposal and document the evaluation results." On November 11, 1992, an NTS assignment to investigate the recommended modification was made with a due date of December 31, 1993. Subsequent review indicated that the licensee closed the NTS item with no indication an evaluation or modification was completed.

The inspectors discussed this item with the support engineers and licensee management and determined that the modification was not being

pursued. The inspectors also discussed with operations personnel the level of knowledge regarding the effect of a failure in the control circuit. These discussions indicated that operators were not aware of the condition and would assume control power was available if the lights remained lit. The inspectors communicated this information to licensee management. Further licensee action regarding the need for a modification and training of the operators is an Inspector Followup Item (50-254/265-95005-05).

4.7. System Engineering Awareness of Radiation Monitor Power Supply Failure

On June 9 the 1A1 reactor protection system electrical protection assembly tripped on undervoltage causing a half scram (PIF 95-1775). The probable cause was attributed to the 1A main steam line radiation power supply failure. Interviews on June 13 with the system engineer and lead engineer indicated that operations had not communicated to the system engineering organization the problems associated with the half scram.

5.0. PLANT SUPPORT (71750 and 92904)

5.1 Fire Protection

The inspectors performed an unannounced inspection of the fire protection program. The purpose of the inspection was to review corrective actions on previously identified issues.

5.1.1. Plant Conditions

Control of normal combustibles was good with very few transient combustibles in the plant. Equipment in the plant had few oil leaks. There were few minor fires during the assessment period, which indicated good fire prevention practices. However, the large number of impairments and problems with diesel fire pumps indicated that additional attention was required for fire protection equipment maintenance. Also, two emergency lights were found inoperable during a walkdown of the plant.

5.1.2. Emergency Lighting

The inspectors' review of the fire protection impairment list indicated that emergency lighting was not promptly repaired following identification as impaired. Results of 8 hour discharge surveillances indicated a high failure rate of about 17 percent for emergency lighting. The licensee repaired only some of the affected emergency lighting. In addition, the licensee did not track or trend the failure rate nor perform a root cause evaluation for the failures. A licensee sample indicated that 70 percent of the emergency lights were not properly aimed, and the information to correctly aim the lights had not been provided. This failure to promptly correct conditions adverse to quality is a violation of 10 CFR Part 50, Appendix B, Criterion XVI (50-254/265-95005-06a.)

During the inspection, 23 emergency lights were inoperable and 19 of these were necessary for the operation of safe shutdown equipment and

associated access and egress routes. Some emergency lights had been inoperable since December 1994. The licensee stated that part of the failures resulted from electrical busses being taken out-of-service during the outage without turning the battery packs off. A complete drain down of the batteries for the extended period of time resulted in batteries that could no longer meet the 8 hour surveillance test. After the inoperable emergency lighting was identified by the inspectors, the licensee took prompt action to have the emergency lights repaired prior to the Unit 2 startup.

5.1.3. Poor Fire Brigade Drill and Self Evaluation

On July 11 the inspectors observed an unannounced fire brigade drill. The fire marshal had placed two dummies to represent injured personnel in the space. The fire fighting staff appropriately used the pre-fire plans to identify risks in the area, but did not simulate isolation of the electrical equipment in the space. In addition, pre-fire plans failed to list a hydrogen line in the room as a fire hazard. The simulated isolation of this line delayed the fire fighting effort. The brigade members responded with appropriate fire fighting gear.

The fire brigade's ability to extinguish a fire was evaluated by the inspectors as ineffective. During the unannounced fire drill, the fire brigade was not timely in the initial response to the fire and in setting up the fire fighting equipment. There was poor team work in deploying fire hoses into the fire area. The subsequent poor coordination of the brigade members resulted in unnecessary delays in attacking the simulated fire. The brigade was very slow to remove the dummies from the room after extinguishing the fire, taking longer than 30 minutes for the second dummy to be removed. During this simulated rescue effort brigade members crossed the area of the oil spill and simulated extinguished fire without a reflash watch.

The licensee could not show that corrective actions had been or were being taken for weaknesses noted during previous fire brigade drills. For example, it was not apparent from drill critiques that a critical assessment was made of the fire brigade drills. The licensee noted very few weaknesses. Also, many fire brigade critiques indicated a slow response time to fight a simulated fire.

Control room command and control of the fire brigade response was weak. The control room had very little involvement with the fire fighting effort other than making appropriate phone calls. The control room did not use the pre-fire plans to help assess the fire conditions or give input on the overall fire fighting effort.

A critique was held at the end of the fire drill with all of the participants in the drill present. During the critique the fire marshal stated that the fire drill was a success with only minor problems. The inspectors considered the drill a failure because of the problems noted above. Failure to take effective corrective actions to previously identified fire brigade response timeliness concerns as identified and documented in Fire Protection Program Audit Reports, 04-93-11 and 04-94-11, resulted in continued timeliness concerns during subsequent fire brigade drills. Also many fire brigade critiques

indicated a slow response time during drills. This condition is a violation of 10 CFR Part 50, Appendix B, Criterion XVI (50-254/265-95005-06b).

5.1.4. Backlog of Nuclear Work Requests and Impairments

The number of fire protection work requests and impairments (256 items) was high. Some of the impairments were safety significant. The concern was that compensatory measures were in place too long. Some of the impairments had been on the impairment list since 1989. In addition, corrective actions taken by the licensee in response to previously identified similar issues (Fire Protection Program Audit Report 04-94-08 and Nuclear Mutual Limited inspections) did not improve timeliness for repair of fire protection deficiencies. This condition is a violation of 10 CFR Part 50, Appendix B, Criterion XVI (50-254/265-95005-06c).

5.1.5. Untimely Audit and Surveillance Corrective Action

Audit investigations for fire protection contained some significant findings. The QA surveillances were performance based observations of conditions in the plant and were effective in identifying fire protection program problems. However, the QA audit group had not been aggressive in identifying and obtaining a timely resolution to the fire protection issues identified in this report.

5.2 Emergency Preparedness (82701)

5.2.1. Actual Emergency Plan Activations

Three Unusual Events had been declared since December 10, 1993. Records reviewed indicated that classifications and notifications to state, county, and the NRC, had been made properly and in a timely manner for these three emergency plan activations. Documentation packages for each event were detailed and technically correct. Minor problems identified during these declared events also indicated the licensee's corrective actions taken for these items.

5.2.2. Emergency Response Facilities, Equipment, Instrumentation and Supplies

Tours were conducted through the emergency response facilities and the environs team vehicle (GSEP van). Each facility was well maintained and in a good state of operational readiness. Documents reviewed indicated that emergency equipment inventories and maintenance were performed as required.

Use and manning of the operations support center (OSC) was adequate. Construction was scheduled to start June 28 to convert the OSC into office area. Emergency Preparedness staff had proactively planned for response facility needs in preparation for the construction. Followup of licensee actions to ensure relocation and operability of an OSC will be tracked as an Inspection Followup Item (Nos. 50-254/265-95005-07).

5.2.3. Organization and Management Control

Recent management changes had the two Emergency Preparedness (EP) Coordinators report to the Radiation Protection and Chemistry Support Supervisor. Management support to the EP program, was considered good.

5.2.4. Training

Records indicated that drills and exercises were formally critiqued and appropriate. Significant critique items were selected for corrective action. The inspector observed very effective performance-based training for the environs teams in the new GSEP van. Students performed "hands-on" training on most of the environs team emergency activities.

The inspector reviewed a draft training module. The module included necessary information on NRC incident response. This was a good document; however, the inspector noted there was no mention of other Federal agency's incident responses to an emergency. Interviews with key emergency response personnel and discussions with EP staff indicated that no training regarding NRC and other federal agency's incident response had been conducted. This could have an adverse impact on a licensee's ability to interface during an actual emergency. Followup of licensee actions related to the Licensee's evaluation of this issue will be tracked as an Inspection Follow-up Item (Nos. 50-254/265-95005-08).

5.2.5. Audits and Surveillances

The 1994 EP Audit was reviewed by the inspector and found to meet the requirements of 10 CFR 50.54(t), with respect to scope and the assessment of effectiveness of licensee's interface with the State and local agencies. An "Emergency Preparedness Peer Review," conducted March 6-10, 1995, provided an excellent self-assessment of the program. The review covered nine areas in a concise manner and provided recommendations on virtually all areas.

The licensee wrote PIF 94-1530 concerning the failure of the June 22, 1994, Semi-annual Augmentation Drill. Only two of the minimum four out of five positions called in during the drill. Minimum manning for the facilities was retested on June 28, 1994, and passed with four of five minimum staff members calling in within the 60 minute limit. Discussions with the EP staff indicated some of the limitations of the callout system involve use of the pagers, range of the pagers, dead spots in the coverage, etc. The initial corrective actions involved a voice response unit system to replace and augment the pager system. Corporate EP was in the process of testing the new callout system.

5.2.6. Communications Capabilities

The primary means of notification to offsite agencies was through the dedicated nuclear accident report system (NARS). Backup communications was provided by commercial phone. Also available for backup communications was a microwave link to the load dispatcher, cellular phones, and the federal telephone system (FTS). Additionally, a 5 point ringdown line was connected to Illinois Department of Nuclear Safety and the Iowa State Emergency Operations Center.

6.0. Issue Resolution (92701 and 92702)

The following previously identified items were reviewed to ensure that corrective actions were accomplished in accordance with the technical specifications. This included reviewing the responses to notices of violation, inspection follow up items (IFIs), and licensee event reports (LERs).

6.1. IFIs and Violations Reviewed

(Closed) Violation 254/265-92201-04: Environmental Qualification (EQ) Of The Flow Reversing Valves On The RHR Heat Exchanger. The licensee evaluated the actuators and valves for inclusion in the EQ program (CHRON #'s 195696 and 0309639). The evaluation showed that the actuators and valves were environmentally qualified meeting Department of Operating Reactors guideline requirements in the original as-installed conditions. The actuators and valves have been added to the EQ Program. This item is closed.

(Closed) Violation 254/93025-01a(DRP), Unresolved Item 265/93025-04d (DRP), and Inspection Follow-up Item 254/265-94004-37(DRS): Vendor's Recommendations Were Not Incorporated Into the Preventive Maintenance Program or Maintenance Procedure. The licensee revised the Quad Cities Administrative Procedure (QCAP) 450-03, "Vendor Equipment Technical Information Review," requiring system engineering and maintenance review of vendor information for incorporation of vendor information into the preventive maintenance program (PM) or procedures. The vendor equipment technical information program coordinator was responsible for facilitating the vendor information review process. All of vendor information for safety related equipment was either being reviewed or bounded for review completion. The licensee currently had about 240 non-safety related items in preparation for the review process. The inspectors did not have any concerns with this issue. These items are closed.

(Closed) Violation 254/265-93025-05: Failure to Adequately Test and Document Core Spray (CS) Check Valve 1-1402-9A. The NRC identified that the licensee did not adequately test leakage past CS check valves 1402-9A & B and RHR check valves 1000-69A & B. The licensee developed procedures to quantify leakage past both CS and RHR check valves. The licensee performed these tests on Unit 2 during Q2R13 outage. The inspectors reviewed test results. This item is closed.

(Closed) Unresolved Item 254/265-93032-06: Five Electrical Loads Not Included In The Licensee's Initial Degraded Voltage Analysis Calculations. The inspector reviewed the revised documentation and associated emergency diesel generator (EDG) calculations with the licensee. The inspector concluded that the EDG loads were within the design basis acceptance criteria. This item is closed.

(Closed) Unresolved Item 254/265-93032-08: Feedwater Flow Testing Found to be Non-Conservative. This issue was the subject of Violation 50-254/265-94004-18a which was closed in Inspection Report 50-254/265-95003. This item is closed.

(Closed) Violation 254/265-94004-13b: Control Room Air Conditioner Compressor Loading Time Not Established Or Identified In Station Procedures. The inspector reviewed the revised documentation and associated emergency diesel generator (EDG) calculations with the licensee. The inspector concluded that the revised documentation and EDG loads were within the design basis acceptance criteria. This item is closed.

(Closed) Unresolved Item 265/254-94005-05: Jet Pump Flow Converter Missing a Capacitor. The licensee identified that two jet pump square root flow converters did not have capacitors installed as required by a vendor drawing. The licensee installed capacitors in the affected circuits. The licensee attributed the error to poor self check by maintenance technicians who installed the capacitors during a modification in 1989. This item is closed.

(Open) Inspection Follow-up Item 254/265-94015-01: During the 1994 annual GSEP exercise, the Emergency Operations Facility (EOF) had communications problems during the transfer of command and control from the Corporate EOF (CEOF) and the staff failed to recognize the radiological release and release path in a timely manner. This item will remain open pending successful demonstration of the capabilities for clear communications during the transfer of command and control between the EOF and the CEOF and for clear communications of emergency conditions and radiological releases.

(Open) Inspection Follow-up Item 254/265-94015-02: During the 1994 annual Generating Station Emergency Plan (GSEP) exercise, the offsite agencies were not notified of the controlled venting of containment and subsequent radiological release in a timely manner. Discussion with the licensee indicated that revisions to the corporate emergency plan implementing procedures were in process. This item will remain open pending revision of emergency procedures and successful demonstration of the capabilities to notify the offsite agencies of a radiological release in a timely manner.

(Open) Inspection Follow-up Item 254/265-94015-03: During the 1994 annual GSEP exercise the protective measures group in the EOF failed to provide timely protective action recommendations. This item will remain open pending successful demonstration of the protective measures group's capability to provide timely protective action recommendations.

(Closed) Violation 254/265-94020-01a: Failure To Meet Design Control Requirements For Post-modification Testing (PMT) For An Exempt Change To Modify The Seal Cooling Line On The RHRSW Pumps. The PMTs for these design changes were revised to include acquisition of seal line flow and seal temperature data. The corrective actions were adequate and this item is closed.

(Closed) Violation 254/265-94020-01b: Failure To Meet Design Control Requirements For PMT After Installation Of Anti-cavitation Trim For The RHR System Inboard Suppression Pool Cooling and Test Valves. Licensee conducted PMT testing showing that the trim installation was effective

in reducing the cavitation and revised guidance for conducting post modification vibration testing. The corrective actions were proper and this item is closed.

(Closed) Violation 254/265-94020-01c: Failure To Meet Design Control Requirements For a Modification To "Change ATWS Trouble Alarm" In That the Licensee Failed To Evaluate The Impact of the Modification On Station Procedures, Failed to Evaluate the Addition of Electrical Loads, and Failed to Provide Adequate PMT. The evaluations were all performed, parts of one procedure was re-performed, three instrument maintenance surveillances were reviewed and two were modified. The corrective actions were proper and this item is closed.

(Closed) Violation 254/265-94020-01d: Failure to Meet Design Control Requirements In That a Calculation of Record Does Not Exist to Justify the 4160V Degraded Voltage Relay Reset Value. A measurement program has been developed to re-baseline the Quad Cities Auxiliary Power System Analysis using the Electrical Load Monitoring System (ELMS). The ELMS Initiative Project Plan, Data Collection Phase, was approved on February 27, 1995, with the first milestone being the installation of data loggers by June 15, 1995. The inspector verified the installation of the data loggers, reviewed the plan, and found the corrective actions to be proper. This item is closed.

The final project report is scheduled to be issued by September 30, 1996. Review of the data gathered, the updating of the ELMS database, and the calculations to determine the adequacy of the 4160 volt degraded voltage relay reset value is an Inspector Followup Item IFI (50-254/265-95005-09).

(Closed) Violation 254/265-94020-01e: Failure to Meet Design Control Requirements for Changes Made to the High Pressure Core Injection (HPCI) Room Cooler Fan Thermostat's. An evaluation was performed to determine the HPCI room cooler thermostat setpoint considering the equipment qualification temperature limit for the HPCI room. A setpoint of 100°F was established and a setpoint change was processed. The individuals originally involved were instructed on the appropriate process to administer a setpoint change. The corrective actions were adequate and this item is closed.

(Closed Violation 254/265-94020-02): The Procedural Change from an Approximate Run Time to a Change in Test Tank Level for the SBLC Pumps Operability Surveillance Adequately Corrects the Identified Deficiency. This item is closed.

(Closed) Inspection Follow-up Item 254/265-94026-02: Solenoid Operated Valve Failures. The inspectors were concerned that the licensee did not take appropriate action after two independent failures of Unit 2 scram discharge volume (SDV) drain valves to close. Subsequently, the licensee repaired all of Unit 2 SDV drain solenoid valves. Similarly, two recirculation system sample isolation solenoid operated valves (2-220-44 & 45) failed to pass the surveillance test. The licensee repaired both solenoids. The licensee attributed the valve failures to age degradation and infrequent use. This item is closed.

6.2. LERs Reviewed

(Closed) LER 254/94004: Results of Feedwater Flow Testing Found Flow Indication in the Non-Conservative Direction. Upon discovery of this condition, the licensee derated both units. The licensee performed special testing of both units' feedwater flow nozzles. The test concluded that actual flow was 1.4% (Unit 1) and 1.7% (Unit 2) greater than actual flow. This error resulted in calculated full power exceeding the licensed thermal power level of 2511 megawatts by 1.56% (Unit 1) and 1.78% (Unit 2). This was the subject of Violation 50-254/265-94004-18a. The inspectors reviewed the licensee's corrective actions. This item is closed.

8.0. Exit Interview

The inspector met with the licensee representatives denoted below during the inspection period and near the conclusion of the inspection on July 21. 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 July 21 along with others.

ComEd

Bill Pearce, Station Manager
Dave Cook, Operations Manager
John Hutchinson, Site Engineering Manager
Hayden Smith, Fire Marshal
Frank Tsakeres, Rad Chem Superintendent
Mike Wayland, Maintenance Superintendent
Dennis Winchester, Site QV Director

9.0. DEFINITIONS

9.1. Inspection Followup Items

Inspection followup items are matters which have been discussed with the licensee which will be reviewed further by the inspectors and which involve some action on the part of the NRC or licensee or both. Inspection followup items disclosed during this inspection are discussed in paragraphs 4.1., 4.6., 5.2.2., and 5.2.4.

9.2. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items violations or deviations. Unresolved items disclosed during this inspection are discussed in paragraph 4.2.