U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-254/91013 (DRP); 50-265/91009 (DRP)

Docket Nos. 50-254; 50-265 Licenses No. DPR-29; DPR-30

Licensee: Commonwealth Edison Company
Opus West III
1400 Opus Place
Downers Grove, IL 60515

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

Inspection At: Quad Cities Site, Cordova, Illinois

Inspection Conducted: April 20 through June 1, 1991

Inspectors: T. E. Taylor
J. M. Shine
R. Bocanegra
D. E. Jones
R. M. Lerch

Approved By: B. Burgess, Chief Date June 11, 1991
for Reactor Projects Section 1B

Inspection Summary

Inspection from April 20 through June 1, 1991 (Reports No. 50-254/91013 (DRP); 50-265/91009 (DRP))
Areas Inspected: Routine, unannounced safety inspection by the resident and regional inspectors of operational safety verification; monthly maintenance observation; monthly surveillance observation; training effectiveness; report review; events; and meetings and other activities.
Results: Of the areas inspected, no violations were identified. A brief summary of the inspection report is as follows:

EXECUTIVE SUMMARY

Plant Operation

Plant operations were steady during the report period. On May 18, 1991, during high pressure coolant injection (HPCI) system testing, the area radiation monitor alarmed due to abnormally high radiation levels occurring in the room. Actions taken by operations personnel were considered prompt and appropriate.

Maintenance and Surveillance

Performance in this area was considered good during the period.

Engineering and Technical Support

Performance in this area continues to improve.

Radiological Controls

Performance in this area was steady.

Action Plan Followup

Action Plan issue 2.1.h.4, concerning licensee - NRC communication, was reviewed for closure this report period. Based on responses from regional inspectors concerning adequate licensee communications and resident inspector daily communications with the licensee relative to NRC concerns, this item is considered closed.

DETAILS

1. Persons Contacted

Commonwealth Edison Company (CECo)

N. J. Kalivianakis, General Manager, BWR Operations
R. L. Bax, Station Manager
*R. A. Robey, Technical Superintendent
*G. F. Spedl, Production Superintendent
*R. Stols, Nuclear Licensing Administrator
*J. Swales, Assistant Superintendent - Operations
G. Tietz, Superintendent of Programs
J. Fish, Master Mechanic
J. Sirovy, Services Director
*T. Tamlyn, ENC Site Manager
*D. Craddick, Assistant Superintendent - Maintenance
B. Tubbs, Operating Engineer - Unit 1
B. Strub, System Engineer Supervisor
J. Kopacz, Operating Engineer - Unit 0
J. Wethington, Assistant Tech Staff Supervisor
*A. Misak, Regulatory Assurance Supervisor
R. Walsh, Technical Staff Supervisor
D. Bucknell, Assistant Technical Staff Supervisor
C. Smith, Quality Nuclear Program Supervisor
K. Leech, Security Administrator
B. McGaffigan, Assistant Superintendent - Work Planning
J. Hoeller, Training Supervisor
D. Kanakares, Regulatory Assurance
R. Bajema, Chief Steward
D. Edwards, Chief Steward

Nuclear Regulatory Commission

*T. E. Taylor
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*J. M. Shine
*R. M. Lerch

*Denotes those attending the exit interview conducted on May 30, 1991, and at other times throughout the inspection period.

The inspectors also talked with and interviewed several other licensee employees, including: members of the technical and engineering staffs; reactor and equipment operators; shift engineers and foremen; electrical, mechanical, and instrument maintenance personnel; and contract security personnel.

2. Operational Safety Verification (71707)

During the inspection period, the inspectors verified that the facility was being operated in conformance with the licenses and regulatory requirements and that the licensee's management control system was effectively carrying out its responsibilities for safe operation. This was done on a sampling basis through routine direct observation of activities and equipment, tours of the facility, interviews and discussions with licensee personnel, independent verification of safety system status and limiting conditions for operation action requirements (LCOARs), corrective action, and review of facility records.

On a sampling basis the inspectors daily verified proper control room staffing and access, operator behavior, and coordination of plant activities with ongoing control room operations; verified operator adherence with the latest revisions of procedures for ongoing activities; verified operation as required by Technical Specifications (TS); including compliance with LCOARs, with emphasis on engineered safety features (ESF) and ESF electrical alignment and valve positions; monitored instrumentation recorder traces and duplicate channels for abnormalities; verified status of various lit annunciators for operator understanding, off-normal condition, and corrective actions being taken; examined nuclear instrumentation and other protection channels for proper operability; reviewed radiation monitors and stack monitors for abnormal conditions; verified that onsite and offsite power was available as required; observed the frequency of plant/control room visits by the station manager, superintendents, assistant operations superintendent, and other managers; and observed the safety parameter display system for operability.

During tours of accessible areas of the plant, the inspectors made note of general plant/equipment conditions, including control of activities in progress (maintenance/surveillance), observation of shift turnovers, general safety items, etc. The specific areas observed were:

a. Engineered Safety Features (ESF) Systems

Accessible portions of ESF systems and components were inspected to verify: valve position for proper flow path; proper alignment of power supply breakers or fuses (if visible) for proper actuation on an initiating signal; proper removal of power from components if required by TS or Final Safety Analysis Report; and the operability of support systems essential to system actuation or performance through observation of instrumentation and/or proper valve alignment. The inspectors also visually inspected components for leakage, proper lubrication, cooling water supply, etc.

b. Radiation Protection Controls

The inspectors verified that workers were following health physics procedures for dosimetry, protective clothing, frisking, posting, etc., and randomly examined radiation protection instrumentation for use, operability, and calibration.

c. Security

The inspectors, by sampling, verified that persons in the protected area (PA) displayed proper badges and had escorts if required; vital areas were kept locked and alarmed, or guards posted if required; and personnel and packages entering the PA received proper search and/or monitoring.

d. Housekeeping and Plant Cleanliness

The inspectors monitored the status of housekeeping and plant cleanliness for fire hazards, protection of safety-related equipment from intrusion of foreign matter and general appearance.

The inspectors also monitored various records, such as tagouts, jumpers, shiftly logs and surveillances, daily orders, maintenance items, various chemistry and radiological sampling and analysis, third party review results, overtime records, quality assurance and/or quality control audit results and postings required per 10 CFR 19.11.

No violations or deviations were identified.

3. Monthly Maintenance Observation (62703)

Station maintenance activities affecting the safety-related systems and components listed below were observed/reviewed to ascertain that they were conducted in accordance with approved procedures, regulatory guides and industry codes or standards, and in conformance with Technical Specifications.

The following items were considered during this review: the limiting conditions for operation were met while components or systems were removed from and restored to service; approvals were obtained prior to initiating the work; activities were accomplished using approved procedures and were inspected as applicable; functional testing and/or calibrations were performed prior to returning components or systems to service; quality control records were maintained; activities were accomplished by qualified personnel; parts and materials used were properly certified; radiological controls were implemented; and fire prevention controls were implemented. Work requests were reviewed to determine the status of outstanding jobs and to assure that priority is assigned to safety-related equipment maintenance which may affect system performance.

The following maintenance activities were observed and reviewed:

Unit 1

Replacement of CR 120 relay coils
Reactor core isolation cooling system (RCIC) turbine governor
troubleshoot and repair

Main power transformer replacement
HPCI turbine stop valve repair
Intermediate range monitor (IRM) 15 troubleshoot of spiking
1C reactor feed pump seal repair

Unit 2

HPCI turbine stop valve repair
IRM 17 troubleshoot

The inspectors monitored the licensee's work in progress and verified that it was being performed in accordance with proper procedures, and approved work packages, that 10 CFR 50.59 and other applicable drawing updates were made and/or planned, and that operator training was conducted in a reasonable period of time.

No violations or deviations were identified.

4. Monthly Surveillance Observation (61726)

The inspectors observed surveillance testing required by Technical Specifications during the inspection period and verified that testing was performed in accordance with adequate procedures, that test instrumentation was calibrated, that limiting conditions for operation were met, that removal and restoration of the affected components were accomplished, that results conformed with Technical Specifications and procedure requirements and were reviewed by personnel other than the individual directing the test, and that any deficiencies identified during the testing were properly reviewed and resolved by appropriate management personnel.

The inspectors also witnessed portions of the following test activities:

Unit 0

QOS 4100-1 "A" Monthly Diesel Fire Pump Test
QOS 6600-1 Diesel Generator Monthly Load Test

Unit 1

QCOS 1300-1 RCIC Monthly and Quarterly Pump Operability Test
QCOS 1300-7 RCIC Manual Initiation Test
QCOS 2300-13 HPCI Manual Initiation Test

Unit 2

QCOS 2300-5 Quarterly HPCI Pump Operability Test
QIS 60-1 Weekly Power Operation Functional Test
QIS 51-1 Reactor Pressure Indication Calibration

On May 18, 1991, during performance of QCOS-2300-1 "HPCI Pump Operability", the area radiation monitor (ARM) in the HPCI cubicle alarmed. The alarm setpoint was 20 millirem (mr) per hour. Levels were verified by radiation protection personnel in the 20-25 mr range. Management oversight was sufficient in that it was immediately recognized that greater than 20 mr level required entry into the emergency operating procedures (EOP). Ensuing actions taken by operations personnel were considered prompt and appropriate. The EOPs were modified, through onsite review, to raise the ARM setpoint to allow further testing. The licensee has determined that the source was the HPCI torus suction line, which is located near the ARM. Corrective actions, such as shielding or flushing the line, are under review.

No violations or deviations were identified.

5. Plant Startup From Refueling (71711)

The intent of this inspection was to ascertain whether systems disturbed or tested during the outage were returned to an operable status prior to plant startup. Additionally, to ascertain whether plant startup, approach to criticality, heatup, and required testing was conducted timely and in accordance with approved procedures.

The inspectors monitored portions of the following activities:

a. Residual heat removal system logic tests

b. Core spray logic tests

c. Reserve auxillary transformer return to service

d. Unit 1 emergency diesel generator operability test

e. RCIC logic test

f. Shutdown margin determination

g. Emergency core cooling system simulated automatic actuation and diesel generator auto-start surveillance

h. Completion of master and outage startup checklists

i. Approach and achievement of criticality

j. Plant heatup to operating pressure

k. RCIC and HPCI flow rate and manual initiation tests

l. Control rod hot scram timing

Unit 1 startup commenced at 1:22 a.m. on April 24, 1991, with criticality achieved at 4:24 a.m. on a 166 second period. Synchronization to the grid occurred at 3:37 p.m. on April 26, ending a 166 day refueling outage. The unit was subsequently shutdown on April 27, due to RCIC inoperability (see paragraph 8.a). The unit was restarted on April 29, and put on line April 30. The unit was shutdown on May 21, 1991, due to main transformer concerns (see paragraph 8.c) and will remain shutdown until approximately June 26, 1991.

No violations or deviations were identified.

6. Training Effectiveness (41400, 41701)

The effectiveness of training programs for licensed and non-licensed personnel was reviewed by the inspectors during the witnessing of the licensee's performance of routine surveillance, maintenance, and operational activities and during the review of the licensee's response to events which occurred during the inspection period. Personnel appeared to be knowledgeable of the tasks being performed, and nothing was observed which indicated any ineffectiveness of training.

No violations or deviations were identified.

7. Report Review

During the inspection period, the inspector reviewed the licensee's Monthly Performance Report for April, 1991. The inspector confirmed that the information provided met the requirements of Technical Specification 6.9.1.8 and Regulatory Guide 1.16.

The inspector also reviewed the licensee's Monthly Plant Status and Technical Staff Reports for April, 1991.

No violations or deviations were identified.

8. Events (93702)

a. Technical Specification Required Shutdown Due to Reactor Core Isolation Cooling System (RCIC) Inoperability

On April 27, 1991, an unusual event was declared for Unit 1 per the Generating Station Emergency Plan. This was due to the expiration of a 12 hour limiting condition of operation (LCO) (TS 3.5.E.4), which required reduction of reactor pressure to less than 150 pounds per square inch (psi) within 24 hours. The reactor was manually scrammed (normal shutdown method) at approximately 17% power, terminating the unusual event within the 24 hour time frame.

The licensee was performing a post-refueling startup and had amended the TS, amendment 130, adding a surveillance requirement for RCIC during startup following system maintenance. The amendment required satisfactory flow rate testing within 12 hours of reaching 920 psi reactor pressure, or pressure reduction to less than 150 psi within 24 hours.

Causes of the inoperability were attributed to misadjustment of turbine speed governor control settings and miswired contacts on the 1301-61 (RCIC steam supply) valve. The controller electronics were misadjusted during performance of QIP 1300-1, "Adjustment Procedure for RCIC . . . Generator/Signal Converter", which apparently lacked sufficient detail to adequately perform the task. The technicians consulted the vendor (Woodward) to obtain appropriate settings. Proper operation was verified through successful flow rate testing on May 1, 1991. Weaknesses in procedural adequacy, particularly in the instrument maintenance area, have been previously identified by NRC and third party audits. The procedure rewrite project has been expedited in this area, with completion expected by December 31, 1992. The inspectors are monitoring progress in this area and have no further questions at this time.

b. HPCI Stop Valve Repair

On May 7, 1991, the licensee entered a 14 day LCO for Unit 1, and the same for Unit 2 on May 8. The Unit 1 HPCI turbine stop valve failed to open during manual initiation testing. Inspection identified a sheared retaining pin for the long bushing surrounding the valve stem of the stop valve. Absence of the retaining pin allowed for play in the long bushing, interfering with the travel of the valve stem, causing the valve to fail. Subsequent inspection of the Unit 2 stop valve also indicated a missing retaining pin, although it had performed adequately during surveillances.

Maintenance history indicated that the Unit 1 valve had been overhauled during the recent refueling outage, and for Unit 2 during the 1987 refuel outage. The long bushing, valve, and retaining pin are housed in a stuffing box, which is bolted to the valve body utilizing a flexitalic gasket. The stuffing box and internals were assembled at the vendor factory (Atwood-Morrill) and installed as outage contract work by General Electric (GE) personnel utilizing approved station procedures.

The root causes of the failure were attributed to inadequate factory work, inadequate vendor information, and secondarily, the method utilized to install the flexitalic gasket. Peening of the stuffing box to prevent long bushing movement was to be performed at the factory. This process had not been performed on either stuffing box. Additionally, the vendor information possessed by the station (drawing) did not indicate peening of the stuffing box was required. The GE personnel also were unaware of this. Without this information, the licensee was unable to verify the adequacy of the factory work, or properly perform the work onsite. The procedure to "crush" the flexitalic gasket had been altered to include torquing values as recommended by the vendor. This was previously a "skill of the craft" job. It is postulated that the revised method could have allowed long bushing play, contributing to the shearing of the pin.

The stuffing box "package" was replaced for Unit 1, utilizing the peening process and engineering approved gasket torquing procedures. The pin was replaced on Unit 2, utilizing the above procedures. Both HPCI systems were subsequently determined operable within the 14 day LCO.

c. Unit One Shutdown Due to Main Transformer Replacement

On May 21, 1991, the licensee, due to recent problems surfacing on other transformers and enhanced transformer surveillance, discovered problems with the Unit 1 main power transformer. Oil samples indicated increased methane, ethane, ethylene, acetylene, and water content. Additionally, a decrease in the dielectric qualities of the oil was observed. The unit was taken off line as a precautionary measure to facilitate repairs prior to failure.

Internal inspection revealed signs of degradation warranting a long outage period (5 to 8 weeks) for repair. Indications observed were aluminum flakes on the bottom of the tank, loose bolting, and carbon in the oil cooler piping. Preliminary conclusions are that the loose bolting led to a shifting of circulating current flux patterns giving rise to "hot" spots within the unit. Transformer heating is an historical problem with the General Electric transformer design. Modifications to the degraded transformer had been performed in the past, but were not the ultimate fix. The transformer will be overhauled and modified to correct the heating problem and will become a spare.

The replacement transformer is a Westinghouse unit, replacing the General Electric unit. The unit is a spare available to both Dresden and Quad Cities, and was previously used at Dresden. The replacement is expected to be completed by June 26, and is on schedule as of June 1, 1991. Due to transformer differences, on-site vendor expertise is being utilized during the installation. Operating procedures and operator training for the new equipment is being developed and is incorporated into the schedule. The inspectors will continue to monitor the replacement activities.

No vinlations or deviations were identified.

9. Meetings and Other Activities (30702)

SALP Meeting

On May 28, 1991, the Systematic Assessment of Licensee Performance presentation to the licensee was conducted. Personnel attending included Messrs. Bige Thomas, Cordell Reed, and Dennis Galle from CECo corporate, and Messrs. Bert Davis, Hubert Miller, and Wayne Shafer from NRC Region III.

10. Site Visits by NRC Staff

a. Electrical Distribution Sysem Functional Inspection

During the month of April, 1991 an electrical distribution system functional inspection (EDSFI) was conducted. The focus of the inspection was a review of system electrical design and supporting documentation. The major findings were associated with lack of, or quality of, documentation to support component design bases. The inspection exit was held on May 10, 1991, with Messrs. Hubert Miller, Mark Ring, and Ron Gardner of NRC Region III in attendance. The specific details of the EDSFI will be contained in the forthcoming inspection report.

b. Simulator Inspection

The Quad Cities simulator inspection on May 2-3, 1991, focused on several areas including: the availability of the simulator for training versus simulator down time, the similarity between the simulator panels and Quad Cities' control room panels, the response of the simulator to given scenarios, and the knowledge and abilities of the training staff.

The simulator performed well throughout the inspection period without failure. The simulator appeared to be well constructed and incorporated some of the latest technology in its physical construction and instructor interface. The instructor's console was intuitive and appeared to be easily used. The hardware was installed in such a manner that it facilitated location and replacement of failed components. This significantly reduced simulator down-time and minimized interruptions to simulator training. The building in which the simulator was housed had a specially designed air conditioning system to filter incoming air. The panels were slightly pressurized to prevent the entrance of dust into the panels and associated electronics. Both hardware and software are state of the art.

The simulator panels mocked the Quad Cities' control room panels well. Simulator responses to events paralleled closely expected plant responses. A highlight of the inspection was the ability of the simulator to operate in slow motion, which enhanced the simulator's value as a training aid. Several questions arose during the simulator demonstration and were passed along to the licensee. None of the questions had any safety significance or bearing on the simulator demonstration.

The simulator staff has made excellent use of the simulator and were able to demonstrate the capabilities of the machine. The instruction provided by the facility instructors was extremely helpful. Several members of the staff were involved in the delivery

of the simulator from the factory and are still associated with the simulator. This experience level of both hardware and software was valuable in maintaining reliable simulator operation.

In summary, Quad Cities has a state of the art simulator that has developed into a valuable training resource for both operations and qualification purposes, providing an excellent training environment. The equipment appears to be reliable and the training staff demonstrated their competence as indicated by the knowledge and understanding of both hardware and software programs and applications.

11. Exit Interview

The inspectors met with the licensee representatives denoted in Paragraph 1 during the inspection period and at the conclusion of the inspection on May 30, 1991. 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.