Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

July 14, 1992

U.S. Nuclear Regulatory Commission
Washington, DC 20555

Attention: Document Control Desk

Subject: Quad Cities Nuclear Power Station Units 1 and 2
Response to Service Water Operational Performance
Inspection Report Nos. 50-254/92-201; 50-265/92-201
NRC Docket Nos. 50-254 and 50-265

Reference: (a) B.A. Boger letter to Cordell Reed dated May 1, 1992 transmitting NRC Inspection Report 50-254/92-201; 50-265/92-201

(b) M.J. Miller letter to Cordell Reed dated June 16, 1992 requesting a response to NRC IR 50-254/92-201; 50-265/92-201

Enclosed is the Commonwealth Edison Company (CECo) response to the six deficiencies which were transmitted with the letter of reference (a) and the Inspection Report. The letter of reference (b) classified the defeciencies as unresolved items and requested a written response. The CECo response is provided in the attachment.

If your staff has any questions or comments concerning this transmittal, please refer them to Jim Watson, Compliance Engineer at (708) 515-7205.

Sincerely,

D. L. Farnes for

T.J. Kovach
Nuclear Licensing Manager

Attachment

cc: A.B. Davis, Regional Administrator - Region III
L. Olshan, Project Manager, NRR
T. Taylor, Senior Resident Inspector

ZNLD/1856/1

IE01

ATTACHMENT

UNRESOLVED ITEM 92-201-01

URI Title: Heat Load Calculations for RHRSW and DGCW Pump Vaults and ECCS Pumps Coolers

Description of Condition:

Sargent & Lundy (S&L) Calculation VT-15 analyzed various loading combinations. In the case of only one DGCW pump operating with its associated room cooler, the heat load was larger than the rated DGCW vault cooler capacity of 30,000 Btu/hr for an air temperature of 105°F. In addition, this calculation did not include heat loads from the sump motors and fan motors. However, the licensee used an unverified higher cooler capacity of 104,500 Btu/hr, provided by the manufacturer for a higher room air temperature (120°F versus 105°F), to defend its position that the coolers would remove the generated heat load. A new S&L calculation, VT-16, under preparation during the team inspection, verified that the loads were higher than the cooler capacity, confirming the team's concerns. However, for an air temperature of 120°F, VT-16 calculated a new cooler capacity that exceeded the heat loads.

In the case of one RHRSW pump operating, VT-15 indicated total heat load generated was again higher than the cooler capacity. Again some heat loads, such as sump pump motors, were neglected. The new calculation, VT-16, indicated a heat load of 196,480 Btu/hr, which was substantially higher than the RHRSW pump cooler capacity of 150,000 Btu/hr, assuming an air temperature of 105°F. However, by using an air temperature of 120°F, this new calculation showed that the cooler capacity exceeded the heat load.

Stone and Webster (SWEC) Calculation 004 showed the required heat load raised the RHRSW and DGCW temperature by 5°F as it passes through the coolers. This calculation contained only pump motor loads. The fact that the calculation contained only pump motor loads demonstrated, once again, that RHRSW pump vault cooler capacity, corresponding to a maximum air temperature of 105°F, was smaller than the heat load. This result was in agreement with the results of VT-15 and VT-16.

The new calculation, VT-16, which addressed the RHRSW and DGCW pump vaults, considered the effect of the tube plugging on the cooler performance and could be used to assess cooler margin. The licensee stated that the VT-16 calculation would be finalized and components and equipment would be qualified for the higher temperature of 120°F.

SWEC calculation 004, which contained only motor loads, computed a heat load for the HPCI room that was higher than the room cooler capacity. However, this calculation was in error since it assumed that the pump was motor driven instead of turbine driven.

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S&L's 1968 calculation, sizing the ECCS coolers, lacked required detail and contained many unverified assumptions of the heat loads. Therefore, it could not be used to verify the cooler capacities for all ECCS rooms were higher than the heat loads.

Response:

CECo believes that there is a misunderstanding of the design basis for the RHRSW and DGCW vault room temperatures at Quad Cities Station. The 105°F air inlet condition is not a design input; rather it is a standard condition the vendor uses to evaluate coil performance. CECo acknowledges that the 105°F air inlet condition is contained in the Quad Cities UFSAR; however, this 105°F limit is in error.

On March 19, 1992, Sargent & Lundy completed calculation VT-16. This calculation concluded that both the RHRSW and DGCW pump coolers have approximately twice the required cooling capacity for every possible combination of pumps operating. VT-16 used a maximum vault room temperature of 120°F, which is consistent with the CECo response to IE Bulltein 79-01B. VT-16 also verified that the applicable equipment and components were qualified to 120°F and included additional heat loads (i.e. sump motors). In addition, tube plugging data was considered in the calculation, as well as the loss of one fan for the DGCW pump cooler.

Currently, CECo is in the process of recompiling the design basis for the RHRSW system under the "Design Basis Documentation" program. This program will review the existing Design Basis Documentation and create new Design Basis as required for these areas. The effected UFSAR sections will be revised as required. This action is scheduled to be completed in April 1993.

The 1968 S&L ECCS room cooler sizing calculations were part of the original design basis. Although reconstituting design basis calculations is not required by G.L. 89-13, new calculations are currently being performed to support room cooler inspection for operability determinations. These calculations will be completed by August 28, 1992.

CECo agrees that the SWEC calculation 004 contained errors. However, CECo engineering identified these errors prior to the team's arrival at Quad Cities and had rejected the calculation for use in any application. This calculation was not utilized by CECo and no additional actions were taken.

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UNRESOLVED ITEM 92-201-02

URI Title: Operability of Unit 1 DGCW System

Description of Condition:

As part of the response to Generic Letter (GL) 89-13, the licensee installed pressure taps (Modification M4-1-87-026) for measuring pressure differential across heat exchangers. M4-1-87-026 post-modification testing demonstrated that the DGCW pump can provide the required flow to all components. Flow balancing was achieved in Unit 1 by throttling valves located downstream of these components. Problems associated with silts and fouling of these valves resulted in flow blockage. These valves were subsequently fully opened. The Unit 1 DGCW System was left in an unbalanced configuration for the current operating cycle.

Two flow tests performed over the last month for Unit 1, indicated that the flow through the DGCW pump was about 1500 gpm, with 1040 gpm going to the DG heat exchanger and the remaining 450 gpm going to the ECCS coolers. The design flow to the coolers was 404 gpm. The actual flow represented a 15 percent margin over the design flow. The design flow distribution through the coolers was 40 gpm to HPCI, 68 gpm each to A and B core spray, and 114 gpm each to A and B RHR coolers. However, during both tests, the flow distribution to the individual coolers was unknown. The flow would be a function of individual path/component hydraulic resistance, which appeared to increase substantially as a results of fouling core spray pump cooler B, considering that core spray pump cooler A had about twice the flow of B.

For all of the above tests, the measured Unit 1 DGCW pump flows were higher than the design flow. A letter by the pump manufacturer stated that the design flow throughout the pump was 1304 gpm at 210 foot total head. The manufacturer recommended installing a larger impeller if flows up to 1600 gpm are desirable.

The licensee did not provide the team with any assessment of the effect of higher flow on the pumps, including vibration, erosion, and the adequacy of pump motor.

Alternate water supply to the Unit 1 ECCS pump room coolers was obtained from the shared 1/2 DGCW pump. Based on previous test data, the subject pump delivered approximately 1300 gpm. The licensee has not demonstrated that the 1/2 DGCW pump can meet the demands of the 1/2 emergency diesel generator heat exchanger and the Unit 1 ECCS pump coolers, as required during specific scenarios of Appendix R to 10 CFR Part 50.

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Response:

CECo will acquire Unit 1 DGCW pump and motor vibration and pump motor running current data under full flow conditions. This data will be used in evaluating the impact that flow rates above design have on the pump and motor. This evaluation will be completed by September 1, 1992.

As part of normal operation and maintenance, CECo routinely records and trends pump vibration data. Pump preventative maintenance is scheduled when this information indicates evidence of significant pump degradation. Thus, CECo currently has sufficient programs in place to ensure that adequate maintenance is performed on the pumps.

CECo provided copies of erosion data which showed that no significant erosion had occurred in either the Unit 1 DGCW pump suction elbow or discharge reducing elbow. These are the locations most likely to show evidence of erosion if it were to occur.

Existing surveillance testing routinely verifies that the 1/2 DGCW pump is capable of delivering the required flow to the 1/2 emergency diesel generator heat exchanger and the Unit 2 ECCS room coolers. A similar surveillance is being generated to verify the 1/2 DGCW pump is capable of delivering the required flow to the 1/2 DG heat exchanger and the Unit 1 ECCS room coolers. This will be completed by December 31, 1992.

ATTACHMENT

UNRESOLVED ITEM 92-201-03

URI Title: Single Failure Vulnerabilities

Description of Condition:

The following single failure vulnerabilities, identified by the Stone and Webster Engineering Corporation (SWEC) service water design review, have not been addressed by the licensee:

- Upon DGCW initiation, check valve (CV) 1-3999-561, which was normally closed, may fail in the closed position. This will result in the loss of DGCW flow to the HPCI coolers.

- Upon DGCW initiation, Check Valve CV 1-3999-560, which was normally open, may fail in the open position. This would result in the diversion of DGCW flow from the ECCS room coolers to the normal service water system (backflow) and potentially divert from the coolers required flow. Although the SWEC report recognized that manual valve 3999-562 could be closed to mitigate the failure of check valve 3999-560 to close, the licensee had not taken action to ensure that the 3999-560 valve could be closed by plant operators and that the appropriate changes were made to the emergency procedures. In response to the team's concerns, as a temporary measure, the licensee closed manual valve 3999-562 to isolate check valve 3999-560 and stated that permanent corrective action will be evaluated.

Response:

CECo will evaluate long-term corrective actions for these check valves based on the acceptability of the CECo ECCS room cooler analysis. This evaluation will be completed by September 1992.

In the interim, the IST procedure for full flow testing is being reviewed for improvements to enhance reliability with emphasis on ensuring that check valve 1(2)-3999-561 does not fail closed. This will be completed by December 31, 1992. Additionally, valve 1(2)-3999-570 has been closed to isolate check valve 1(2)-3999-560.

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UNRESOLVED ITEM 92-201-04

URI Title: RHR Heat Exchanger Valves not Environmentally Qualified

Description of Condition:

The precaution sections of the referenced emergency procedures allowed the operators to change the position of the flow reversing valves during an event, as necessary, to enhance heat transfer capability. Eight RHR heat exchanger motor-operated valves (MOVs) for reversing flow (1(2) 1001-186 A(B) and 1(2) 1001-187A(B)) were not environmentally qualified. The team was concerned that the unqualified valves could fail in some intermediate position and render the RHR heat exchanger inoperable during an accident mitigating activity. The licensee stated at the exit meeting that this matter would be reviewed immediately. Subsequently, the licensee removed the permission to operate the subject valves during accident conditions from the procedures. The valves would be evaluated for inclusion into the licensee's environmental qualification program.

Response:

CECo has administratively suspended the operation of these valves during accident conditions until the valves can be environmentally qualified.

The eight RHR heat exchanger MOVs for reversing flow (1(2)-1001-186A(B) and 1(2)-1001-187A(B)) will be environmentally qualified by performing a field walkdown. If present components are found not to be qualified, they will be replaced with qualified components. This will be completed by December 31, 1992.

ATTACHMENT

UNRESOLVED ITEM 92-201-05

URI Title: Incomplete Inservice Testing Program

Description of Condition:

The team identified the following valves, which were credited in performing various safety functions, but were not included in the licensee's inservice testing program:

- valves credited for single failure:
  - RHRSW/SWS Supply to Control Room HVAC

    1/2-5799-410
    1/2-5799-381
  - DGCW/SWS Supply to ECCS Room Coolers

    1(2)-3999-562
- valves required to admit/redirect flow:
  - RHRSW/SWS Supply to Control Room HVAC

    1/2-5741-319A (RHRSW flow admission valve)
    1/2-5741-333 (RHRSW/SWS flow control valve)
    1-5799-384/406/385 (Unit 2 RHRSW supply)
    2-5799-406/384/407/385 (Unit 1 RHRSW supply)
  - RHRSW supply to RHR heat exchanger:

    1(2)-1001-5A/5B (RHRSW flow control valve)
    1(2)-1001-184A/B, -185A/B, - 186A/B, & 187A/B (RHR heat exchanger flow reversing valves)
  - DGCW supply

    3906/3907 (DG heat exchanger flow reversing valves)
    2(1/2)-3999-89 (1/2 DGCW pump supply to ECCS room coolers)

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Response:

In developing the current revision of the Inservice Testing (IST) program, CECo used several documents to evaluate the individual safety functions of each plant component. These documents included Technical Specifications, Final Safety Analysis Report, and various Technical Manuals. The draft Service Water Design Review Report cited by the NRC during the Service Water inspection had not been written and, therefore, was not used in the development of the current IST program.

CECo evaluated each of the listed valves during the preparation of the current revision of the IST program. At that time, it was determined that these components were not required, per the ASME Code, to be included in the IST program.

CECo will re-evaluate the valves listed in the deficiency during the preparation of the IST program update for the third ten-year interval. This update is scheduled for submittal in early 1993. The results of this evaluation will ensure that the appropriate components are included in the IST program.

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UNRESOLVED ITEM 92-201-06

URI Title: Unit 2 RHR Heat Exchanger Room Cooler Inoperable

Description of Condition:

The team reviewed the details of the licensee's heat exchanger and room cooler inspection program and the results of the Unit 1 and Unit 2 Cycle 11 inspections. Heat exchanger inspections were performed and documented in accordance with Procedure QCP 1400-29, "Heat Exchanger Inspection Program."

The initial inspections, conducted in November 1990 and January 1991, identified significant flow restrictions in both the Unit 1 RHR heat exchanger room coolers 1A and 1B. The licensee determine that the flow restriction affected the heat removal capacity of the coolers beyond their 17-percent design margins. The licensee failed to recognize and subsequently address the plugging of the coolers as a potential operability issue. Consequently, required NRC notification of the degraded condition of the safety-related coolers was not made. Similar coolers on Unit 2, which was on line and continued to operate for the remainder of its cycle, were not inspected until March 1992. Inspection of the Unit 2 RHR heat exchanger room coolers identified that 28 percent of the first-pass tubes of the four-pass cooler were plugged in the 2A cooler and 58 percent of the first-pass tubes were plugged in the 2B cooler.

The licensee concluded from a completed study, NFS Report NO. RSA-Q-90-02, Revision 2 dated August 1990, and a safety evaluation in accordance with the Code of Federal Regulations 10 CFR 50.59 that the RHR heat exchanger room coolers were not required to mitigate the consequences of an accident. The team noted that the licensee's study assumed that natural ventilation was available in the ECCS pump rooms. However, a field verification during the inspection identified no natural ventilation pathway for the 2B RHR heat exchanger room. The team concluded that the licensee failed to take appropriate corrective action to address the degraded RHR heat exchanger room coolers that were identified during the Unit 1 Cycle 11 refueling outage because timely action was not taken to inspect and evaluate the operability of the Unit 2 RHR heat exchanger room coolers. Therefore, the Unit 2 RHR room cooler appeared to be inoperable for approximately 1 year while Unit 2 was on line, which could have affected the operability of the RHR system during this period.

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Response:

Consistent with the CECo response to NRC Generic Letter 89-13, the 1B RHR heat exchanger room cooler was inspected and cleaned upon the discovery that the 1A cooler appeared to be fouled beyond its design margin. At that time, CECo did not consider the fouling of the RHR room cooler to be a degradation of the RHR system. This was based upon a CECo analysis which indicated that ECCS systems were operable despite inoperability of the associated room coolers. The analysis had been approved but not implemented at the station.

The implementation of GL 39-13 committed the station to inspect one loop of coolers each outage and only expand to sister components on the same unit when fouling was evident. Inspection of Unit 2 components was planned for the next refuel outage (Q2R11). As the fouling of the Unit 1 RHR room coolers was not considered to degrade the RHR system, it was believed that immediate inspection of the Unit 2 coolers was not warranted.

It was during the inspection of the Unit 2 "A" loop components that the 2A RHR room cooler was found to be fouled beyond its design margin. This required the station to expand its inspection to cover the "B" loop room coolers. The inspection of the 2B RHR room cooler determined similar fouling. At this time, the results of these inspections were viewed as a degradation of the RHR system. CECo initiated a 4-hour ENS notification to the NRC.

On March 11, a review of the previous Unit 1 room cooler inspections was performed due to the reportability of the Unit 2 RHR coolers. This review resulted in the determination that a ENS notification should have been made for the degradation of the Unit 1 RHR system.

CECo has verified through an Engineering evaluation that the fouling of the RHR room coolers would not have prevented the RHR system from performing its immediate design safety function.

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The design heat removal for the room coolers is based on a cooling water temperature of 95° F. The maximum historical Mississippi river temperature recorded at the station was 88.7 °F. Using a computer model, CECo has analyzed the heat removal capability of the coolers. The analysis assumed a maximum blockage of 40 tubes (38 tubes were blocked on the 2B RHR room cooler) and a maximum river temperature of 85°F. At this temperature and blockage, it was determined that the cooler would have been able to provide adequate heat removal. The majority of the historical river water temperature data is less than or equal to 86° F. This study also bounds the degraded 2A RHR room cooler condition.

Due to design similarities, the Station has committed to inspect both "A" and "B" loops of the RHR and Core Spray room coolers at least once per cycle through cycle 13. The long-term inspection frequency will be determined prior to the cycle 14 refuel outages. This will prevent the reoccurrence of significant fouling due to long periods without cleaning.

Per the station response to Generic Letter 89-13, a method of monitoring the condition of these room coolers is being implemented. Modification M4-1(2)-87-026 has installed pressure gauges on the inlet and outlet of the coolers. A procedure to trend and analyze these pressures has been developed. This will ensure that if a cooler is becoming blocked, action can be taken before the design margin is exceeded.

Commonwealth Edison will revise the appropriate operating procedure to require either removal of the 2B RHR Heat Exchanger room equipment hatch (when the room cooler is inoperable) or declared the RHR System inoperable. This will be completed upon NRR approval of the CECO ECCS Room Cooler analysis.