March 1, 2002

Mr. Oliver D. Kingsley, President
Exelon Nuclear
Exelon Generation Company, LLC
Quad Cities Nuclear Power Station
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION
NRC INSPECTION REPORT 50-254/01-15(DRS); 50-265/01-15(DRS)

Dear Mr. Kingsley:

On February 1, 2002, the NRC completed a baseline inspection at your Quad Cities Nuclear Power Station, Units 1 and 2. The results of this inspection were discussed on February 1, 2002, with Mr. T. Tulon and other members of your staff.

This inspection was an examination of activities conducted under your license as they related to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel. Specifically, the inspection focused on the design and performance capability of the diesel generator cooling water and residual heat removal service water systems to ensure the systems were capable of performing required safety related functions.

Based on the results of this inspection, the inspectors identified one issue of very low safety significance (Green). This issue was determined to involve a violation of NRC requirements. However, because of its very low safety significance and because it has been entered into your corrective action program, the NRC is treating this issue as a Non-Cited Violation, in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny this Non-Cited Violation, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region III; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Quad Cities facility.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at **http://www.nrc.gov/NRC/ADAMS/index.html** (the Public Electronic Reading Room).

We will gladly discuss any questions you have concerning this inspection.

Sincerely,

***/RA/***

John M. Jacobson, Chief
Mechanical Engineering Branch
Division of Reactor Safety

Docket Nos. 50-254; 50-265
License Nos. DPR-29; DPR-30

Enclosure: Inspection Report 50-254/01-15(DRS);
50-265/01-15(DRS)

cc w/encl: W. Bohlke, Senior Vice President, Nuclear Services
C. Crane, Senior Vice President - Mid-West Regional
J. Cotton, Senior Vice President - Operations Support
J. Benjamin, Vice President - Licensing and Regulatory Affairs
K. Ainger, Director - Licensing
R. Hovey, Operations Vice President
J. Skolds, Chief Operating Officer
R. Helfrich, Senior Counsel, Nuclear
DCD - Licensing
T. J. Tulon, Site Vice President
M. Perito, Acting Quad Cities Station Manager
W. Beck, Regulatory Affairs Manager
W. Leach, Manager - Nuclear
Vice President - Law and Regulatory Affairs
Mid American Energy Company
M. Aguilar, Assistant Attorney General
Illinois Department of Nuclear Safety
State Liaison Officer, State of Illinois
State Liaison Officer, State of Iowa
Chairman, Illinois Commerce Commission

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Mid American Energy Company
M. Aguilar, Assistant Attorney General
Illinois Department of Nuclear Safety
State Liaison Officer, State of Illinois
State Liaison Officer, State of Iowa
Chairman, Illinois Commerce Commission

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

| | |
|---|---|
| Docket Nos: | 50-254; 50-265 |
| License Nos: | DPR-29; DPR-30 |
| Report No: | 50-254/01-15; 50-265/01-15 |
| Licensee: | Exelon Generation Company, LLC |
| Facility: | Quad Cities Nuclear Power Station, Units 1 and 2 |
| Location: | 22710 206th Avenue North<br>Cordova, IL 61242 |
| Inspection Dates: | January 14 through February 1, 2002 |
| Inspectors: | A. Dunlop, Lead Inspector<br>J. Gavula, Reactor Inspector<br>M. Farber, Reactor Inspector<br>G. O'Dwyer, Reactor Inspector<br>S. Sheldon, Reactor Inspector<br>B. Quirk, Contractor |
| Approved by: | John M. Jacobson, Chief<br>Mechanical Engineering Branch<br>Division of Reactor Safety |

SUMMARY OF FINDINGS

IR 05000254-01-15(DRS); IR 05000265-01-15(DRS), on 1/14/2002 through 2/1/2002, Exelon Generation Company, LLC, Quad Cities Nuclear Power Station, Units 1 and 2. Safety System Design and Performance Capability.

The inspection was routine baseline inspection of the design and performance capability of the diesel generator cooling water and residual heat removal service water systems. It was conducted by regional engineering specialists and a consultant. The inspection identified one Green finding, which was a Non-Cited Violation. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609 "Significance Determination Process" (SDP). The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at **http://www/nrc.gov/NRR/OVERSIGHT/index.html.** Findings for which the SDP does not apply are indicated by "No Color" or by the severity level of the applicable violations.

**Cornerstone: Mitigating Systems**

- Green. The inspectors identified a failure to promptly identify and correct conditions adverse to quality involving the erosion of safety-related residual heat removal service water piping. The licensee's corrective actions for the piping leak included replacing the affected piping and performing ultrasonic testing on similar piping for the other trains. During this inspection, NRC inspectors identified that the corrective actions were inadequate in that the ultrasonic testing was not able to examine the area of the piping affected by the erosion as evidenced by a subsequent failure.

  This finding was determined to be of very low safety significance because the equipment was still capable of performing its intended safety function. A Non-Cited Violation of 10CFR 50 Appendix B, Criterion XVI was identified. (Section 4OA2.b)

Report Details

## 1. REACTOR SAFETY

### Cornerstones: Mitigating Systems and Barrier Integrity

1R21 Safety System Design and Performance Capability (71111.21)

Introduction

Inspection of safety system design and performance verifies the initial design and subsequent modifications and provides monitoring of the capability of the selected system to perform design bases functions. As plants age, the design bases may be lost and important design features may be altered or disabled. The plant risk assessment model is based on the capability of the as-built safety system to perform the intended safety functions successfully. This inspectable area will verify aspects of the mitigating systems and barrier integrity cornerstones for which there are no indicators to measure performance.

The objective of the safety system design and performance capability inspection was to assess the adequacy of calculations, analyses, other engineering documents, and operational and testing practices that were used to support the performance of the diesel generator cooling water (DGCW) and residual heat removal service water (RHRSW) systems during normal, abnormal, and accident conditions. The inspection was performed by a team of inspectors that consisted of a team leader, four Region III inspectors, and a consultant.

The DGCW and RHRSW systems were selected for review during this inspection. This selection was based upon:

- having a high probabilistic risk analysis ranking;
- having had recent significant modifications; and
- not having received recent NRC review.

The criteria used to determine the system's performance included:

- applicable Technical Specifications;
- applicable Updated Final Safety Analysis Report sections; and
- the systems design documents.

a. Inspection Scope

The following system and component attributes were reviewed in detail:

System Needs

Process Medium - water
Energy Source - electrical power

Control Systems - initiation, control, and shutdown actions
Operator Actions - initiation, monitoring, control, and shutdown
Heat Removal - cooling water

System Condition and Capability

Installed Configuration - elevation and flow path operation
Design - calculations and procedures
Testing - flow rate, pressure, temperature, voltage, and current

Components

Four components were selected for detailed review during the inspection. The chosen components were the RHRSW pumps, RHRSW control valves, DGCW pumps, and residual heat removal heat exchangers. The following attributes were reviewed for these components:

Component Degradation
Vibration
Operation
Equipment Protection - flood, missile and freezing
Component Inputs and Outputs
Industry Operating Experience

b. Findings

No findings of significance were identified.

## 4. OTHER ACTIVITIES (OA)

### 4OA2 Identification and Resolution of Problems

a. Inspection Scope

The inspectors reviewed a selected sample of condition reports (CRs), associated with the selected systems, to verify an appropriate threshold for identifying issues and to verify the adequacy of corrective actions for the identified issues. In addition, CRs written on issues identified during the inspection were reviewed to verify adequate problem identification and incorporation of the problem into the corrective action system.

b. Findings

Erosion of Safety-Related Piping Not Adequately Addressed

The inspectors identified one Green Finding that is being treated as a Non-Cited Violation of 10 CFR 50 Appendix B, Criterion XVI, “Corrective Action,” for the failure to promptly identify and correct a condition adverse to quality.

In August, 1998 plant staff identified a pinhole leak in the 1D RHRSW vault room cooler supply piping and initiated CR Q1998-03559. The CR attributed the leak to under deposit corrosion. The corrective actions included performing ultrasonic tests (UTs) of the remaining seven RHRSW room coolers' supply piping. The UTs in 1999 identified that the 2C pipe had wall thinning below design requirements. The wall thinning was documented on CR Q1999-02232 and the piping was replaced. The UTs did not indicate wall thinning of the remaining room cooler supply piping. However, a pinhole leak of the 2A room coolers' supply piping occurred in February 2000, which was documented on CR Q2000-00599. When the leaking 2A piping was replaced in May of 2000, the licensee examined the damaged section of piping. The licensee concluded that the failure mechanism was not under deposit corrosion, but instead appeared to be cavitation-induced erosion due to a flow restricting orifice in the piping. In addition, the licensee's evaluation documented on the 2000 CR concluded that the UT on the 2A piping had been inadequate to detect the pipe wall thinning. The UT had not examined the portion of piping affected by the erosion due a pipe flange interference.

The cavitation erosion can cause significant wall loss around the entire pipe circumference thereby challenging structural integrity of the piping. The significance that the cause of the wall thinning was general area erosion rather than localized corrosion was not completely recognized. The licensee did begin preparing long-term modifications to address the erosion issue for all the room cooler supply piping by replacing each flow restricting orifice plate with two. However, the immediate condition of the six remaining coolers supply piping was not adequately investigated or re-evaluated to ensure operability. When the inspectors questioned why the other UTs performed in 1999 were acceptable to address the operability and structural integrity of the piping for the remaining room coolers based on the inspection results on the 2A piping, the licensee initiated CR 93444. The licensee re-performed the UTs and identified that the 2B and 2D room cooler supply piping were also below design minimum wall requirements. An operability evaluation performed by the licensee concluded that the pipe wall thicknesses were above the code required minimum requirements for operability, such that the piping and associated system was determined to be operable but degraded. The licensee promptly replaced the degraded piping. The licensee appropriately followed their corrective action process, e.g., reviewing other systems for susceptibility to this phenomenon and ensuring a reasonable basis for assuming all the systems were operable.

The inspectors concluded that the failure of the RHRSW room coolers' supply piping due to continuing erosion had a credible impact on safety, which affected and could have again affected the operability, availability, reliability, or function of a train in a mitigating system. The failure to identify and correct the continuing erosion was a condition adverse to quality. This was determined to be of very low significance (Green) by the significance determination process because the equipment was still capable of performing its intended safety function.

10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that measures be established to assure that conditions adverse to quality are promptly identified and corrected. Contrary to this, the licensee failed to identify and correct continuing erosion in safety-related RHRSW room coolers' supply piping, a condition adverse to quality. This violation of 10 CFR 50, Appendix B, Criterion XVI, is being treated as a Non-Cited Violation consistent with Section VI.A of the NRC Enforcement

Policy (NCV 50-254/01-15-01; 50-265/01-15-01). This finding is in the licensee's corrective action program as CR 93444.

4OA6 Meeting

Exit Meeting

The inspectors presented the inspection results to Mr. T. Tulon and other members of licensee management and staff at the conclusion of the inspection on February 1, 2002. The licensee acknowledged the information discussed during the exit. No proprietary information was identified.

## KEY POINTS OF CONTACT

Licensee

W. Beck, Regulatory Assurance Manager
S. Campagne, Electrical Design Engineering
T. Fuhs, Regulatory Assurance
S. Laughlin, Diesel Generator System Engineer
S. Mroz, Mechanical Design Engineer
P. O'Brien, Engineering Assessor
M. Perito, Acting Plant Manager
T. Peterson, Regulatory Assurance
B. Porter, Design Engineering
J. Potts, Heat Exchanger Engineer
M. Snow, Nuclear Oversight
B. Strub, RHRSW System Engineer
J. Taft, Design Engineering
M. Tucker, Corporate Electrical Design Engineering
T. Tulon, Site Vice President
J. Wethington, Design Engineering

NRC

J. Adams, Resident Inspector
K. Stoedter, Senior Resident Inspector

## ITEMS OPENED, CLOSED, AND DISCUSSED

Opened/Closed

| | | |
|---|---|---|
| 50-254/01-15-01/ 50-265/01-15-01 | NCV | Failure to adequately address the erosion of the RHRSW room coolers' supply piping |

## LIST OF ACRONYMS USED

| | |
|---|---|
| ADAMS | Agency-wide Documents and Management System |
| CR | Condition Report |
| CFR | Code of Federal Regulations |
| DGCW | Diesel Generator Cooling Water |
| DRS | Division of Reactor Safety |
| NCV | Non-Cited Violation |
| NRC | Nuclear Regulatory Commission |
| NRR | Office of Nuclear Reactor Regulation |
| PARS | Publically Available Records |
| RHRSW | Residual Heat Removal Service Water |
| SDP | Significance Determination Process |
| UFSAR | Updated Final Safety Analysis Report |
| UT | Ultrasonic Test |

LIST OF DOCUMENTS REVIEWED

**Calculations**

| Number | Title | Revision or Date |
|---|---|---|
| ATD-0010 | FLO-SERIES Model of RHRSW System | Revision 2 |
| ATD-0155 | Diesel Generator Cooling Water Hydraulic Calculation | Revision 0 |
| ATD-0189 | Diesel Generator Cooling Water System Hydraulic Model Calibration | Revision 0 |
| CMED-058089 | RHRSW Pump / Motor Mounting Bolts | Revision 00 |
| CQD-042415 | Evaluation of the Effect of High Ambient Temperature on the RHRSW Motors | March 29, 1989 |
| DCR-990455 | Affect of DCP 9900295 on RHRSW Flow Model | Revision 0 |
| DCR-990457 | Affect of DCP 9900295 on Head Loss Across RHRSW | Revision 0 |
| EMD-067922 | Evaluation of Suction Piping to RHRSW Pumps 2-1001-65A and 2-1001-65B | Revision 00 |
| NED-EIC-MOV-QC-0001 | Motor Operated Valve Terminal Voltage Calculation | Revision 1 |
| NED-E-EIC-0055 | Thermal Overload Heaters for Motor Operated Valves 1(2)-1001-5A/5B | Revision 0 |
| NED-I-EIC-0219 | RHR HX Service Water Tube to Shell D/P Trip System Error Analysis and RHR HX Service Water Outlet Pressure Indication Error Analysis at Normal Operating Conditions | Revision 0 |
| NED-M-MSD-47 | Quad Cities RHR Heat Exchanger Performance Requirements as a Function of River Temp | Revision 0 |
| NED-M-MSD-116 | Quad Cities RHR Heat Exchanger Acceptance Criteria Development | Revision 0 |
| QC-IET-E-002 | Evaluation of Thermal Overload Heaters for Motor Operated Valves, 1-1001-4A and 1-1001-4B | Revision 0 |
| QC-NPD-96-0002 | M01-1001-5A & B Post Modification Vibration Test Evaluation | Revision 0 |
| QDC-0000-E-0206 | Motor Terminal Voltage Calculations for Quad Cities Unit 1 and Unit 2 Generic Letter 89-10 Motor Operated Valves | Revision 1 |

**Calculations**

| Number | Title | Revision or Date |
|---|---|---|
| QDC-1000-E-148 | Replacement Fixed Resistor for MOV-1-1001-5A Position Indication Circuit | Revision 0 |
| QDC-1000-E-0169 | Minimum Required Voltage for RHRSW Pump Cooler Fans | Revision 1 |
| QDC-1000-E-0171 | Minimum Required Voltage for RHR Emergency Air Handling Unit | Revision 0 |
| QDC-6700-I-0834 | Instrument Drift Analysis of ABB Model 411T4375 Voltage Relays for 4.16kV Emergency Bus (Degraded Voltage) | Revision 0 |
| QDC-6700-I-0935 | 4kV Degraded Voltage Time Delay Setpoint Error Analysis | Revision 0 |
| QDC-1000-M-0131 | Net Positive Suction Head Availability vs Requirements for DGCW and RHRSW | Revision 2 |
| QDC-1000-M-0337 | Effect of Screen Blockage on the Water Level in the Residual Heat Removal Service Water Bay | Revision 2 |
| QDC-1000-M-0698 | Design Basis Analysis of RHR Heat Exchanger Cooling Capacity | Revision 0 |
| QDC-1400-E-0170 | Minimum Required Voltage for Core Spray Emergency Air Handling Unit Motors | Revision 0 |
| QDC-5700-E-0173 | Minimum Required Voltage for Diesel Generator Vent Fans | Revision 0 |
| QDC-5700-H-0695 | RHR and RHRSW Pump Room Cooling Following Failure of Lock and Dam 14 | Revision 0 |
| QDC-5700-H-0695 | RHR and RHRSW Pump Room Cooling Following Failure of Lock and Dam 14 | Revision 000A |
| QDC-6600-E-0174 | Minimum Required Voltage for DGCWP | Revision 1 |
| VT-16 | RHRSW and DGCW Pump Room Cooler Performance Evaluation | Revision 1A |
| 055607(CMED) | Revise Mounting Evaluation for Toshiba/Houston 100 HP Motor | May 14, 1993 |
| 067038(EMD) | RHRSW Pump Vault Humidity Reduction Mod. | Revision 0 |
| 8549-84-19-2 | Determining Voltage at Terminals of Starter and Control Relays | Revision 0 |

**Calculations**

| Number | Title | Revision or Date |
|---|---|---|
| 8913-67-19-1 | Quad Cities Unit 1 Div I Safety Related Load Running/Starting Voltages | Revision1 |
| 8913-67-19-3 | Second Level Undervoltage Relay Setpoint U1 | Revision 1 |
| 8913-69-19-1 | Quad Cities Unit 1 Div II Safety Related Load Running/Starting Voltages | Revision 1 |
| 8913-71-19-1 | Quad Cities Unit 2 Div I Safety Related Load Running/Starting Voltages | Revision 2 |
| 8913-71-19-2 | Second Level Undervoltage Relay Setpoint U2 Division I | Revision 1 |
| 8913-73-19-1 | Quad Cities Unit 2 Div II Safety Related Load Running/Starting Voltages | Revision 1 |
| 8913-73-19-3 | Evaluation of 460V Diesel Generator Cooling Water Pump Minimum Starting Voltage | Revision 00A |
| 8913-73-19-4 | Second Level Undervoltage Relay Setpoint U2 Division II | Revision 2 |
| 8913-73-19-3 | Nonsize 2 Motor Control Center (MCC) Control Voltage Contactor Circuit Lengths fed From Switchgear 29 | Revision 0 |
| 8913-73-19-7 | Circuit Breaker Setting for New Toshiba DG Cooling Water Pump Motors | Revision 0 |
| 9048-37-19-4 | Application of 15 Amp Bussman KTK-R Fuse to the DGCW Pump Cooler Fan Motor Circuits | Revision 0 |
| 9048-37-19-5 | Size of Overload Heaters for DG 1/2 Cooling Water Pump Cooling Fans | Revision 0 |
| 9149-15-19-2 | Minimum Running Voltage for DGCW Cooler Fan & RHRS Emergency Air Handling Unit | Revision 0 |
| 9149-20-19-1 | 125 VDC Bus Voltage Calculations for Quad Cities Station | Revision 8 |

**Condition Reports Generated Due to the Inspection**

| Number | Title | Revision or Date |
|---|---|---|
| CR 90937 | Drawing Error on 3-Way Valve (M-22; M-69) | January 16, 2002 |
| CR 91766 | RHRSW Load is Different in QCOA 6100-03, 04 (SBO) | January 22, 2002 |

**Condition Reports Generated Due to the Inspection**

| Number | Title | Revision or Date |
|---|---|---|
| CR 91837 | Errors Identified on DGCW P&IDs M-22 Sheet 5 and M-69 Sheet 5 | January 23, 2002 |
| CR 91880 | Reduced Seismic Criteria Used to Qualify RHRSW Piping | January 23, 2002 |
| CR 92983 | UFSAR Discrepancy 75% Minimum Motor Start Voltage | January 29, 2002 |
| CR 93012 | Inconsistencies in UFSAR Section 3.4.1.2.1.2 Regarding RHRSW Vault Flood Protection | January 29, 2002 |
| CR 93016 | Ultimate Heat Sink Instrument Uncertainties | January 29, 2002 |
| CR 93115 | Calculation Qualification of Turned-down RHRSW Pump Anchor Bolts | January 30, 2002 |
| CR 93281 | MCC Voltages in Degraded Volt Calculations | January 31, 2002 |
| CR 93308 | Discrepancies Between ELMS and Voltage Calculations | January 31, 2002 |
| CR 93336 | Op Evaluation for 1A RHR HX Leak Needs Enhancement | January 31, 2002 |
| CR 93368 | IST Data Shows Higher Suction Losses for U1 DGCW/RHRSW Pumps | January 31, 2002 |
| CR 93385 | Different RHRSW Suction Minimum Water Level Values in Calculation and in QCOA 0010-14 | January 31, 2002 |
| CR 93394 | CREVS Degraded Voltage Procedure Load Shedding Discrepancy | January 31, 2002 |
| CR 93444 | RHRSW Vault Room Cooler Leak Operability Evaluation Inadequate Follow-up | February 1, 2002 |

**Condition Reports Reviewed During the Inspection**

| Number | Title | Revision or Date |
|---|---|---|
| PIF 95-00570 | Bus 28 and 29 Cross-tied During Shutdown | March 8, 1995 |
| PIF 96-01096 | U1 DGCW Pump Cubicle Cooler Fan Motor Wired Incorrectly | March 25, 1996 |
| PIF 96-01920 | Discrepancies in Cable Lengths | May 26, 1996 |
| PIF 98-00342 | Fouling Factors Assumed for RHRSW and DGCW Coolers May be Incorrect | January 21, 2001 |
| Q1997-0428 | 1/2 DGCW Pump Inboard Bearing Temperature and Discolored Oil | February 20, 1997 |

**Condition Reports Reviewed During the Inspection**

| Number | Title | Revision or Date |
|---|---|---|
| Q1997-02568 | Component Classification | July 7, 1997 |
| Q1997-02823 | 1A RHR Rm Cooler DP Above Limit | July 11, 1997 |
| Q1997-02824 | 1B Core Spray Rm Cooler DP Above Limit | July 15, 1997 |
| Q1997-03497 | 2A Core Spray Rm Cooler Low Flow | September 24, 1997 |
| Q1998-00383 | Pump Performance Acceptance Criteria Do Not Include Instrument Tolerance | February 6, 1998 |
| Q1998-01282 | Ultimate Heat Sink Evaluation | March 24, 1998 |
| Q1998-01363 | Error in Calculation MECH-13, RHRSW Pump Motor BHP Requirements | March 19, 1998 |
| Q1998-01508 | RHR Heat Exchanger Operability Determination | April 10, 1998 |
| Q1998-02496 | Possible Mixing of Motor Bearing Grease on 1B RHR Room Cooler | May 17, 1998 |
| Q1998-03559 | Pinhole Leak in the 1D RHRSW Vault Room Cooler Supply Piping | August 4, 1998 |
| Q1998-05492 | Unit 2 HPCI Room Cooler West End Baffle Plate Gaskets Found Missing During Inspection | December 11,1998 |
| Q1999-00593 | 1/2 DG Cooling Water Pump Motor Amps Not Balanced | February 17, 1999 |
| Q1999-02053 | Unit 1/2 EDGCWP Procedural Guidance Inadequate | June 16, 1999 |
| Q1999-02232 | 2C RHRSW Vault Room Cooler Supply Piping below Minimum Wall | June 30, 1999 |
| Q1999-02552 | QCOS 6600-01, Diesel Generator Monthly Load Test | August 3, 1999 |
| Q1999-02645 | B CR HVAC RCU is Affecting RHRSW Pump Curve | August 19, 1999 |
| Q1999-02845 | 1/2 D/G Availability During QCOS 6600-01 | August 30,1999 |
| Q1999-03001 | Inadequate Sharing of OPEX/PIF Information Between Departments | September 12, 1999 |
| Q1999-03285 | 1/2 DGCWP CV Failed to Close on Spring Force Alone | September 28, 1999 |
| Q1999-03451 | Incorrect Flow Cited in UFSAR for ECCS Room Coolers | October 12, 1999 |
| Q1999-03903 | 1A RHRSW Vault Sump Pump Discharge Check Valve Found Stuck Open | November 10, 1999 |
| Q2000-00046 | Failure of 2B RHRSW Vault Sump Pump Discharge Check Valve | January 5, 2000 |

**Condition Reports Reviewed During the Inspection**

| Number | Title | Revision or Date |
|---|---|---|
| Q2000-00599 | 2A RHRSW Vault Room Cooler Leak | February 3, 2000 |
| Q2000-00634 | High Flow on U2 Diesel Generator Cooling Water Pump | February 5, 2000 |
| Q2000-00801 | Silt in RHRSW Pump Bay | February 15, 2000 |
| Q2000-00968 | Print Does Not Match Installed | February 29, 2000 |
| Q2000-01032 | Adverse Trend: U-2C RHRSW Vibrations | March 7, 2000 |
| Q2000-01481 | Silt, Zebra Mussels, and partially plugged screens in RHRSW Pump Bay | April 11, 2000 |
| Q2000-01775 | Unit 1 C RHRSW HP Pump Inboard Bearing Oil Analysis Results | May 9, 2000 |
| Q2000-01801 | 1D RHRSW Pump Failure | May 11, 2000 |
| Q2000-03225 | Smoke From MCC 28-2 RHRSW Pump B Fan Breaker | September 8, 2000 |
| Q2000-03473 | Unit DGCWP Auto Start Capability vs ECCS Room | October 2, 2000 |
| Q2000-03552 | As Found Condition of RHRSW Intake Bay | October 10, 2000 |
| Q2000-04076 | Smoke From MCC 28-2 RHRSW Pump A Fan Breaker | November 3, 2000 |
| Q2000-04083 | RHRSW Valves to B Control Room HVAC Found Out of Position | November 3, 2000 |
| Q2000-04287 | Venting EDG Flow Indicators | December 1, 2000 |
| Q2001-00040 | December Oil Sample for U1 DGCW Pump Indicates High Water | Jan 4, 2001 |
| Q2001-00296 | Valve 2-1001-185A Failed to Close | January 27, 2001 |
| Q2001-00416 | RHRSW Vault Sump Pump Float Obstructed Preventing Pump Operation | February 6, 2001 |
| Q2001-00679 | Calculation VT-16 Needs Revision | February 26, 2001 |
| Q2001-00811 | FME from Tail End of Spring from a Check Valve in RHRSW System | March 14, 2001 |
| Q2001-00833 | Zebra Mussels on Trash Rake of Unit 2 Intake Bay | March 17, 2001 |
| Q2001-01364 | Erratic Flow Indication for 1/2 DGCW Pump | May 6, 2001 |
| Q2001-01521 | Bases of ITS Section 3.7.2 Appears More Restrictive than the LCO | May 18, 2001 |
| Q2001-01673 | Discrepancies with EPU Calculation QDC-3900-M-1077 | June 1, 2001 |

**Condition Reports Reviewed During the Inspection**

| Number | Title | Revision or Date |
|---|---|---|
| Q2001-01802 | Unnecessary Cycling of Safety-related Equipment | June 4, 2001 |
| Q2001-02396 | Pressure Gauges OOT | July 30, 2001 |
| Q2001-02645 | Slime Growth on Unit 1 DGCWP | August 22, 2001 |
| Q2001-02993 | Crib House Center Bay Screen | September 25, 2001 |
| Q2001-03054 | RHRSW Pump Discharge Check Valve Found with Broken Spring | October 2, 2001 |
| Q2001-03134 | Calculation Status in Passport | October 5, 2001 |
| Q2001-03159 | 1A RHR Heat Exchanger Leaking from Reactor Side in Service Water Side | October 11, 2001 |
| Q2001-03191 | RHRSW Pump CV Surveillance Found CV Degraded but Functional | October 16, 2001 |
| Q2001-03192 | As Found VOTES Testing Reveals Actuator Structural Limits were Exceeded | October 17, 2001 |
| CR 0080088 | Long Time Delay Setting for DGCWP Motor Feed Breakers | October 24, 2001 |
| CR 0086930 | Issues Involved with 2A RHR Room Cooler Normal Power Contactor | December 17, 2001 |

**Design Change Packages**

| Number | Title | Revision or Date |
|---|---|---|
| 0000022339 | MOV 1-1001-4A/4B Thermal Overload Heater Change | February 4,1998 |
| DCP 9800103 | Thermal Overload Replacement for MCC 28-1A for RB Temp. Issue | March 24, 1998 |
| DCP 9900029 | Install sacrificial anodes in heads of DGHXs | September 2, 1999 |
| DCP 9900171 | 4KV Bus Crosstie Control Circuit Modification | June 29, 2000 |
| DCP-9900355 | SQUG - Brace HPCI Room Cooler 2-5747 | Revision 0 |
| E04-1-93-306 | RHR Valve Replacements: Valve Nos. MO 1-1001-5A and MO 1-1001-5B | June 12, 1996 |
| M-4-1-74-35 | Modification of the RHRSW Discharge Piping | January 12, 1981 |
| M-4-1-74-049 | RHRSW Discharge Piping | July 17, 1974 |

**Design Change Packages**

| Number | Title | Revision or Date |
|---|---|---|
| M-4-1-85-036A-D | Install Pressure Taps on Suction Side of RHRSW Pumps and Unit 2 DGCW Pump | April 15, 1988 |
| M04-1-87-002-A | RHRSW Pump Impeller replacement | June 12, 1989 |
| M-4-1/2-74-012 | !A/2A RHRSW Cross Tie | December 5, 1980 |
| M-4-1/2-85-14 | Install Selector Switch in 1/2 DG Room to Select Power Supply for 1/2 DG Cooling Water Pump | December 1, 1986 |
| M04-2-87-002D | RHRSW Pump 2D Impeller Replacement | |
| M04-2-87-026 | ECCS Room Cooler Instrumentation | January 31, 1996 |
| M04-2-92-006I | Redundant Power Feed 1/2-5749 A & B | July 31, 1992 |
| M4-1(2)-74-35 | RHR Heat Exchanger Service Water Discharge Piping | May 5, 1980 |

**Design Information Transmittal**

| Number | Title | Revision or Date |
|---|---|---|
| DG00-000923 | EPU DIR for EPU Task T0401-Form OPL-4A (PDLB version) | August 1, 2000 |
| DIT-QC-EXT-0153 | RHRSW HP Pump Cut-water Mod Calc | May 19, 1993 |
| NDIT QDC-98-170 | RHRSW and DGCW Fan Motor Thermal Aging Report for Westinghouse Class B Motors | May 12, 1998 |
| QDC-98-218 | Additional Parameters to be used in Quad Cities Containment Analyses | July 31, 1998 |
| QDC-98-218-01 | Reference Clarification Performed in Response to PIF Q1999-00324 | April 28, 1999 |

**Drawings**

| Number | Title | Revision or Date |
|---|---|---|
| 4E-1303 | Key Diagram 4160V Switchgear 11, 12, 13 14 | T |
| 4E-1310 | Key Diagram Turbine Building Essential Service MCC's 18-2, 19-2, & 19-3 | AK |
| 4E-1318B | Overall Key Diagram 125 V DC Distribution Centers | Revision J |
| 4E-1328 | Single Line Diagram Emergency Power System | Revision F |

**Drawings**

| Number | Title | Revision or Date |
|---|---|---|
| 4E-1349 Sheet 1 | Schematic Diagram 480V Transformer 18 & 19 and Bus 18 & 19 Main Breakers | Revision T |
| 4E-1349 Sheet 2 | Schematic Diagram 480V Transformer 18 & 19 and Bus 18 & 19 Main Breakers | Revision R |
| 4E-1349 Sheet 3 | Schematic Diagram 480V Transformer 18 & 19 and Bus 18 & 19 Main Breakers | Revision U |
| 4E-1350A Sheet 1 | Schematic Diagram Engine Control & Generator Excitation Standby Diesel Generator 1 | Revision AL |
| 4E-1350A Sheet 2 | Schematic Diagram Engine Control & Generator Excitation Standby Diesel Generator 1 | Revision AH |
| 4E-1350B Sheet 1 | Schematic Diagram Diesel Generator 1 Auxiliaries & Start Relays | Revision AK |
| 4E-1350B Sheet 3 | Schematic Diagram Diesel Generator 1 Auxiliaries & Start Relays | Revision AL |
| 4E-1350D | Schematic Diagram Fuel Pool Cooling Water Pump 1B & DGCW Pump 2 Feed Transfer Control | Revision G |
| 4E-1351A Sheet 1 | Schematic Control Diagram Engine Control & Generator Excitation Standby Diesel Generator 1/2 | Revision AN |
| 4E-1351A Sheet 2 | Schematic Diagram Engine Control & Generator Excitation Standby Diesel Generator 1/2 | Revision AH |
| 4E-1351B Sheet 1 | Schematic Diagram Diesel Generator 1/2 Auxiliaries & Start Relays | Revision R |
| 4E-1351B Sheet 2 | Schematic Diagram Diesel Generator 1/2 Auxiliaries & Start Relays | Revision Y |
| 4E-1351C | Schematic Diagram Diesel Generator 1/2 Auxiliaries & Start Relays | Revision N |
| 4E-1438 Sheet 3 | Schematic Diagram RHR System Relay Logic Div-I | Revision AJ |
| 4E-1438J | Schematic Diagram RHR System Motor Operated Valves - Div I | Revision AC |
| 4E-1438L | Schematic Diagram RHR System Motor Operated Valves - Div II | Revision AC |
| 4E-1438P | Schematic Diagram RHR System Service Water Pumps 1-1001-65A, B, C & D 4160 Breaker Control Div I & II, Sheet 14 | Revision Y |

**Drawings**

| Number | Title | Revision or Date |
|---|---|---|
| 4E-1438R Sheet 16 | Schematic Diagram RHR System Heat Exchanger Valves MO 1-1001-4A, -185A, -186A, -187A Division I | Revision M |
| 4E-1660H | 480V SWGR Bus 18 Internal Schematic Diagram Section 184 Compt C & Section 185 Compt B | Revision N |
| 4E-1675F | Wiring and Schematic Diagram Reactor Building Essential Service 480V MCC 18-1B Part 1 | Revision AL |
| 4E-1701 | Wiring Diagram Main Control Board Panel 901-3 | Revision BY |
| 4E-1757A | Wiring Diagram Panel 901-32 Part 1 | Revision BD |
| 4E-1757B | Wiring Diagram Panel 901-32 Part 2 | Revision AP |
| 4E-2303 | Key Diagram 4160V Switchgear 21, 22, 23, 24 | Revision L |
| 4E-2350A Sheet 1 | Schematic Diagram Engine Control & Generator Excitation Standby Diesel Generator 2 | Revision AK |
| 4E-2350A Sheet 2 | Schematic Diagram Engine Control & Generator Excitation Standby Diesel Generator 2 | Revision AK |
| 4E-2350B Sheet 1 | Schematic Diagram Diesel Generator 2 Auxiliaries & Start Relays | Revision AK |
| 4E-2350B Sheet 2 | Schematic Diagram Diesel Generator #2 Auxiliaries & Start Relays | Revision AG |
| 4E-2438C Sheet 2 | Schematic Diagram RHR System Relay Logic Div I | Revision U |
| 4E-2438E Sheet 2 | Schematic Diagram RHR System Relay Logic Div II | Revision V |
| 4E-2438P Sheet 1 | Schematic Diagram RHR System Pumps 2-1001-65A, B, C, D 4160V Breaker Control Div I and II | Revision N |
| 4E-2438P Sheet 2 | Schematic Diagram RHR System Pumps 2-1001-65A, B, C, D 4160V Breaker Control Div I and II | Revision M |
| 4E-2660H | Internal Schematic Diagrams 480V SWGR 28 Compartments 284C & 285B | Revision F |
| 4E-6830C | Technical Support Center Computer Input Wiring Tabulation (Analog) | Revision U |
| B-38 | Crib House Plan Elev 552'-6" | Revision F |
| B-56 | Intake & Discharge Structure North Area | Revision F |
| B-700 | Turbine Building Condensate Pump Floor Plan | Revision H |

**Drawings**

| Number | Title | Revision or Date |
|---|---|---|
| M-4A | Environmental Zone Map (Basement Floor Plan) Elevation 554'-0" | Revision D |
| M-22 Sheet 1 | Diagram of Service Water Piping | Revision CU |
| M-22 Sheet 3 | Diagram of Service Water Piping Diesel Generator Cooling Water | Revision P |
| M-22 Sheet 5 | Diagram of Service Water Piping | Revision G |
| M-37 | Diagram of RHR Service Water Piping | Revision AV |
| M-39 Sheet 3 | Diagram of Residual Heat Removal (RHR) Piping | Revision D |
| M-69 Sheet 1 | Diagram of Service Water Piping | Revision CR |
| M-69 Sheet 3 | Diagram of Service Water Piping Diesel Generator Cooling Water | Revision L |
| M-69 Sheet 5 | Diagram of Service Water Piping | Revision E |
| M-79 | Diagram of RHR Service Water Piping | Revision AR |
| M-81 | Diagram of Residual Heat Removal (RHR) Piping | Revision C |
| M-297 | Piping in Substructure Miscellaneous Pans & Sections | Revision L |
| M-315 | Outdoor Piping West Area Below Elev 580'-0" | Revision T |
| M-725 Sheet 3 | Piping & Instrument Diagram Control Room HVAC | Revision M |
| M-994F | Piping Isometric for Hydraulic Analysis RHR Service Water Loop A | Revision 0 |
| M-998J | Piping Isometric for Hydraulic Analysis Diesel Generator Service Water | Revision 0 |

**Lesson Plans**

| Number | Title | Revision or Date |
|---|---|---|
| LN-6600 | Emergency Diesel Generator | Revision 5 |
| LN-1000 | Residual Heat Removal System | Revision 7 |

**Miscellaneous Documents**

| Number | Title | Revision or Date |
|---|---|---|
| AT 79047 | Operability Determination for Q2001-03159 | Revision 1 |
| R-2380 | Diesel Engine - Generator Sets | September 21, 1967 |
| Q-92-007-0192-00 | Diesel Generator Cooling Water Pump Motor | Revision 1 |
| NEDO-32961 | Safety Analysis Report for Quad Cities 1 & 2 Extended Power Uprate (Non-Proprietary) | Revision 1 |
| ANSI/ISA-67.04.01-2000 | Setpoints for Nuclear Safety-Related Instrumentation | February 29, 2000 |
| ISA-RP67.04.02-2000 | Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation | January 1, 2000 |
| ISA Draft TR67.04.09 | Graded Approaches to Setpoint Determination (Draft 5) | September 2000 |
| SS-F-01-0055 | ITS Setpoint Change 10CFR50.59 Screening For Facility Change | March 9, 2001 |
| | Maintenance Rule Expert Panel Meeting Minutes - 480V MCC and Lower Voltage Distribution Panels | December 14, 2000 |
| | Inservice Testing Program Third Ten Year Interval | Revision 2 |
| | Inservice Test Hydraulic and Vibration Data for DGCW and RHRSW Pumps (2000 - 2001) | |

**Procedures**

| Number | Title | Revision or Date |
|---|---|---|
| QCMPM 1500-02 | RHR Service Water Vault Submarine Door Preventive Maintenance | Revision 5 |
| QCMPM 4400-11 | RHR Service Water Intake Bay Inspection | Revision 4 |
| QCMPM 6600-02 | Diesel Engine Thermostatic Valve Inspection CM 6.1.1 | Revision 7 |
| QCOA 0010-12 | Fire/Explosion | Revision 19 |
| QCOA 0010-14 | Failure of Lock and Dam #14 | Revision 5 |
| QCOA 1000-02 | Loss of Shutdown Cooling | Revision 12 |
| QCOA 1000-04 | LPCI Automatic Initiation | Revision 10 |
| QCOA 1000-07 | Loss of 125 VDC Control Power to RHR Channel 1(2)A Initiation Logic | Revision 7 |

**Procedures**

| Number | Title | Revision or Date |
|---|---|---|
| QCOA 1000-08 | Loss of 125 VDC Control Power to RHR Channel 1(2)B Initiation Logic | Revision 6 |
| QCOA 6100-03 | Loss of Offsite Power | Revision 12 |
| QCOA 6100-04 | Station Blackout | Revision 8 |
| QCOA 6600-11 | Loss of Normal Power Feed to the Diesel Generator 1(2) Cooling Water Pump and Cubicle Coolers A & B | Revision 7 |
| QCOA 6600-14 | Loss of a Diesel Generator Cooling Water Pump | Revision 11 |
| QCOP 1000-04 | RHR Service Water System Operation | Revision 14 |
| QCOP 1000-05 | Shutdown Cooling Operation | Revision 28 |
| QCOP 1000-07 | Torus Water Cooling with Control Room Inaccessible | Revision 9 |
| QCOP 1000-09 | Torus Cooling Start Up and Operation | Revision 14 |
| QCOP 1000-15 | RHR Service Water Operation using Loop A Cross-Tie Header | Revision 11 |
| QCOP 1000-16 | RHR Service Water Vault Sump Pumps Operation | Revision 0 |
| QCOP 1000-20 | RHR Service Water Operation using Loop A Cross-Tie Header | Revision 13 |
| QCOP 1000-30 | Post-Accident RHR Operation | Revision 14 |
| QCOP 1000-31 | RHR Service Water Pump Venting | Revision 10 |
| QCOP 6600-01 | Diesel Generator 1(2) Preparation for Standby Operation | Revision 25 |
| QCOP 6600-04 | Diesel Generator 1(2) Preparation for Standby Operation | Revision 19 |
| QCOP 6600-05 | Diesel Generator 1/2 Start Up | Revision 21 |
| QCOP 6600-06 | Diesel Generator 1/2 Shut Down | Revision 17 |
| QCOP 6600-13 | Diesel Generator 1/2 Out of Service | Revision 4 |
| QCOP 6600-14 | Emergency Diesel Generator Cooling Water Pump Manual Operation | Revision 3 |
| QCOP 6600-15 | 1/2 Diesel Generator Cooling Water Pump Cross Connect Alignment | Revision 5 |
| QCOS 1000-04 | RHR Service Water Pump Operability Test | Revision 28 |
| QCOS 1000-13 | RHR Service Water Flush of Loop B for Appendix R | Revision 12 |

**Procedures**

| Number | Title | Revision or Date |
|---|---|---|
| QCOS 1000-19 | RHR Service Water Flush of Loop A for Appendix R | Revision 11 |
| QCOS 1000-20 | RHR/RHR Service Water Pump Breaker Local Control Test for Appendix R | Revision 9 |
| QCOS 1000-28 | RHR Service Water Pump Performance Test | Revision 7 |
| QCOS 1000-29 | RHR Heat Exchanger Thermal Performance Test | Revision 6 |
| QCOS 6600-04 | Diesel Generator Heat Exchanger Flow Reversal | Revision 10 |
| QCOS 6600-06 | Diesel Generator Cooling Water Pump Flow Rate Test | Revision 20 |
| QCOS 6600-08 | 1/2 Diesel Generator Cooling Water to Unit 1 and Unit 2 ECCS Room Coolers Flow Test | Revision 16 |
| QCOS 6600-17 | Operating Cycle Diesel Cooling Water Pump Alternate Power Feed Test for Appendix R | Revision 11 |
| QCOS 6600-28 | Diesel Generator Cooling Water Pump Operability Test with ECCS Room Coolers Isolated | Revision 4 |
| QCTP 0820-10 | Heat Exchanger and Room Cooler Inspection | Revision 2 |
| QCTS 0820-01 | Leak Test of RHR Service Water Vault Flood Protection Penetrations | Revision 7 |
| QCTS 0820-14 | Evaluation of RHRSW Vault Flood Protection Leakage Test Results | Revision 1 |
| QOA 6700-04 | 480V Bus 18(28) Failure | Revision 16 |
| QOA 6700-05 | 480V Bus 19(29) Failure | Revision 13 |
| QOP 6700-02 | 480 Volts Bus Tie Circuit Breakers | Revision 19 |

**Surveillances (completed)**

| Number | Title | Date performed |
|---|---|---|
| QCOADS0100-19 | Quad Cities OAD Undervoltage Relay Calibration Bus 13-1 | April 16, 2001 |
| QCOADS0100-20 | Quad Cities OAD Undervoltage Relay Calibration Bus 14-1 | April 23, 2001 |
| QCOS 1000-04 | RHR Service Water Pump Operability Test | November 21, 2001 |
| QCOS 1000-04 | RHR Service Water Pump Operability Test | December 7, 2001 |
| QCOS 1000-04 | RHR Service Water Pump Operability Test | December 28 2001 |

**Surveillances (completed)**

| Number | Title | Date performed |
|---|---|---|
| QCOS 1000-04 | RHR Service Water Pump Operability Test | January 18, 2002 |
| QCOS 6600-06 | Diesel Generator Cooling Water Pump Flow Rate Test | October 23, 2001 |
| QCOS 6600-06 | Diesel Generator Cooling Water Pump Flow Rate Test | November 15, 2001 |
| QCOS 6600-06 | Diesel Generator Cooling Water Pump Flow Rate Test | December 6, 2001 |

**Technical Specifications**

| Number | Title | Revision or Date |
|---|---|---|
| 3.3.8.1 | Loss of Power (LOP) Instrumentation | Revision 199/195 |
| 3.7.1 | Residual Heat Removal Service Water (RHRSW) System | Revision 199/195 |
| 3.7.2 | Diesel Generator Cooling Water (DGCW) System | Revision 199/195 |
| B 3.7.1 | Residual Heat Removal Service Water (RHRSW) System | Revision 199/195 |
| B 3.7.2 | Diesel Generator Cooling Water (DGCW) System | Revision 199/195 |

**Updated Final Safety Analysis Report Sections**

| Number | Title | Revision or Date |
|---|---|---|
| Section 3.4.1.2.1.2 | Isolation of the RHR Service Water Pumps and the Diesel Generator Cooling Water Pumps from Flood Water | Revision 6 |
| Section 8.3.1.2 | 4160V Systems | Revision 6 |
| Section 8.3.1.4 | 480V Systems | Revision 6 |
| Section 8.3.2.2 | 125VDC Systems | Revision 6 |
| Section 9.2.1 | Residual Heat Removal Service Water Subsystem | Revision 6 |
| Section 9.2.5 | Ultimate Heat Sink | Revision 6 |
| Section 9.5.5 | Diesel Generator Cooling Water System | Revision 6 |

**Work Orders**

| Number | Title | Revision or Date |
|---|---|---|
| 99243411 | Diesel Generator Cooling Water Pump Flow Instrument Calibration | December 14, 2001 |
| 00377999 | Change Setpoint on Unit 1 DGCWP Motor 1-3903 (Bus 19 Cub 6A) | January 4, 2002 |
| 00378048 | Change Setpoint on Unit 2 DGCWP Feed Brkr Bus 29 Cub 6A | January 11, 2002 |
| 00378052 | Change Setpoint on Unit 1/2 DGCWP Feed Brkr Bus 18 Cub 4C | January 24, 2002 |
| 00378054 | Change Unit 2 Feed Brk (Bus 28 Cub 4C) Setpoint for 1/2 DGCWP | January 24, 2002 |