

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-254/93032(DRP); 50-265/93032(DRF)

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: December 26, 1993, through February 7, 1994

Inspectors: T. E. Taylor
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Reactor Projects Section 1B

3/3/94

Date

Inspection Summary

Inspection from December 26, 1993, through February 7, 1994 (Report Nos. 50-254/93032(DRP); 50-265/93032(DRF))

Areas Inspected: Routine, unannounced safety inspection by the resident inspectors of licensee action on previously identified items, licensee event reports, operational safety, engineered safety feature systems, maintenance, surveillance, and events.

Results: Of the areas inspected, one violation with three examples was identified for the failure to follow procedures. One example involved a failure to comply with chemical control procedures for Belzona use. Another example involved an instrument maintenance technicians' failure to follow procedures for returning an instrument transmitter to service. The third example involved a failure by mechanical maintenance supervision to follow procedures and ensure proper instructions for use of Argo packing were included in a work package. Unresolved items concerning the impact of using Belzona in pumps and valves, loading of emergency diesels, correlation of high pressure core injection (HPCI) system room cooler flow to differential pressure measurements, and feedwater flow calibration uncertainty were also identified.

EXECUTIVE SUMMARY

Plant Operation

Performance in this area was mixed. Improvements in control room professionalism and control of activities was evident. However, a control rod mispositioning event demonstrated a continuing need for management attention. Causal factors contributing to the rod mispositioning event included procedural non-compliance, test control weaknesses, and a lack of effective oversight by the unit supervisor. Immediate corrective actions were considered prompt and appropriate.

Management overview during implementation of the new control room organization was weak. This weakness was most apparent during the rod mispositioning event. A unit supervisor's lack of involvement to ensure proper controls during a core spray surveillance activity was also noted.

In response to the personnel issues, a station stand-down and stop-work was implemented for two shifts. This was done to emphasize the need for improved performance to licensee personnel.

Maintenance and Surveillance

Performance in this area was mixed. Maintenance management, through its first line supervisors, was ineffective in ensuring procedure adherence. Three examples of failures to follow procedures were identified in this report period.

The Unit 2 maintenance outage was well managed. The extensive main steam isolation valve refurbishment was considered well managed and a positive measure toward resolution of equipment problems.

Engineering and Technical Support

Four unresolved items involving weak engineering performance were identified. HPCI room cooler differential pressure (dp) data was used for equipment operability determinations without correlation of dp to actual cooler medium flow. Uncertainties in the feedwater flow calibration may have resulted in the licensee exceeding the thermal power limits authorized by the license. An epoxy coating material (Belzona) was used without an engineering evaluation to assess its impact on the reactor vessel or associated systems.

DETAILS

1. Persons Contacted

Commonwealth Edison Company (CECo)

- R. Pleniewicz, Site Vice President
- G. Campbell, Station Manager
- *R. Baumer, Regulatory Assurance
- D. Bucknell, Assistant Technical Staff Supervisor
- S. Childers, Operations Improvement Program Supervisor
- N. Chrissotimos, Regulatory Assurance Supervisor
- *D. Cook, Shift Operations Supervisor
- H. Hentschel, Operations Manager
- G. Klone, Operating Engineer - Unit 1
- J. Kopacz, Operating Engineer - Unit 2
- *T. Kroll, Maintenance Superintendent
- J. Kudalis, Support Services Director
- *B. McGaffigan, Assistant Superintendent - Work Planning
- B. Moravec, Site Engineering and Construction Manager
- *M. Richter, Site Engineering & Construction
- L. Tucker, Technical Service Superintendent
- D. VanPelt, System Engineer Supervisor
- *D. Winchester, Site Quality Verification Director

*Denotes those attending the exit interview conducted on February 7, 1994.

The inspectors also contacted several other licensee personnel, including members of the engineering, operations, maintenance, and contract security staff.

2. Licensee Action on Previously Identified Items (92701, 92702)

(Closed) Unresolved Item 50-254/265-93030-03: On November 30, 1993, with Unit 1 in shutdown, two instrument maintenance (IM) technicians returned a series of reactor level instruments to service. On the following shift, control room operators discovered that a reactor level instrument was reading erroneously high. Technicians found level transmitter 1-263-57B valved out-of-service. The technicians returned the transmitter to service and checked other transmitters on the rack. Redundant instrumentation was operable to provide the required inputs to safety systems.

The restoration checklist used previously to return the instrument to service was signed by the two IM technicians as having been properly completed. The verification process permitted both parties to be present when performing the verification, and required independent checks of valve positions by the second technician. Transmitter 1-263-57B was inadvertently signed by the second technician as being restored. After the restoration checklist was completed, the technician, performed

the restoration, signed the attachment adjacent to the second technician's signature. The licensee disciplined the technicians involved and were determining any additional corrective actions. Weak implementation of the verification process was considered a causal factor for the inoperable transmitter.

QCIPM 100-12, "Refuel Outage Backfilling Reactor Instruments Sensing Lines," Step H.16.b required that differential pressure instruments be returned to service then lead sealed. Attachment B of the procedure was signed by the technicians erroneously indicating that instrument I-263-57B was returned to service and lead sealed. Failure to properly implement QCIPM 100-12 is considered an example of a Violation of Technical Specification 6.2.A.1 (50-254/265-93032-01a(DRP)).

One violation was identified concerning a failure to follow procedures while returning reactor level instruments to service.

3. Licensee Event Report (LER) Review (92700)

Through direct observations, discussions with licensee personnel, and review of records, the following event report was reviewed to verify reportability requirements were fulfilled, immediate corrective action was accomplished, and corrective action to prevent recurrence had been, or will be, accomplished in accordance with technical specifications.

(Closed) LER 254/265 93025-LL: Unit 2 "A" Loop Main Steam Isolation Valves (MSIVs) Exceed Technical Specification Leakage Limits. On December 5, 1993, the "A" set of MSIVs failed the local leak rate test. The licensee inspected MSIVs in both units and initiated repair as needed. Unit 1 MSIVs were examined using radiography and determined to be operable. The results of these inspections and repair efforts are being tracking by Inspection Follow-up Item 50-254/265-93030-04(DRP). This LER is considered closed.

No violations or deviations were identified.

4. Regional Request (92701)

A part 21 notification was made by Westinghouse concerning defective puffer tube assemblies used in certain 4kv bus breakers. The licensee verified that the suspect puffer tube assemblies were not installed in the plant and were not stocked in the warehouse. The licensee's resolution of this issue was considered timely.

No violations or deviations were identified.

5. Operational Safety Verification (71707)

The inspectors observed control room operation, reviewed applicable logs, and conducted discussions with control room operators. The inspectors verified the operability of selected emergency systems,

reviewed tagout records, and verified the proper return-to-service of affected components.

Tours of accessible areas of the plant were conducted to observe plant equipment conditions, including potential fire hazards, fluid leaks, excessive vibration, and to verify that equipment discrepancies were noted and being resolved by the licensee.

The inspectors observed plant housekeeping and cleanliness conditions and verified implementation of radiation protection and physical security plan controls.

a. Unit 2 Reactor Trip Signal

On December 24, 1993, an erroneous reactor water low level signal was generated. At the time of event occurrence, Unit 2 was in cold shutdown for a planned maintenance outage with all rods fully inserted. All systems responded properly. Mechanical maintenance (MM) personnel had just removed temporary packing from valve 2-220-118A, an isolation valve to anticipated transient without scram (ATWS) instrumentation. The 118A valve shared a common sensing line with the reactor low water level differential pressure transmitters. A pressure drop, resulting from a brief spray of water from the packing gland as the last ring of packing was removed, caused the reactor water low level signal.

During preparations to repack the valve, MM personnel discussed with the Shift Engineer the possibility of a reactor shutdown signal if the valve backseat did not hold. The maintenance aspects of this activity are discussed in paragraph 7.e.

Individual precursors that led to the event were:

- Replacement of the 118A valve and its impact on the RVLIS modification were not discussed in the planning stages of the Unit 2 maintenance outage.
- Failure to identify that no packing was present in the 118A valve until after installation.
- Weak management overview of the scheduling of valve work compared to the overall RVLIS work and of the impact of the 118A valve work on the instrumentation system.
- Reliance on backseating of a valve rather than performance of a full out-of-service on a system that could impact plant operations.

This event demonstrated a need for management involvement to assure proper communication of expectations and effective control of maintenance activities.

b. Potential Drywell Pneumatic System Degradation

During the inspection period, the inspectors identified that the drywell pneumatic system air quality may have been degraded in that non-safety related drywell pneumatic air dryers were not functional for about 15 months. In addition, required air samples had not been taken for 1 year. This system took suction from the drywell and compresses the gas for Primary Containment pneumatic loads. The drywell pneumatic system was classified as non-safety related. However, safety related components supported by this compressor could potentially be degraded due to poor air quality.

The recommended maximum dew point at line pressure for the system was 35°F. Air samples indicated that the dew point was at 65°F. At the prompting of the inspectors, an operability evaluation for the drywell pneumatic air system was performed. The system was determined to be operable based on acceptable test results of safety isolation valve closure times and the use of corrosion resistant material in the system. Additionally, the Unit 1 air was blown-down at the system low points and no moisture was detected. A work request has been written for Unit 2 testing. This is considered an Inspection Follow-Up Item (254/265-93032-02(DRP)).

Licensee response to the issue, after the inspectors explained the concerns, was considered good. Design changes have been developed for future replacement of the drywell pneumatic air dryers, 1A and 2B. The 1B and 2B dryers were being repaired, as necessary, until modifications were implemented. This is an example of the licensee's failure to actively pursue longstanding equipment problems.

c. Emergency Diesel Generator (EDG) Auxiliary Power Feeds Concerns

The inspectors reviewed a concern identified at Dresden Station involving the loss of both divisions of emergency AC power to Unit 2 rendering the EDG cooling water pump (DGCWP) and pre-lube oil pump inoperable. The inspectors reviewed electrical drawings, P&IDs, performed walkdowns, and assessed applicable procedure adequacy. The inspectors determined that redundant power supplies for EDGCWP and pre-lube oil pumps exist. The electrical distribution system, through redundant power sources and bus cross-tie capabilities, resulted in multiple sources of emergency AC power to the EDG pumps. The inspectors had no further concerns with this issue.

d. Personnel Errors Resulting in a Stand-Down and Stop-Work

Due to a number of personnel errors in recent months, licensee management declared a work stand down to sensitize plant personnel to the negative trend. All non-vital and non-limiting condition of operation work was suspended. Workers were briefed on

management expectations to achieve safe and event free operation. The inspectors attended several briefings and found management's message was effectively communicated and well-received by licensee personnel. These personnel errors are summarized in the following paragraphs.

A control rod mispositioning event on January 27, 1994, occurred when a nuclear station operator (NSO) moved a control rod without an authorized rod pull sheet. A special NRC inspection was performed to assess the corrective actions and investigate the event. Details of that event and results of the special inspection were documented in Inspection Report 50-254/265-4 94003(DRP).

On January 31, 1994, an instrument maintenance (IM) technician operated a wrong switch while performing Quad Cities Instrument Surveillance Procedure (QCIS) 1000-5, "Quarterly High Drywell Pressure Auto Blowdown/HPCI Initiation Calibration and Functional Test." The IM failed to verify the proper switch location prior to operating the switch.

During performance of Quad Cities Operating Surveillance Procedure (QCOS) 1300-1, "Periodic RCIC Pump Operability Test," an equipment operator tripped the RCIC turbine locally due to poor communications with the control room NSO. This resulted in RCIC unavailability for several minutes.

None of the three events resulted in plant transients or significant reductions in safety margins. However, all three represented instances where attention to the task being performed was not adequate. These events demonstrated the continued need for licensee management to resolve the issues of poor procedural adherence, attention to detail, and management oversight.

e. Control Room Staff Reorganization

During the inspection period, the control room organization was revised. The previous organization had the shift control room engineer (SCRE) responsible for both units. The new organization eliminated this position, replacing it with a unit supervisor (US) for each unit. The reorganization was in response to concerns regarding the SCRE's ability to supervise two units and the shift engineer's (SE) administrative work load. A number of the administrative responsibilities of the SE were given to the USs. This permitted the SE more time to oversee shift activities. The reorganization resulted in a more formal control room demeanor; varying degrees of enhanced control of activities has been noted. Conversely, senior operations management overview of the organization change was considered weak.

During a core spray surveillance test, repeated annunciator alarms required the operator's attention. Also, the operator was performing several procedures concurrently related to the pump test. Until questioned by the inspectors, the US did not react to the distractions to ensure proper control of the test activity. Expectations of the US's functions were not well communicated as evidenced by the observed oversight of control room activities. Subsequently, licensee management issued a memorandum identifying expectations of the operations crews.

Through discussions with operators, observation of control room activities, and preliminary assessment of a mispositioned control rod, the inspectors identified a weakness in the management overview provided to the new unit supervisors. Licensee management was aware of the identified weakness and was in the process of determining corrective actions. This is considered an Inspection Follow-up Item (50-254/265-93032-03(DRP)).

No deviations or violations were identified. Two inspection follow-up items were identified concerning drywell pneumatic system degradation and control room staff reorganization.

6. Engineered Safety Feature (ESF) Systems (71710)

During the previous inspection period, the inspectors walked down accessible portions of Unit 1 core spray system. The inspectors informed the licensee of technical, radiological and housekeeping deficiencies. During this report period, the inspectors reviewed the licensee's action to address the noted deficiencies and found them to be appropriate.

7. Monthly Maintenance Observation (62703)

Station maintenance activities for both safety related and non-safety related systems were observed and/or 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.

Maintenance activities observed and/or reviewed with no inspector comments included:

EDG Gear Driven Coolant Pump Inspection
RCIC Pump Repairs/Troubleshooting

Maintenance activities observed and/or reviewed with comments included:

a. Main Steam Isolation Valve (MSIV) Maintenance and Inspection

As a result of safe test and local leak rate test failures, MSIV 2-203-1A was disassembled for repairs. Upon disassembly, pieces of nut locking tab washers, and one broken disk plate stud and nut

were found inside the bottom of the valve disk. The component failures were due to improper installation of the locking tabs or improper torquing on the disk plate nuts.

The deficient condition of MSIV 2-203-1A was similar to an event involving a MSIV stem-to-disk separation in September 1991. Because of past history at Quad Cities, and within the industry, the licensee decided to inspect five MSIVs on Unit 2. The valves had not been disassembled since before 1983. Maintenance was performed on MSIVs, 2B and 2D, in 1991 and 1993, respectively. The use of new locking tabs, torque valves, and proper positioning were detailed in the 2B and 2D MSIVs work packages. Only the 1A MSIV was found to have missing locking tabs and disk plate nuts not torqued during the recent inspections.

An advanced radiography technique was utilized to inspect all Unit 1 MSIVs. Prior to the radiography, the following criteria were established for making operability determinations:

- Of the eight studs around the circumference of the disk, a minimum of four studs and nuts were required to hold the disk plate to the disk.
- The nuts must be fully threaded and a locking tab must be discernible.
- One nut on each valve should have one tab up and one tab down.

Review of the radiographs indicated that the valves had locking tabs present, and all eight studs and nuts were engaged properly. However, the inboard MSIVs' locking tabs were not in the proper configuration. The engineering evaluation was revised based upon review of the five disassembled valves on Unit 2. The evaluation concluded that the studs and bolts were sufficiently torqued, and will remain torqued until the next refuel outage. Refurbishment of Unit 1 MSIVs was scheduled for the March 1994 refueling outage. The synopsis of MSIV detailing repairs, corrective actions, and root cause analysis were considered thorough. The inspectors had no further concerns.

b. Fire in Unit 2 Drywell During MSIV Maintenance

On December 30, 1993, there was a fire in the Unit 2 drywell caused by an electrical cable used for heat treatment of welds on the MSIVs. The fire was extinguished by fire watch personnel in the area in less than 4 minutes. Quick actions taken by the fire watch prevented the fire from spreading and restricted damage. The fire was confined to a small area. No personnel injuries occurred. Equipment damage was limited to the affected cable. MSIV maintenance was suspended and the area was quarantined until an investigation was completed.

The licensee determined that reflective insulation, which was removed from main steam piping, had penetrated the outer insulation of the electric cable. The metal insulation caused a direct short from the cable to ground via the metal grating. The excessive current ignited the plastic sheathing surrounding the cable. After this event, the licensee checked the continuity of all cabling used for weld treatment of the MSIVs. Reflective insulation was stored in a manner to prevent its contact with the electric cables.

c. Actuation of Fire Suppression Equipment

On December 24, 1993, during a maintenance activity, personnel inadvertently actuated the fire suppression sprinklers in the Unit 2 high pressure coolant injection (HPCI) room. Unit 2 was shutdown and Unit 2 HPCI was inoperable at the time of the event. A sensing wire actuated the fire protection system. The sensing wire may have been damaged by a drop light hung in the vicinity.

Similarly, on January 4, 1994, during maintenance on a fire detection system, personnel inadvertently actuated the fire protection system in the vicinity of the Unit 2 atmospheric containment atmosphere dilution (ACAD) compressor. No equipment was affected since the sprinklers were not actuated but the "dry pipe" was pressurized. This is considered an Inspection Follow-up Item (50-254/265-93032-04(DRP)) pending review of the licensee's corrective actions.

d. Unit 2 Maintenance Outage

On January 26, 1994, Unit 2 was synchronized and loaded to the grid ending the maintenance outage. During the outage, the major activities included: disassembly, inspection, and reassembly of five MSIVs; installation of the reactor vessel water level indication system (RVLIS) modification; motor operated valve differential pressure testing; unit emergency diesel generator power pack replacement; and installation of nozzle taps for feedwater flow calibration.

Initial training for the RVLIS modification was poor, in that the instructor, due to short preparation time, was not prepared and the training presentation was confusing. After the inspectors discussed the concern with licensee management, training was provided again to the operators prior to Unit 2 startup.

e. Mechanical Maintenance Work on Valve 2-220-118A

On December 17, 1993, valve 2-220-118A, an isolation valve for anticipated transient without scram (ATWS) instrumentation, was replaced. After installation, the new valve was discovered not to have the required valve "packing" installed. The correct packing was not available at the station, and the licensee decided that

temporary packing would be installed to allow other work pertaining to a reactor vessel level instrumentation (RVLIS) modification to continue.

On December 24, 1993, the temporary packing was removed and permanent packing was to be installed. However, the packing was incorrectly installed on the first attempt. Subsequently, the WR was revised and the valve packing properly installed. Also, before attempting to repack the valve, a thorough out-of-service (OOS) was performed.

During the inspectors review of the work request (WR) it was identified that the WR instructions were incomplete. Quad Cities Mechanical Maintenance Procedure (QCMM) 1515-7, Step 7, required that for specialty packing material, the supervisor will provide any special considerations to be observed when packing a valve. Valve 118A was repacked using Argo specialty packing. The licensee failed to incorporate specific instructions needed for the packing material into the work instructions. A generic packing instruction was used that did not have the needed information. This is considered a Violation of Technical Specifications Section 6.2.A.1 (50-254/265-93032-01b(DRP)).

One violation was identified regarding the failure to provide specific instructions in a work package. One inspection follow-up item was identified concerning licensee corrective actions on actuations of fire suppression equipment.

8. Monthly Surveillance Observation (61726)

During the inspection period, the inspectors observed test activities. Observations made included one or more of the following attributes: testing was performed in accordance with adequate procedures; test equipment was in calibration; test results conformed with technical specifications and procedure requirements; test results were properly reviewed; and test deficiencies identified were properly resolved by the appropriate personnel.

Test activities observed and/or reviewed with no inspector comments included:

- QCOS 6600-1 EDG Monthly Load Test
- 1-1400-2 Monthly Core Spray MOV Operability Test
- 1-1400-1 Quarterly Core Spray Pump Test
- 1-1400-8 Quarterly Core Spray Valve Operability Test
- 1-1400-4 Monthly Core Spray Pump Operability Test
- QTS 130-4 Control Rod Hot Scram Time Testing
- RCIC Pump Special Test Run

Test activities observed and/or reviewed with comments included:

HPCI Room Cooler Surveillance Test

On January 30, 1994, the licensee performed Quad Cities Operating Surveillance Procedure (QCOS) 5750-9, "ECCS Room and DGCWP Cubicle Cooler Differential Pressure Monthly Surveillance." The flow parameters recorded for the high pressure coolant injection (HPCI) room cooler were 0 gallons per minute (gpm) at 4 pounds square-inch differential (psid). The surveillance test required greater than 40 gpm and 3.8 to 10.2 psid to consider the system operable. Operators determined that there was flow through the system and the flow instrument was erroneous. The detector was vented and silt was found in the effluent. A problem information form (PIF 94-020) was written to document the deficient condition. The instrument was returned to service and the test was performed with satisfactory results.

The inspectors noted that the surveillance used redundant methods to determine that there was flow through the HPCI room cooler. A flow rate of 0 gpm was recorded; however, the system was not declared inoperable since the indicator was in error. Subsequent to an engineering evaluation, operations conservatively declared the system inoperable since both flow and dp were low.

On February 4, the inspectors observed another performance of QCOS 5750-90-9. The licensee recorded 36 gpm for cooling water flow through the HPCI room cooler. The flow detector was back flushed and indicated flow did not change. The cooler outlet valve was throttled open an additional half turn and flow stabilized at about 46 gpm. The deficient test condition was documented on a PIF and returned to engineering for an operability determination. The surveillance test was resumed to ensure that other cooled components were not adversely effected by the cooler flow adjustment.

The inspectors had two concerns associated with the surveillance test. First, QCOS 5750-9, step F.4, stated that if HPCI room cooler flow was less than 40 gpm, then the HPCI system should be declared inoperable. The 40 gpm design flow assumed high cooling water temperatures (~95°F). Lesser flow rates may be acceptable if cooling water temperatures were lower than design temperature. The system may not be "inoperable" but must be analyzed to ensure that the design heat rate can be removed by the room cooler for a given flow rate and cooling water inlet temperature.

Second, an engineering evaluation was previously performed to determine the required minimum flow of service water to each emergency core cooling system (ECCS) corner room cooler. Each ECCS room cooler did not have a flow meter in its cooling water supply. The licensee used differential pressure to estimate flow to the component. However, the dp was not correlated to actual flow rate to the component. The surveillance test determined operability of the components based on flow and differential pressure. This is considered an Unresolved Item (50-

254/265-93032-05(DRP)) pending review of operability evaluation of ECCS room cooler performance and licensee resolution of inaccurate flow parameters

No violations or deviations were identified. One unresolved item was identified regarding the required flow rate of HPCI and ECCS room coolers.

9. Engineering and Technical Support (71707)

a. 125 VDC Battery Seismic Supports

The inspectors noted a discrepancy regarding battery rack bolt sizing. The bolts used to hold the battery racks to the floor were 3/8 inch size, but the rack was constructed using 1/2 inch bolts. The licensee demonstrated that the bolts were of adequate design to ensure the battery racks would remain anchored to the floor during a seismic event. The expected forces between the rack and the floor during a seismic event were within the design requirements of the bolts and the concrete slab. The inspectors had no further concerns.

b. Pipe Supports

The inspectors identified that the core spray pump discharge piping restraints differed on similar piping runs. The licensee presented drawings of the piping runs and computer generated stresses anticipated for each piping run which verified that the different piping restraints were correct. The inspectors had no further concerns.

Additionally, the inspectors identified a pipe support on the main steam piping downstream of the outboards MSIVs that appeared prone to fatigue failure. The licensee provided technical information to show the piping was anchored in a manner such that the pipe supports were not susceptible to fatigue failure.

c. Electrical Loads on Essential Busses

On December 8, 1993, the licensee identified five additional electrical loads on safety related motor control centers (MCCs). The electrical loads were not included in the calculations in the licensee's initial degraded voltage analysis. As a compensatory measure, the licensee hung out-of-service tags on the power supply breakers to prevent the loads from being energized. The licensee performed an evaluation to verify that the voltage on the emergency buses would not be degraded when the buses were loaded. Additionally, the inspectors identified a concern regarding a degraded voltage condition if the additional MCC loads were supplied from the emergency diesel generators. This is considered an Unresolved Item (50-254/265-93032-06(DRS)) pending further inspector review.

d. Uncontrolled Use and Possible Misapplication of Epoxy Coating

Due to concerns with uncontrolled use, possible misapplication, and potential reactor water chemistry interactions, a review was performed on the licensee's use of an Epoxy coating (Belzona). The inspectors identified the following concerns:

- The epoxy coating "Belzona" had been used extensively in the service water (SW) and condensate systems. Mississippi river water, which was the medium for the SW, was highly abrasive causing excessive wear of pumps and valves. Belzona had been used extensively to reduce erosion of SW components. The condensate system was a high velocity and high temperature system. Condensate temperatures through the feedwater heater tubes normally ranged from 105-230°F. Vendor information stated that use of Belzona in aggressive flow, cavitation or erosion, or fluids with high oxygen content, should be limited to process temperatures no higher than 150-180°F.
- Engineering documents stated that epoxy (Belzona) products were not suitable for temporary use in the primary coolant system. In addition, fluid system cavitation in steel piping locations would experience further cavitation with an epoxy in that same location.
- Engineering evaluations did not address potential concerns regarding impact of chipping during emergency or accident conditions for systems in which components had been coated with Belzona.
- Materials made from epoxy resins and metal fillers can become abrasive due to their high hardness.

The station had categorized the most commonly used Belzona products (Ceramic R-Metal and Ceramic S-Metal) as Category III products. Products listed in Category III were not permitted for use on stainless steel systems. While the inspectors did not identify that Belzona products had been applied directly to stainless steel, the potential for Belzona to break off and settle in systems with stainless steel was not evaluated.

Several nuclear work requests (NWRs) were reviewed to determine the extent of Belzona use in various plant systems. The inspectors found that the NWRs were not detailed enough to identify specific points of Belzona application in various pumps and valves. Administrative controls and training for Belzona use was considered weak.

After the inspectors raised the above concerns, the licensee's system materials analysis department (SMAD) performed a chemical

analysis of Belzona. Total halogen limits exceeded the licensee's chemistry procedure and GE recommended guidelines. The halogens, chlorine and fluorine, were identified in a GE engineering document addressing sealants, as known intergranular stress-corrosion cracking (IGSCC) contributors. The use of epoxy coatings is considered an Unresolved Item pending the inspectors further investigation of the possible impact on plant systems (50-254/265-93032-07(DRP)).

The inspectors review of a guidance manual for the station's chemistry department identified several warnings against using Belzona. Mentioned in the manual was that Belzona products do not generally conform to manual chemical analysis limitations. Other items were:

- The vendor had not provided any training or direct oversight of Belzona use.
- The vendor had not supplied Nuclear Quality products to the licensee; nor had the vendor supplied a complete chemical analysis.

Quad Cities Administrative Procedure (QCAP) 700-2, "Chemical Control," stated that consumable products which may come in direct contact with reactor coolant water shall be analyzed by SMAD. The analysis was not performed prior to Belzona use. Subsequent to the inspectors inquiry, a test was performed. The results identified that the chlorine and fluorine levels exceeded GE and licensee chemistry requirements. Failure of the licensee to perform an analysis of Belzona (a consumable epoxy coating) is considered a Violation of Technical Specification 6.2.A.1 (50-254/265-93032-01c(DRP)).

e. Feedwater Flow Calibrations

The licensee's Vulnerability Assessment Team identified an issue concerning potential uncertainties with feedwater flow instrument calibrations. The issue was further emphasized as part of the NRC Diagnostic Evaluation Team findings relative to poor licensee action for resolution of engineering issues. During this report period, the licensee has conducted test on Unit 1. Preliminary results indicate that the maximum thermal power limit of 2511 megawatts (thermal) may have been exceeded. This issue is considered an Unresolved Item (50-254/265-93032-8(DRP)) pending review of final test results for Units 1 and 2.

One violation was identified regarding the failure to perform an analysis prior to application of an epoxy coating. Three unresolved items were identified regarding: additional loads supplied from the emergency diesel generators; use of epoxy coatings in plant systems; and feedwater flow instrument calibration.

10. Unresolved Items

Unresolved items are matters which require more information in order to ascertain whether it is an acceptable item, an open item, a deviation or a violation. Unresolved Items disclosed during this inspection are discussed in sections 8, 9.c, 9.d, and 9.e.

11. Inspection Follow-Up Items

Inspection Follow-up items are matters which have been discussed with the licensee, will be reviewed by the inspectors, and which involved some action on the part of the NRC, licensee, or both. Inspection Follow-up Items disclosed during the inspection are discussed in sections 5.b, 5.e, and 7.c.

12. 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 February 7, 1994. 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.