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ESK-94-115

December 29, 1994

Director, Office of Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

**ATTENTION:** Document Control Desk

**SUBJECT:** Quad Cities Power Station Units 1 and 2;
NRC Docket Number 50-254 and 50-265;
NRC Inspection Report Numbers 50-254(265)/94020

**REFERENCE:** W. D. Shafer Letter to E. S. Kraft, Jr., Dated November 29, 1994, Transmitting Notice of Violation

Enclosed is Commonwealth Edison's (ComEd's) response to the Notice of Violation transmitted with the referenced letter. The NOV cited four Severity Level IV violations. The violations were 1) inadequate design control, 2) failure to follow surveillance procedures, 3) inadequate corrective actions, and 4) failure to adequately test SBLC check valves and failure to adequately exercise the core spray minimum flow check valves. In addition, a response is provided to the inspection follow-up item addressed in paragraph 2.2.7 of the referenced document.

If there are any questions or comments concerning this letter, please refer them to Nick Chrissotimos, Regulatory Assurance at (309)654-2241, extension 3100.

Respectfully,

E. S. Kraft, Jr.
Site Vice President
Quad Cities Station

Attachment

cc: J. Martin, Regional Administrator, RIII
R. Pulsifer, Project Manager, NRR
C. Miller, Senior Resident Inspector, Quad Cities



IE01

**VIOLATION 50-254/265-94020-01(A-E)**

10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires that, "... design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program." "Design control measures shall be applied to items such as the following: reactor physics, stress, thermal, hydraulic, and accident analyses; compatibility of materials; accessibility for inservice inspection, maintenance, and repair; and delineation of acceptance criteria for inspections and tests."

a. Contrary to the above, Exempt Change E04-1-93-131, "Reroute Seal Cooling Line on RHRSW Pumps 1-1001-65B,C,D. Add Vent Valve to Seal Cooling Line on RHRSW Pumps 1-1001-65A,B,C,D," Revision 0, installed an in-line 3 gpm orifice in the seal (Mississippi River) water supply piping with an opening smaller than the mesh of the upstream crib house screens without verifying or checking the adequacy of design for potential fouling. There was no post-modification test (PMT) requirements for verification of the quantity or existence of flow to the seals (254-94020-01A(DRS)).

b. Contrary to the above, Exempt Change E04-1-93-307, "Installation of Anti-Cavitation Trim for Valves MO-1-1001-36A(B)," Revision 0, failed to perform adequate PMT to verify the functional adequacy of the installed modification and that the new anti-cavitation trim successfully lowered cavitation induced vibration (254-94020-01B(DRS)).

c. Contrary to the above, Modification M04-1-87-010, "Change ATWS Trouble Alarm," 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 (254/265-94020-01C(DRS)).

d. Contrary to the above, no calculation of record existed to justify the 4160 Volt degraded voltage relay reset value. A calculation was necessary to determine permissible switchyard voltage and bus loading for normal operation to minimize the probability of losing the preferred source of power during an accident. The licensee failed to justify by calculation that the 4160 Volt degraded voltage relay would reset after a loss of coolant accident occurring at normal operating voltages (254/265-94020-01D(DRS)).

e. Contrary to the above, on August 10, 1994, the Unit 1 & 2 high pressure core injection room (HPCI) cooler fan thermostat's setpoints were adjusted without an adequate engineering evaluation and proper setpoint change (254/265-94020-01E(DRS)).

These violations represents a Severity Level IV problem (Supplement I).

**REASON(S) FOR THE VIOLATION**

ComEd acknowledges the violation. The post-modification testing examples cited in this violation were due to inadequate implementation of the post-modification testing process.

ComEd has enhanced post-modification testing at Quad Cities Station. This enhancement has been accomplished through the implementation and increased focus on the following procedures:

| | |
|---|---|
| ENC-QE-06.4 | "Modification Acceptance Testing Evaluation" |
| TID-DS-04 | "Post Modification Acceptance Testing" |
| QAP 1270-5 | "Required Tests of Modifications" |
| QAP 1270-14 | "Guidelines for Develpoment of Modification Tests" |

Both design and testing responsibilities now recide with the Site Engineering Modification Design Department which promotes coordination between the design and testing activities. The examples in this violation have been communicated to design personnel at group meetings to ensure design personnel understand the importance of testing all aspects of design changes.

With respect to the specific examples cited in this violation, the reasons for each is provided below.

a. There is a potential for fouling of the seal cooling line. An undocumented judgement was made that seal flow does not have an impact on seal operation.

b. Sound level measurements, which initially existed in the post-modification test, were subsequently deleted in lieu of the detailed vibration testing which was to be performed at a later date.

c. The failure to evaluate the impact of Modification M04-1-87-010 on station procedures is due to a lack of attention to detail on the part of the design engineer who failed to take into account the potential impact on Instrument Maintenance Surveillances.

   The electrical loads for Modification M04-1-87-010 were evaluated by the design engineer instead of the Site Load Coordinator as intended by the procedure (QAP 1270-S27, "Station Modification Checklist for On-Site Review"). This action was a result of misinterpreting the procedure step.

   Based on the review performed during the E&TS inspection, the time delay circuit was not tested for currently installed Modification M04-2-82-021.

d. A calculation of record does not exist to justify the 4160 volt degraded voltage relay reset value. The calculations of record for the Quad Cities Auxiliary Power System utilize conservative modeling of loading. The collection of field data/measurements during unit operation (at maximum loading conditions) is required to establish realistic system loading and voltages. This data is needed prior to the performance of a rigorous calculation to determine the adequacy of the reset value of the degraded voltage relays.

e. The setpoint change to the HPCI Room Cooler thermostats using the PIF process (and without the necessary evaluation) was inappropriate.

**CORRECTIVE STEPS TAKEN AND RESULTS ACHIEVED**

a. During the recent installation of Exempt Change E04-2-93-131 for the '2B' RHRSW Pump (September 1994), the post-modification test included the acquisition of seal line flow and seal temperature data. The data indicated adequate seal flow and seal temperature.

b. Unit 1 RHR System vibration data was collected on November 3, 1994, during the performance of the quarterly operability surveillance for the system. The testing was performed to quantify the affects of the trim installed in MO 1-1001-36A&B (by comparing the post-modification vibration data to pre-modification [baseline] data obtained in August 1993). Vibration measurements were taken on the MO 1-1001-36A&B valves, as well as six (6) other valves (MO 1-1001-18A&B, MO 1-1001-34A&B, MO 1-1001-37A&B) which could experience vibration caused by the cavitation in the '36' valves. The post-modification vibration testing demonstrated that the trim installation in the MO 1-1001-36A&B valves was effective in reducing the cavitation and associated vibration.

c. Problem Identification Form (PIF) 94-2448 was generated on the post-modification test for Modification M04-2-82-021 and the failure to identify/update procedures effected by Modification M04-1-87-010. The issue screening from the PIF confirmed that the Unit 2 modification (M04-2-82-021) did not affect the operability of the ATWS System.

d. During the E&TS inspection, an evaluation was performed to compare the minimum credible voltage of the 4160 volt switchgear under design basis LOCA and unit trip conditions to the maximum reset voltage of the second level undervoltage relays installed on buses 13-1 and 14-1. The evaluation utilized bi-weekly walkdown information on loading of the non-safety related load centers in order to utilize realistic system loading and voltages. The evaluation indicated that the auxiliary power system would not be expected to trip during either a design basis accident or a unit trip from full power.

e. During the E&TS inspection the setpoints for the HPCI Room Cooler thermostats were returned to the 'as-found' 85° F. In addition, Problem Identification Form (PIF) 94-2263 was written to address the fact the thermostat setpoint was changed without the appropriate engineering evaluation. The issue screening for the PIF determined that the functional capability of the safety-related systems, structures, or components in the HPCI rooms were not affected by the 100° F setpoint.

Individuals involved with PIF 94-2001, which provided a setpoint change for the HPCI Room Coolers, have been instructed on the appropriate process to administer a setpoint change.

**CORRECTIVE STEPS TAKEN TO AVOID FURTHER VIOLATION**

a. A letter from the seal vendor has been obtained, indicating that the mechanical seals for the RHRSW pumps do not require a flush to function. Although the flush provides an environment which should extend the life of the seal, it will not impact the function of the seal. This documentation will be included in the Exempt Change (E04-1(2)-93-131) for the remaining pumps to be modified ('2D', '1B', and '1C'). Additionally, the post-modification tests for these design changes will include the acquisition of seal line flow and seal temperature data.

b. Exempt Change E04-2-93-307 will be performed to install anti-cavitation trim for valves MO 2-1001-36A&B during Q2R13. The post-modification test for this design change will include vibration testing in order to assess the effectiveness of the trim.

The design change procedures/checklists will be reviewed to ensure that sufficient direction is provided for the performance of post-modification vibration testing. This review will be completed by February 1, 1995.

c. PIF 94-2448 will address the necessity, as well as the timeframe, for the testing of the Unit 2 time delay circuit. In addition, the Instrument Maintenance Surveillances (QCIS 200-28, QCIS 200-31, and QCIS 200-34) will be reviewed for future testing of the circuitry.

For Modification M04-1-87-010, the steps of QAP 1270-S27 ("Station Modification Checklist For On-Site Review") which address procedure review (step 5) and electrical load additions (step 12) will be reperformed. Step 5 relating to procedure review will include Instrument Maintenance Surveillances QCIS 200-28, QCIS 200-31, and QCIS 200-34. Step 12 relating to electrical load additions will be routed through the Site Load Coordinator. These activities will be completed

prior to the installation of the modification.

d. ComEd recognized the conservative modeling of loads in the calculation of record for the Quad Cities Auxiliary Power System. A measurement program is being developed to rebaseline the Quad Cities Auxiliary Power System Analysis. This measurement program involves the instrumenting of various non-safety related buses to collect field measurements during unit operation (at maximum loading conditions). During Q2R13, instrumentation will be installed to support the measuring program. Data will be collected during Cycle 14 operation for Unit 2. Following completion of the data collection, a schedule will be developed for the updating of the ELMS database and the performance of a calculation to determine the adequacy of the 4160 volt degraded voltage relay reset value.

e. An evaluation has recently been performed to determine the HPCI Room Cooler thermostat setpoint. The evaluation took into account the EQ temperature limit for the HPCI room, and HPCI System operation during normal and accident conditions. A thermostat setpoint of 100° F was recommended for each unit.

A setpoint change will be processed to establish the HPCI Room Cooler thermostat setpoint at 100° F. This setpoint change will also update the instrument database for the thermostat. It is expected that completion of the setpoint change, along with the implementation of the new setpoint, will be completed by February 28, 1995.

**DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED**

Full compliance will be achieved upon completion of the aforementioned outstanding activites (completion dates noted in the text).

**VIOLATION 50-254/265-94020-02**

2. 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires that, "Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings."

   QCOS 1100-01, "Standby Liquid Control Flow Rate Meter Accuracy Determination," Revision 1, required that the standby liquid control (SBLC) pumps be operated for approximately 3 minutes in order to verify the accuracy of the flow meter.

   Contrary to the above, on and prior to August 4, 1994, the SBLC flow rate meter accuracy determination was not accomplished in accordance with QCOS 1100-01. The SBLC system pumps were operated for considerably less than three minutes the last three times the surveillance procedure was performed on all four SBLC system pumps (254/265-94020-02(DRS)).

This is a Severity Level IV violation (Supplement I).

**REASON(S) FOR THE VIOLATION**

ComEd acknowledges the violation. The SBLC pumps were operated for less than the "approximately 3 minutes" specified by QCOS 1100-1. Given the system configuration, the test tank capacity is the controlling factor for the operating time of the pump. A timeframe for pump operation should not have been specified.

**CORRECTIVE STEPS TAKEN AND RESULTS ACHIEVED**

Problem Identification Form (PIF) 94-2273 was generated to review the adequacy of QCOS 1100-1. QCOS 1100-1 has been revised (Revision 2, dated October 25, 1994) to provide more direction for operation to the test tank. The procedure revision specified the portion of the test tank to be utilized during testing (i.e., between the top of the suction line to 4-6" below the return line). This approach will ensure that an accurate tank volume is utilized for determining pump flow rate (void of any suction or discharge line connection) while still providing a sufficient volume to minimize any test methodology inaccuracies. The necessity for specifying a timeframe for pump operation is eliminated.

QCOS 1100-1 has been performed on Unit 1 since the implementation of the revision. The duration of the pump runs provided sufficient volume for the determination of pump flow rate to verify the accuracy of the flow meter.

**CORRECTIVE STEPS TAKEN TO AVOID FURTHER VIOLATION**

Procedure adherence was one of the identified improvement areas for the recent Quad Cities Station restart effort. As part of this effort, QCAP 1100-12, "Procedural Use and Adherence," was revised (Revision 5, dated November 28, 1994) in order to eliminate any potential ambiguity in management expectations for strict procedural adherence. Training was also conducted to communicate to site personnel the expectations, and necessity, for strict procedural adherence. In addition, during the startup of Unit 2, a procedure adherence overview program was implemented.

**DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED**

Full compliance has been achieved with the completion of the aforementioned activities.

**VIOLATION 50-254/265-94020-03(A-C)**

3. 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires that, "Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected."

a. Contrary to the above, on August 5, 1994, the residual heat removal pump 2B minimum flow check valve failed an in-service test (IST) and a nuclear work request was not processed to promptly identify and correct the problem (265-94020-03A(DRS)).

b. Contrary to the above, during 1992 and 1993, prompt corrective actions were not taken to address the Unit 1 and 2 SBLC system relief valve setpoint drift problem (254/265-94020-03B(DRS)).

c. Contrary to the above, on September 3, 1993, the Unit 2 reactor core isolation cooling system rupture disc flange and seating surface showed signs of steam cutting and corrosion (PIF 93-0107). On May 14, 1994, the problem identification form (PIF) was administratively closed. As of September 15, 1994, no root cause evaluation was made and no corrective actions were taken, nor was Unit 1 inspected for a similar problem (254/265-94020-03C(DRS)).

These violations represents a Severity Level IV problem (Supplement I).

**REASON(S) FOR THE VIOLATION**

ComEd acknowledges the violation.

a. During the performance of the Unit 2 RHR System Quarterly Surveillance on August 5, 1994, the flow through the minimum flow line of each RHR pump was measured to verify the operability of the minimum flow line check valve. The measured flowrate for the '2B' RHR minimum flow line (95 gpm) failed to meet the acceptance criteria of 140 gpm. Since the acceptance criteria was not met, the minimum flow line check valve was declared inoperable and Problem Identification Form (PIF) 94-1964 was initiated to document the condition. Nuclear Work Request (NWR) Q17490 was also written to investigate and correct the low flow condition in the minimum flow line. Although the work request was identified as 'short outage', the work request was not scheduled during the unit's five (5) day forced outage which began on August 23, 1994. A contributing factor was the lack of a scheduling urgency since the '2B' RHR Pump was still considered operable as evaluated by the PIF.

b. Prompt corrective actions were not taken to address recent SBLC relief valve setpoint drift concerns. In addition, QTS 170-3 ("Standby Liquid Control System Outage Surveillance) allowed for the flushing (or preconditioning) of the valves prior to the performance of the relief valve setpoint testing.

c. Problem Identification Form (PIF) 93-107 was not addressed/evaluated in a timely manner; however, the issue had been reviewed and prioritized with the outstanding system activities at the time. The administrative closure of a Level IV PIF does not prevent the implementation of corrective actions. Corrective action(s) are pursued based on the assessment by the cognizant individual/department.

**CORRECTIVE STEPS TAKEN AND RESULTS ACHIEVED**

a. During the recent forced outage on Unit 2 which began on October 3, 1994 (Q1F35), the components in the '2B' RHR minimum flow line were disassembled to investigate and correct the low flow condition in accordance with work request Q17707. It should be noted that work request Q17490 which was previously generated on August 5th was cancelled to work request Q17707. The '2B' minimum flow check valve (2-1001-142B) and restricting orifice (RO 2-1001-73) were inspected and found to have no deficiencies; however, upon disassembly of the manual isolation valve (2-1001-141B), a quarter (25 cent piece) was found in the valve bonnet. Although the quarter was not in the flow stream, it could have prevented the valve from being fully opened. PIF 94-2647 was initiated to document the condition. A review of the TJM database, which records historical work data to approximately 1985, revealed that no previous work had been performed on 2-1001-141B. Given the condition (heavily corroded with rust) and age (dated "1965") of the quarter, coupled with the results of the review of the TJM records, it was concluded that the quarter had been in the valve for a significant period of time.

   QCOS 1000-6, "Quarterly RHR Pump/Loop Operability Test," was successfully performed on Unit 2 on December 3, 1994 (following reassembly/reinstallation of the components in the '2B' minimum flow line). The flowrate through the '2B' minimum flow line was measured to be approximately 153 gpm, which is consistent with the minimum flow values received for the remaining RHR pumps on the unit.

b. Problem Identification Form (PIF) 94-2273 was generated to review the adequacy of QTS 170-3, "Standby Liquid Control System Outage Surveillance." As a result of that review, QTS 170-3 is being revised (to be issued as QCTS 340-1) to require the performance of QCOS 1100-4, "SBLC Relief Valve Setpoint Check," prior to the flushing of the system. QCTS 340-1 will be issued prior to Q2R13.

c. PIF 93-0107 was identified for closure as part of the RCIC System certification to support Unit 2 startup from the recent forced outage (Q2F35). Site Engineering Evaluation 4-2438 evaluated the slope of the Unit 2 steam (exhaust) piping and the effect that potential condensate accumulation (as a result of the slope) could have on the RCIC turbine and rupture disc. The evaluation determined that the amount of condensate that could accumulate in this piping after system shutdown would not be sufficient to cause condensate backup into the turbine. Any condensate collected would be flushed to the barometric condenser when the system is restarted. Condensate accumulation at the rupture disk could corrode the area of the rupture disk around the flange. Corrosion around the flange surface would not significantly effect the burst pressure given the current double rupture disk design. The RCIC rupture disks and pipe flanges were replaced for both units in accordance with Exempt Change EO4-1(2)-93-221 during Q2M11 (December 1993) and Q1R13 (March 1994). This replacement corrected the steam cuts and corrosion that were present in the Unit 2 flange seats. Based on the evaluation, the current Unit 2 configuration is acceptable.

   The Unit 1 RCIC steam (exhaust) piping was inspected and no slope concern was identified.

**CORRECTIVE STEPS TAKEN TO AVOID FURTHER VIOLATION**

a. QCPP-1003, "Restart Checklist", has recently been implemented to provide guidance for restart of a unit. The checklist ensures that open corrective maintenance work requests are reviewed for potential impact on unit startup and power operations.

b. The crystallization of sodium pentaborate in the internals of the relief valves is suspected to be contributing to previous setpoint drift events. Heat tracing was recently installed on the relief valves for each unit during Q1M9 (November 1993) and Q2M11 (December 1993). In addition, during Q2R13 the Unit 2 relief valves will be visually inspected prior to the performance of the setpoint test. This inspection, which is a corrective action from Deviation Report 04-02-93-022, is being performed to determine the extent of any sodium pentaborate crystallization.

   In order to facilitate the monitoring of SBLC relief valve performance, the system engineer will begin trending the test results, and failure events, of the valves.

c. The electronic PIF System which was recently implemented, and currently accessible to site personnel, will facilitate the communication on the status of PIFs to departments and cognizant individuals.

**DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED**

Full compliance will be achieved upon completion of the aforementioned outstanding activites (completion dates noted in the text).

**VIOLATION 50-254/265-94020-04(A-B)**

4. 10 CFR 50.55a.(f)(4)(ii), states, in part, that ISTs to verify operational readiness of pumps and valves, whose function is required for safety, must comply with the requirements of the latest edition and addenda of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code.

a. ASME Code, Section XI, IWV-3522, "Exercise Procedure," states that, "Valves that are normally open during plant operation and whose function is to prevent reversed flow shall be tested in a manner that proves the disk travels to the seat promptly on cessation or reversal of flow."

Contrary to the above, on September 15, and June 21, 1994, the licensee failed to adequately test and prove the SBLC system pumps 1A and 2B discharge check valve disks traveled to their seat promptly on reversal of flow (254/265-94020-04A(DRS)).

b. ASME Code, Section XI, IWV-3521, "Test Frequency," states that, "Check valves shall be exercised at least once every three months" (quarterly). ASME Code, Section XI, IWV-3522, "Exercising Procedure," states that, "Check valves shall be exercised to the position required to fulfill their function..."

Contrary to the above, as of September 2, 1994, the core spray minimum flow check valves 1(2)-1402-13A/B were not adequately exercised, on a quarterly basis, to the full stroke position required to fulfill their safety function (254/265-94020-04B(DRS)).

These violations represents a Severity Level IV problem (Supplement I).

**REASON(S) FOR THE VIOLATION**

ComEd acknowledges the violation.

a. ASME Section XI, Subsection IWP, requires the classification of valves according to the required safety function. The SBLC pump discharge check valves, 1100-43A/B, have been classified in the Quad Cities Station IST Program as Category 'C' (valves which are self actuating in response to some system characteristic). These check valves are designed to prevent gross backflow through the non-operating pump, and do not have a specified code required leakage acceptance criteria.

QCOS 1100-7, "Quarterly SBLC Pump Flow Rate Test", was revised in March 1994 (Revision 1) to include instructions to verify that the discharge check valves travel to the closed position. This testing opens the discharge isolation valve of the non-operating (idle) pump and verifies that pressure (at the discharge of the idle pump) does not reach that of the operating pump within 10 seconds. The acceptance criteria is based on the logic that a fully closed check valve with a seat leak would inhibit an immediate pressure buildup upstream of the check valve. Since the current check valve test was only recently incorporated into QCOS 1100-7, significant data has not been accumulated and the trends to date have, in most cases, been inconclusive.

During ComEd's review of this violation, it was identified that check valve performance could also be verified through the confirmation of an acceptable SBLC flow rate (>40 gpm). Currently, QCOS 1100-7 does not verify the SBLC flow rates with the idle pump's discharge isolation valve in the open position. As a result, QCOS 1100-7 is currently being revised to include this flow rate verification.

b. The minimum flow lines are not equipped with flow and/or pressure instrumentation which would provide a positive means of check valve position. To address ASME Section XI, the station developed a test where the flow passing through the minimum flow line would be calculated as the difference between the recorded total Core Spray flow with the minimum flow line isolated, and the recorded total Core Spray flow with the minimum flow line open. The acceptance criteria for this test was to verify that a flow decrease was observed when the minimum flow line was open. ComEd concurs that the approach only constitutes a partial open test.

**CORRECTIVE STEPS TAKEN AND RESULTS ACHIEVED**

a. Based on test results to date, the Unit 2A SBLC Discharge Check Valve (2-1101-43A) is scheduled to be disassembled and inspected during Q2R13.

b. On September 6, 1994, a test was performed that measured the flow rates passing through each of the four Core Spray minimum flow lines. Using an ultrasonic flow meter, the following flow rates were achieved: 1A - 150 gpm, 1B - 145 gpm, 2A - 195 gpm, 2B - 240 gpm. The difference in flow rates between the units is attributed to differing restricting orifice styles on Unit 1 compared to Unit 2 Given the measured flow rates, there is no evidence to suggest that the minimum flow check valves are not opening satisfactorily. In addition, PIF 94-2214 determined that the current Core Spray minimum flow rates support the operability of the pumps.

The Unit 2 Core Spray minimum flow check valves have been scheduled to be disassembled and inspected during Q2R13.

**CORRECTIVE STEPS TAKEN TO AVOID FURTHER VIOLATION**

a. QCOS 1100-7 is being revised to incorporate a SBLC flow rate verification with the idle pump's discharge isolation valve in the open position. In addition, the revision will ensure that this flow rate verification is factored into the acceptance criteria utilized for determining the operability of the discharge check valve. This procedure revision will be completed by the next scheduled surveillance.

The 2-1100-43A inspection results from Q2R13 will be evaluated with valve trend data, in order to determine the necessity of any revision to the test methodology. This activity will be completed by the completion of Q2R13.

b. The current test method will be reclassified as a partial open test. The requirement for full flow testing these check valves will be addressed as part of the IST Program assessment and revision currently in progress. Various options will be explored, including non-intrusive methods; however, if non-intrusive methods are not practical or effective, the station will consider placing the valves on a periodic disassembly and inspection schedule. The IST Program revision will be submitted to the Staff by May 15, 1995.

**DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED**

Full compliance will be achieved upon completion of the aforementioned outstanding activites (completion dates noted in the text).

**FOLLOWUP ITEM 254-94020-05**

2.2.7 Residual Heat Removal (RHR) System Water Hammer Concerns

The inspectors concluded that the licensee's analysis of IN 87-10, "Potential for Water Hammer during Restart of Residual Heat Removal Pumps," was inadequate. The IN stated that a water hammer could occur in a RHR piping system during the torus cooling mode coincident with a loss of offsite power (LOOP) and receipt of a safety injection (SI) signal. The cause of the water hammer was the loss of water column in the piping system during the time delay between RHR pump stop and start. The time delay was caused by steps required to switch power to the emergency diesel generator (EDG) including EDG synchronization, load shedding and sequencing back to the power supply circuit.

On July 7, 1994, in a response to NRC Open Item 254/265-93026-03(DRP), the licensee stated that "With the torus cooling valves open and the loss of power, the only piping that would lose its fill will be the piping at the highest elevation on top of the torus and toward the torus itself. This piping is only several feet in length and is open ended. Therefore, this piping will have minimal susceptibility to water hammer."

The inspectors reviewed the RHR Loop B system piping connections to the containment spray (CS) upper ring header and low pressure coolant injection (LPCI) system for possible water column loss. The CS upper ring header shutoff valve (Elev. 626'-3") was 55 feet above the torus normal water level (Elev. 571'-6"). Based on the general assumption that 33 feet of water column could be maintained in a closed piping system, the CS system could see 22 feet or more of water column loss. The loss of this substantial amount of water column could result in a severe water hammer event under the operational conditions as described above.

Technical specification 3.5/4.5, "Core and Containment Cooling System, Limited Conditions for Operation (LCO) Basis," Section G, stated that, "An analysis has been done which shows that if a water hammer were to occur at the time emergency cooling was required, the systems would still perform their design function." The licensee was unable to retrieve the water hammer analysis.

On September 28, 1994, a PIF was written by the system engineer that requested SEC evaluate RHR system operability. Further review of this concern is planned and is assigned NRC followup item number 254-94020-05(DRS).

**ACTION TAKEN**

IE Information Notice (IN) No. 87-10, "Potential For Water Hammer during Restart of Residual Heat Removal Pumps", was issued on February 11, 1987. This Information Notice was issued to alert addressees of the potential for water hammer in the RHR System in the event of a design basis loss of coolant accident (LOCA) coincident with a loss-of-off-site-power (LOOP) while the RHR System is running in the 'torus / suppression pool' cooling mode. Prior to this event, the facility discussed in the IN operated both RHR and Core Spray Systems in a "suppression pool mixing" mode. One of the interim corrective actions was to eliminate operation in this mixing mode, and to limit Core Spray and RHR running at the same time. Quad Cities Station does not utilize a "suppression pool mixing" mode.

Based upon ComEd's review, the conditions postulated in IN 87-10 are beyond those assumed in original plant design. The LOCA analysis assumes that the ECCS systems are in a normal standby line-up prior to the event. As a result of recent regulatory inquiries on this issue (IN 87-10), the Boiling Water Reactor Owners Group (BWROG), through the 'RHR Waterhammer / Suppression Pool

Cooling' Committee, has recently initiated efforts to evaluate the significance of this issue. ComEd is participating in this BWROG effort. The BWROG expects to address the following key areas in the look at this issue:

- the original licensing basis;
- the low probability of concurrent LOCA, LOOP, and Suppression Pool Cooling (SPC) mode;
- the original SPC mode design considerations;
- the water hammer experience that has been observed in the industry and the conservatism's in analysis that have been perform (i.e., expected consequences); and
- operational considerations to reduce water hammer concerns by making the use of SPC as efficient as possible.

Problem Identification Form (PIF) 94-2389, was generated to document the Quad Cities condition of having a containment spray line configuration that is susceptible to the water column loss detailed in the inspection report. This loss of water column could result in a water hammer event under the conditions described in IN 87-10. The PIF issue screening, which determined that the RHR system was operable in its present condition, took into consideration the following aspects of this issue.

- The station does not utilize a "suppression pool mixing" mode, thereby minimizing the susceptibility of multiple ECCS Systems.
- Based on a recent review, the suppression pool cooling mode of operation was determined to be occurring approximately 5% of the time, which is not considered high usage; thereby minimizing the susceptibility of the RHR System.
- The expected dynamics of the water column loss during LOCA scenarios which would minimize the potential, and consequences, for a waterhammer event. For large break LOCA scenarios, the water column loss (and potential water hammer) would be expected to be minimized by the higher torus pressure; whereas for the small break LOCA scenarios, where the torus pressure would not be expected to minimize column loss (or the potential for water hammer), there are redundancies of the ECCS Systems to address the condition/scenario.