UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
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LISLE, IL 60532-4352

December 5, 2011

Mr. Michael J. Pacilio
Senior Vice President, Exelon Generation Company, LLC
President and Chief Nuclear Officer (CNO), Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2, COMPONENT DESIGN BASES INSPECTION (CDBI) AND TEMPORARY INSTRUCTION 2515/177, "MANAGING GAS ACCUMULATION IN EMERGENCY CORE COOLING, DECAY HEAT REMOVAL, AND CONTAINMENT SPRAY SYSTEMS REPORT 05000254/2011009; 05000265/2011009

Dear Mr. Pacilio:

On October 21, 2011, the U.S. Nuclear Regulatory Commission (NRC) completed a Component Design Bases Inspection (CDBI) and Temporary Instruction (TI) 2515/177, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," inspection at your Quad Cities Nuclear Power Station, Units 1 and 2. The enclosed report documents the results of this inspection, which were discussed on October 21, 2011, with M. Prospero, and other members of your staff.

The inspection examined activities conducted under your license as they relate 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.

Based on the results of this inspection, five NRC-identified findings of very low safety significance and two unresolved items were identified. The findings involved a violation of NRC requirements. However, because of their very low safety significance, and because the issues were entered into your corrective action program, the NRC is treating the issues as Non-Cited Violations (NCVs) in accordance with Section 2.3.2 of the NRC Enforcement Policy.

If you contest the subject or severity of these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission - Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector Office at the Quad Cities Nuclear Power Station. In addition, if you disagree with the cross-cutting aspect assigned to any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region III, and the NRC Resident Inspector at the Quad Cities Nuclear Power Station.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records System (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Ann Marie Stone, Chief
Engineering Branch 2
Division of Reactor Safety

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

Enclosure: Inspection Report 05000254/2011009; 05000265/2011009
w/Attachment: Supplemental Information

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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:	05000254/2011009; 05000265/2011009
Licensee:	Exelon Generation Company, LLC
Facility:	Quad Cities Nuclear Power Station, Units 1 and 2
Location:	Cordova, IL
Dates:	September 19 through October 21, 2011
Inspectors:	Stuart Sheldon, Senior Engineering Inspector, Lead Zelig Falevits, Senior Engineering Inspector, Electrical Daneira Melendez-Colon, Engineering Inspector, Mechanical Nestor Feliz-Adorno, Engineering Inspector, TI-177 Carey Brown, Operations Inspector John Chiloyan, Electrical Contractor William Sherbin, Mechanical Contractor
Approved by:	Ann Marie Stone, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000254/2011009; 05000265/2011009; 9/19/11 – 10/21/11; Quad Cities Nuclear Power Station, Units 1 and 2; Component Design Bases Inspection (CDBI), Temporary Instruction (TI) 2515/177, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems."

The inspection was a 3-week onsite baseline inspection that focused on the design of components. The inspection was conducted by regional engineering inspectors and two consultants. Five (Green) findings were identified by the inspectors. The findings were considered Non-Cited Violations (NCVs) of NRC regulations. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be (Green) or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

- Green. The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," involving the licensee's failure to specify in a design calculation the allowable relay setpoint calibration tolerances. Specifically, the acceptance criteria used in relay setting calibration procedures was not bounded by the relay setting design calculations. The licensee entered this finding into their corrective action program and verified the calibrated relay settings would still provide adequate electrical protection coordination capability. The inspectors reviewed the licensee's analysis and had no concerns.

  The performance deficiency was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Equipment Performance, and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to adequately evaluate the design requirements of the relay settings could have resulted in a loss-of-relay coordination and could allow a fault on one piece of equipment to propagate to other safety-related equipment outside the designed isolation boundary. The finding screened as very low safety significance (Green) because the finding was design deficiency confirmed not to result in a loss of safety function of a system or a train. There was no cross-cutting aspect associated with this finding because it did not reflect current performance. (Section 1R21.3.b.(1))

- Green. The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of Technical Specification 5.5.6, "Inservice Testing Program," for the failure to perform required testing in accordance with the American Society of Mechanical Engineers Code for eight valves that had active safety functions. Specifically, the licensee failed to test eight valves which were required to operate in Mode 3 to return the residual heat removal system from the shutdown cooling mode to the low pressure coolant injection mode of operation. The licensee entered this finding into their corrective action program and verified the valves were operable based on recent exercising of the valves during the last refueling outages.

The performance deficiency was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Equipment Performance, and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, degraded valve performance could go undetected without periodic testing and trending. The finding screened as very low safety significance (Green) because the finding was not a design or qualification deficiency, did not represent a loss of system safety function, and did not screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. The finding had no cross-cutting aspect because the incorrect valve classification was not indicative of current performance. (Section 1R21.3.b.(2))

- Green. The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, Instructions, Procedures, and Drawings, for the licensee's failure to have appropriate maintenance procedures instructions in place for periodic replacement of the electrolytic capacitors in the 125Vdc and 250Vdc safety-related battery chargers. Specifically, the licensee failed to specify steps or requirements in battery chargers maintenance procedures for a periodic replacement every ten years, within the design service life of the electrolytic capacitors. The licensee entered this finding into their Corrective Action Program and initiated actions to address the non-conformance.

  The performance deficiency was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Equipment Performance, and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, failing to periodically replace the electrolytic capacitors in the battery chargers as required by the vendor and the PCM program could result in the failure of the battery chargers to perform their safety function and respond to initiating events. The finding screened as very low safety significance (Green) because the finding was design deficiency confirmed not to result in a loss of safety function of a system or a train. There was no cross-cutting aspect associated with this finding because it did not reflect current performance. (Section 1R21.3.b.(3))

- Severity Level IV. The inspectors identified a Severity Level IV violation of 10 CFR 50.71, "Maintenance of Records, Making of Reports," for the failure to update the final safety analysis report. Specifically, the final safety analysis report was not updated to reflect the analysis requested by the Commission in Generic Letter 2008-01. This violation was entered into the licensee's corrective action program.

  The performance deficiency was determined to involve a traditional enforcement violation because it impacted the regulatory process. The traditional enforcement violation was determined to be more than minor because the information that was not included in the Final Safety Analysis Report had a material impact on safety and licensed activities. The traditional enforcement violation was determined to be a Severity Level IV violation because the failure to update the final safety analysis report to reflect the analysis performed in response to Generic Letter 2008-01 did not result in an unacceptable change to the facility or procedures. An evaluation for cross-cutting aspect was not applicable because this was a traditional enforcement violation. (Section 4OA5.1c(1))

- Green. The inspectors identified a finding of very low safety significance and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the failure to ensure the emergency core cooling system mode of operation of the residual heat removal system would be capable of performing its mitigating function at Mode 3. Specifically, the residual heat removal system would experience flash evaporation during a rapid system depressurization while in Mode 3 and this condition was not analyzed. This finding was entered into the licensee's corrective action program.

  The performance deficiency was determined to be more than minor because it was associated with the Mitigating System Cornerstone attribute of Equipment Performance and affected the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the design of the residual heat removal system did not ensure that its emergency core cooling mode of operation would be capable of performing its mitigating function at Mode 3. Steam voids would form when transitioning from decay heat removal to emergency core cooling mode of operation in Mode 3 and this condition was not analyzed. The finding screened as very low safety significance (Green) using a Significance Determination Process Phase II evaluation. This finding had a cross-cutting aspect in the area of problem identification and resolution because the licensee did not thoroughly evaluate relevant external operating experience. Specifically, the licensee's evaluation of similar operating experience such as Information Notice 2010-11 incorrectly concluded the station was not vulnerable to the operating experience described therein. [P.2(a)] (Section 4OA5.1c(2))

B. Licensee-Identified Violations

No violations were identified.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Component Design Bases Inspection (71111.21)

.1 Introduction

The objective of the component design bases inspection is to verify design bases have been correctly implemented for the selected risk significant components and operating procedures and operator actions are consistent with design and licensing bases. As plants age, their design bases may be difficult to determine and an important design feature may be altered or disabled during a modification. The Probabilistic Risk-Assessment model assumes the capability of safety systems and components to perform their intended safety function successfully. This inspectable area verifies aspects of the Initiating Events, Mitigating Systems, and Barrier Integrity cornerstones for which there are no indicators to measure performance.

Specific documents reviewed during the inspection are listed in the Attachment to the report.

.2 Inspection Sample Selection Process

The inspectors used information contained in the licensee's PRA and the Quad Cities Standardized Plant Analysis Risk Model to identify two scenarios to use as the basis for component selection. The scenarios selected were Dual Unit Loss of Offsite Power (LOOP) and Loss of Condenser Vacuum. Based on these scenarios, a number of risk significant components were selected for the inspection.

The inspectors also used additional component information such as a margin assessment in the selection process. This design margin assessment considered original design reductions caused by design modification, power uprates, or reductions due to degraded material condition. Equipment reliability issues were also considered in the selection of components for detailed review. These included items such as performance test results, significant corrective actions, repeated maintenance activities, Maintenance Rule (a)(1) status, components requiring an operability evaluation, NRC resident inspector input of problem areas/equipment, and system health reports. Consideration was also given to the uniqueness and complexity of the design, operating experience, and the available defense in depth margins. A summary of the reviews performed and the specific inspection findings identified are included in the following sections of the report.

The inspectors also identified procedures and modifications for review that were associated with the selected components. In addition, the inspectors selected operating experience issues associated with the selected components.

This inspection constituted 20 samples as defined in IP 71111.21-05.

.3 Component Design

a. Inspection Scope

The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), Technical Specifications (TS), design basis documents, drawings, calculations and other available design basis information, to determine the performance requirements of the selected components. The inspectors used applicable industry standards, such as the American Society of Mechanical Engineers (ASME) Code, Institute of Electrical and Electronics Engineers (IEEE) Standards and the National Electric Code, to evaluate acceptability of the systems' design. The NRC also evaluated licensee actions, if any, taken in response to NRC issued operating experience, such as Bulletins, Generic Letters (GLs), Regulatory Issue Summaries (RISs), and Information Notices (INs). The review was to verify the selected components would function as designed when required and support proper operation of the associated systems. The attributes that were needed for a component to perform its required function included process medium, energy sources, control systems, operator actions, and heat removal. The attributes to verify the component condition and tested capability was consistent with the design bases and was appropriate may include installed configuration, system operation, detailed design, system testing, equipment and environmental qualification, equipment protection, component inputs and outputs, operating experience, and component degradation.

For each of the components selected, the inspectors reviewed the maintenance history, preventive maintenance activities, system health reports, operating experience-related information, vendor manuals, electrical and mechanical drawings, and licensee corrective action program documents. Field walkdowns were conducted for all accessible components to assess material condition and to verify the as-built condition was consistent with the design. Other attributes reviewed are included as part of the scope for each individual component.

The following 16 components were reviewed:

- Unit-2 125 VDC Battery No. 2: The inspectors reviewed battery sizing, short circuit, voltage drop, and minimum voltage calculations in order to verify the Unit 2 Division 1 battery is adequately designed to pick up the required loads during a loss of coolant accident (LOCA) and station blackout (SBO). Technical Specification (TS) values were also reviewed and compared to the inputs, results, and assumptions of the calculations and procedures. The inspectors reviewed a sample of completed surveillance battery tests and procedures to ensure the batteries are being tested in accordance with TS requirements and IEEE standards. The inspectors also verified the battery capacity was adequate to support the design basis duty cycle requirements and the battery capacity meets the requirements of the TS. In addition, maintenance procedures were reviewed to ensure maintenance activities (i.e., torque requirements, no-oxide grease, etc.), were being performed in accordance with procedures, IEEE Standards and vendor manuals. In addition, the inspectors reviewed the battery room's hydrogen concentration calculation. The inspectors also completed a system walkdown of the installed batteries and reviewed corrective action documents, trend data, and System Health Report to determine material conditions of the batteries and confirm there was no indication of degradation.

- Unit-2 125 VDC Battery Charger No. 2: The inspectors reviewed calculations relating to sizing and current limit setting to ascertain the adequacy and appropriateness of design assumptions, and to verify the charger was adequately sized to support the design basis duty cycle requirements of the 125Vdc safety-related loads and the associated battery under both normal and design basis accident conditions. The review also verified the battery charger met the TS requirements. The inspectors reviewed generic communications, vendor correspondence and recommendations, operating experience, and test procedures to determine whether maintenance and testing activities for the battery charger were in accordance with vendor's recommendations. The physical and material condition of the charger was visually inspected and corrective action document were reviewed to verify identification of adverse trends. The inspectors reviewed preventive maintenance activities to verify the electrolytic capacitors installed in the battery charger were replaced with appropriate frequency. The inspectors also reviewed the adequacy of the charger's alternating current (AC) input feeder circuit sizing to ensure adequacy of ampacity, short circuit current capability and voltage requirements under the most limiting conditions. A sample of electrical calculations was reviewed to ensure the adequacy of the charger's AC input power circuit breaker ratings.

- Unit-2 125 VDC Bus No. 2A: The inspectors reviewed 125Vdc short circuit calculations and verified the interrupting ratings of the fuses were above the calculated short circuit currents. The 125Vdc voltage drop calculations were reviewed to determine if adequate voltage would be available for the 4.16kV breaker open and close coils and spring charging motors. The inspectors reviewed the 4.16kV motor control electrical diagrams and the voltage drop calculations to ensure adequate voltage would be available for the control circuit components under all design basis conditions.

- Station Blackout (SBO) Diesel (2-6620-1): The inspectors conducted several detailed walkdowns of the SBO diesel area, including cooling water system and fuel oil system to visually inspect the physical condition of these essential support systems. The inspectors reviewed fuel oil consumption calculations, fuel tank sizing, and fuel oil transfer pump vortex and net positive suction head (NPSH) calculations to ensure adequate fuel oil availability. The inspectors also reviewed recent inspection results of the SBO diesel radiator cooling units to ensure adequate jacket water heat transfer capability is maintained. Interviews with Maintenance Rule personnel were conducted to ensure proper maintenance classification of SBO diesel components. The inspectors reviewed electrical loading calculations including voltage and frequency, current and short circuit ratings for all operating modes to determine whether the size of the SBO diesel was within equipment ratings. Walkdown of the diesel generator was conducted with the system engineering personnel to observe its general material condition.

- Emergency Diesel Generator (EDG 1/2): The inspectors selected the EDG fuel oil, air start system, cooling water, EDG cooling water pump room ventilation systems, and tornado protection for review. The inspectors reviewed the UFSAR, design basis calculations, vendor documents, and procedures to identify the design basis requirements for the mechanical support systems. A walkdown was performed to assess material conditions. Recent EDG surveillance test results were reviewed to ensure the mechanical support systems were operating as designed, and verify regular maintenance is performed on the fuel oil, and

lube oil filters. For the fuel oil system, the inspectors reviewed fuel oil consumption calculations, and fuel oil transfer pump vortex and NPSH calculations that were performed to ensure TS requirements for onsite fuel oil storage requirements were met. Recent fuel oil sample results were reviewed to ensure the fuel was within the required limits for chemical composition and foreign material limits. Also, the air start system design and testing were reviewed to ensure sufficient air pressure and volumes are available in the receiver tanks. The diesel generator cooling water (DGCW) system pump design requirements, and recent surveillance testing of the pumps were reviewed to ensure adequate heat transfer capability for the engine jacket water is maintained. The DGCW pump room cooler calculations and recent room cooler inspection results were reviewed to ensure design requirements for heat transfer were maintained. The inspectors reviewed electrical loading calculations including voltage and frequency, current and short circuit ratings for all operating modes to determine whether the size of the EDG was within equipment ratings. The inspectors reviewed the adequacy and appropriateness of design assumptions and calculations related to EDG protection and relay coordination during test mode and during emergency operation. The inspectors reviewed the adequacy of the EDG's high resistance neutral grounding equipment and whether appropriate periodic maintenance and measurements were performed. Walkdown of the diesel generator was conducted with the system engineering personnel to observe its general material condition.

- 4KV Bus 23-1: The inspectors reviewed electrical diagrams, the system health report, the circuit breaker vendor's manual, protective relay settings, loss of voltage and degraded voltage relay settings, electrical distribution system calculations to assess the status and maintenance condition of the equipment and to verify the adequacy of bus and circuit breaker load capacity and short circuit interrupting ratings for full loading and emergency loading. Operating and maintenance test procedures were reviewed to assess whether component operation and alignments were consistent with design and licensing bases assumptions. A walkdown of the bus was conducted to observe its general material condition and whether breaker status indicating lights and control switch positions were consistent with design.

- 4kV Breakers 2328 and 2301: The inspectors reviewed the electrical drawings and station procedures that describe the circuits used for power and control to verify the adequacy of the circuit breaker voltage, current, and interrupting ratings. The review included electrical protective relay settings versus equipment ratings, and security against spurious tripping during postulated electrical fault or overload conditions. The breakers closing and opening control circuits were reviewed to verify breaker tripping and closing logic was consistent with design basis description and interlocking requirements. Several interviews were conducted with the electrical system engineer regarding preventive maintenance and condition trending tests. A walkdown of the breakers was conducted to observe their general material conditions.

- Residual Heat Removal (RHR) Pump 2A: The inspectors reviewed the RHR pump to verify it could meet the design basis requirements. The inspection included a review of required flow rate and pressure for accident conditions. The inspectors reviewed calculations, technical evaluations, pump curves, condition reports, and In-Service Test (IST) trend data to ensure TS and design basis

required flows and pressures could be achieved. Additionally, the inspectors reviewed the operation of the pump in the event of a postulated LOCA under Mode 3 operating conditions. The inspectors reviewed the licensee's response to NRC Bulletin 88-04 to verify the RHR pumps were not subject to failure from inadequate minimum flow or dead-heading from a parallel higher head RHR pump. The inspectors also reviewed the pump area to ensure it was adequately protected from internal flooding hazards. The inspectors also reviewed the motor feeder circuit sizing, to ensure adequacy of ampacity, short circuit current capability, and voltage requirements under the most limiting conditions. A sample of electrical calculations was also reviewed to ensure the adequacy of the motor feeder circuit phase and ground protective relay settings.

- RHR Torus Cooling Isolation Valve (MO2-1001-36A/B): The inspectors reviewed motor-operated valve (MOV) calculations and analysis to ensure the valve was capable of functioning under design conditions. These included calculations for required thrust and torque and vendor specifications. Diagnostic testing and in-service testing (IST) bases documents and surveillance results, including stroke time, local leak rate test (LLRT) trends, and available thrust, were reviewed to verify acceptance criteria were met and performance degradation could be identified. Additionally, the inspectors reviewed the MOV power and control circuits, to ensure adequacy of ampacity, short circuit current capability, and voltage requirements under the most limiting conditions. Samples of electrical calculations were also reviewed to ensure the adequacy of the power supply circuit breaker and thermal overload relay ratings.

- RHR Torus Cooling and Spray Isolation Valve (MO2-1001-34A/B): The inspectors reviewed motor-operated valve calculations and analysis to ensure the valve was capable of functioning under design conditions. These included calculations for required thrust and torque and vendor specifications. Diagnostic testing and in-service testing bases documents and surveillance results, including stroke time, LLRT trends and available thrust, were reviewed to verify acceptance criteria were met and performance degradation could be identified. Additionally, the inspectors reviewed the MOV power and control circuits, to ensure adequacy of ampacity, short circuit current capability, and voltage requirements under the most limiting conditions. A sample of electrical calculations were also reviewed to ensure the adequacy of the power supply circuit breaker and thermal overload relay ratings

- RHR Service Water (RHRSW) Pump 2A (2-1001-65A): The inspectors reviewed drawings, calculations, hydraulic analyses, submergence requirements, operation and test procedures, system health reports, and pump vendor manual to evaluate whether the maintenance, testing, and operation of the pump were adequate. Surveillance test results were reviewed to determine if the pump was operating within established acceptable criteria, and the inspectors also verified the test acceptance criteria ensured the pump could meet the design requirements. The inspectors reviewed the pump area to ensure it was adequately protected from internal flooding hazards. The inspectors also reviewed recent pump intake bay inspection results to ensure silt and debris were not impeding water flow at the pump suction. The inspectors also reviewed the motor feeder circuit sizing, to ensure adequacy of ampacity, short circuit current capability, and voltage requirements under the most limiting conditions.

A sample of electrical calculations was also reviewed to ensure the adequacy of the motor feeder circuit phase and ground protective relay settings.

- Reactor Core Isolation Cooling (RCIC) Pump/Turbine: The inspectors reviewed the RCIC pump and turbine to verify they could meet the design basis requirements. The inspection included a review of required flows for transients, including loss of condenser vacuum, and postulated Appendix R events, as well as minimum flow and maximum cooling water temperature provisions. The inspectors evaluated flow calculations, NPSH calculations, verified the vortex analysis methodology was appropriate, and reviewed in-service test data and test acceptance criteria to ensure TS and design basis requirements were met. The inspectors verified the head correction values used for the RCIC turbine exhaust pressure switches were appropriate and the instruments were properly calibrated. The inspectors also verified the system was adequately evaluated for seismic events. The inspectors also reviewed normal and abnormal operating procedures, system venting procedures and oil sample results.

- RCIC Injection Line to Feedwater Isolation (MO2-1301-49): The inspectors reviewed motor-operated valve calculations and analysis to ensure the valve was capable of functioning under design conditions. These included calculations for required thrust and torque and vendor specifications. Diagnostic testing and in-service testing bases documents and surveillance results, including stroke time, position indication, and available thrust, were reviewed to verify acceptance criteria were met and performance degradation could be identified.

- RCIC Cooling Water Shutoff Valve (MO2-1301-62): The inspectors reviewed motor-operated valve calculations and analysis to ensure the valve was capable of functioning under design conditions. These included calculations for required thrust and torque and vendor specifications. Diagnostic testing and in-service testing bases documents and surveillance results, including stroke time, position indication, and available thrust, were reviewed to verify acceptance criteria were met and performance degradation could be identified.

- Augmented Primary Containment Vent (APCV) Torus Vent Isolation Valve (AO2-1601-60): The torus vent isolation valve was reviewed to verify its ability to operate if called upon in the emergency operating procedures. The vent valve is opened to allow operators to vent the torus during severe accidents, which involve the loss of decay heat removal. This review included design analyses of the valve to verify the capability of the valve to perform its required function. Specifically, the inspectors reviewed air-operated valve thrust calculations, and reviewed the required air pressure to open the valve. The inspectors also reviewed licensing documents, including plant documents related to GL 89-16, which required installation of a hardened wet-well vent. Implementing procedures were reviewed to ensure operation of the valve was within the licensing basis. The inspectors performed a walkdown of the component to verify its accessibility under accident conditions. Surveillance test results were reviewed to ensure the valve performed its containment isolation function.

- APCV Containment Vent Isolation Valve (AO2-1601-23): The containment vent isolation valve was reviewed to verify its ability to operate if called upon in the emergency operating procedures. The vent valve is opened to allow operators to vent the containment during severe accidents which involve the loss of decay

heat removal. This review included design analyses of the valve to verify the capability of the valve to perform its required function. Specifically, the inspectors reviewed air-operated valve thrust calculations, and reviewed the required air pressure to open the valve. The inspectors also reviewed licensing documents, including plant documents related to GL 89-16, which required installation of a hardened wet-well vent. Implementing procedures were reviewed to ensure operation of the valve was within the licensing basis. The inspectors performed a walkdown of the component to verify its accessibility under accident conditions. Surveillance test results were reviewed to ensure the valve performed its containment isolation function.

b. Findings

(1) Non-Conservative Calibration Tolerance Limits for Electrical Relay Settings

Introduction: The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," involving the licensee's failure to specify in a design calculation the allowable relay setpoint calibration tolerances. Specifically, the acceptance criteria used in relay setting calibration procedures was not bounded by the relay setting design calculations.

Description: During the review of licensee's completed protective relay trip setpoint calibration procedures, and relay setting calculations to verify whether the applied relay settings were consistent with the designed basis calculations, the inspectors noted that the stated allowable relay setpoint setting tolerances in the relay setting calibration Procedure MA-MW-772-701 Revision 1 were neither specified nor analyzed in the design basis relay setting Calculation QC-019-E002 Revision 3. The acceptance criteria in relay setting calibration procedure was not bounded by the relay setting calculations to ensure the relay settings achieve selective tripping under postulated electrical fault or overload conditions. Following discovery, the licensee performed a preliminary evaluation for affected components using the worst case scenario of relay setpoint tolerances stated in the relay setting calibration procedure and concluded that at the limits of the setting tolerances, the relay setpoints would not always meet the acceptance criteria, and selective tripping is no longer ensured. The licensee entered this finding into their corrective action program as AR012672186 and AR01279533. Based upon the actual as-left setpoints of the affected components, the licensee determined they would still perform their required safety design basis functions.

Analysis: The licensee's failure to establish adequate relay setpoint tolerances in relay setpoint setting calibration procedures and verify the effects on relay coordination margin in relay setting calculations for relays used on 4.16KV emergency safety feature switchgears was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Equipment Performance, and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the allowed relay setpoint calibration limits would not ensure the calibration activity implement the design basis established by the relay setting calculations. At the limits of the allowable relay setting tolerances, selective tripping, during electrical faults is no longer ensured, and, the loss of relay coordination could allow a fault on one piece of equipment to propagate to other safety-related equipment outside the designed isolation boundary.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I-Initial Screening and Charaterization of Findings," Table 4a for the Mitigating System cornerstone. The finding screened as very low safety significance (Green) because the finding was design deficiency confirmed not to result in a loss of safety function of a system or a train.

The inspectors determined there was no cross-cutting aspect associated with this finding because it did not reflect current performance.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control" requires, in part, that design control measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. Contrary to the above, as of May 24, 2002, the acceptance criteria established in relay setting calculations were not translated into relay setpoint calibration procedures. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as AR01267218 and AR01279533, this violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2 of the NRC Enforcement Policy.
(NCV 5000254/2011009-01; 5000265/2011009-01, Non-Conservative Calibration Tolerance Limits for Electrical Relay Settings)

(2) Failure to Perform Required In-Service Testing of Shutdown Cooling Suction Valves

Introduction: The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of Technical Specification 5.5.6, "Inservice Testing Program," for the failure to perform the required testing in accordance with the ASME Operation and Maintenance (OM) Code for eight valves that had active safety functions. Specifically, these valves were required to operate in Mode 3 to return the RHR system from the shutdown cooling (SDC) mode to the low pressure coolant injection (LPCI) mode of operation.

Description: The inspectors reviewed procedure QCOP 1000-30, "Post-Accident RHR Operation," Revision 26, and Technical Specification Surveillance Requirement 3.5.2.3 and noted that when the RHR system is in operation in the SDC mode, it is considered operable in the LPCI mode if being capable of realignment to the LPCI mode. In order to realign the system from the SDC mode to the LPCI mode, ten valves in the operating unit would have to change position. Of these ten valves, six were classified as active, and four were classified as passive in the IST program. These four valves per unit, or eight total, were the SDC suction valves, 1(2)-1001-043A/B/C/D-MO. The inspectors determined that during a LOCA when running SDC in Mode 3, the SDC suction valves would require closure in order to realign RHR from SDC to LPCI mode. Under this scenario, the valves would have an active closure safety function.

During normal power operations, these suction valves would be in their safety-related position (closed) such that they would not be required to change position. These valves also provide a non-safety-related function in the open position for the shutdown cooling mode of RHR by providing a flow path to cool the vessel by taking suction from the recirculation system suction line and discharging to the recirculation system discharge line. Although the valves were included in the IST program, they were identified as passive valves such that the only testing performed was a remote position indication test on a two-year frequency. Since these valves were required to reposition when the RHR

system was in SDC to meet TS limiting condition for operation (LCO) 3.5.2.3 in Mode 3, the valves had an active safety function and were required by the ASME OM Code to be exercised and stroke time tested on a quarterly frequency. The licensee initiated IR 01279066 and verified the valves were operable based on recent exercising of the valves during the last refueling outage in April 2010 for Unit 2, and May 2011 for Unit 1. The inspectors did not have a concern with the basis for the licensee's operability determination.

The licensee performed their ten-year IST interval update as required by 10 CFR 50.55a in 2001. When the program was updated, the licensee removed the active function of these valves such that all required testing was no longer being performed.

Analysis: The inspectors determined the failure to perform the required testing in accordance with the IST program for eight valves that had active safety functions was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Equipment Performance, and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, degraded valve performance could go undetected without periodic testing and trending.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I - Initial Screening and Characterization of Findings," Table 4a for the Mitigating System cornerstone. The finding screened as very low safety significance (Green) because the finding was not a design or qualification deficiency, did not represent a loss of system safety function, and did not screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. In addition, the licensee provided sufficient justification to verify the valves remained capable of performing their safety-related function. The finding had no cross-cutting aspect because it was not indicative of current performance.

Enforcement: Technical Specification 5.5.6, "Inservice Testing Program," requires testing of Code Class components in accordance with the ASME Boiler and Pressure Vessel Code. ASME OM Code, Section ISTC-3100 requires, in part, exercising valves with active safety functions and Section ISTC-5120 requires, in part, stroke time testing of MOVs. Contrary to the above, since 2001, the eight RHR pump suction MOVs that had active safety functions were not adequately tested in accordance with the IST program. Specifically, the valves that were required to reposition in Mode 3 to return the RHR system from the SDC mode to the LPCI mode of operation, were not exercised or stroke time tested in accordance with the OM testing requirements. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as IR 01279066, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 5000254/2011009- 02; 5000265/2011009-02, Failure to Perform Required In-Service Testing of Shutdown Cooling Suction Valves).

(3) 125Vdc and 250Vdc Safety-Related Battery Charger Testing and Maintenance Procedures Did Not Include Steps for Electrolytic Capacitor (Critical Components) Replacement

Introduction: The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion V, Instructions, Procedures, and Drawings, for the licensee's failure to have appropriate maintenance procedures or instructions in place for periodic replacement of the electrolytic capacitors in the 125Vdc and 250Vdc safety-related battery chargers.

Description: During review of battery chargers surveillance testing and maintenance activities, the inspectors noted vendor manual and Exelon's Performance Centered Maintenance (PCM) program specified periodic replacement of the electrolytic capacitors every ten years (the design service life), per qualifications to IEEE 323. However, the inspectors identified the procedure QCEMS 0210-02, "Battery Charger Testing for Safety-Related 125 VDC and 250 VDC Batteries," Revision 002, did not specify steps for the required periodic replacement of the electrolytic capacitors installed in four 125Vdc and in the three 250Vdc safety-related battery chargers. As a result, the capacitors have not been replaced in the 1A, 2 and 2A (125Vdc) and in the ½ and 1 (250Vdc) battery chargers in about 17 years.

The inspectors noted that Step B.2. of Procedure QCTS 0210 02, "Battery Charger Testing for Safety-Related 125 VDC and 250 VDC Batteries," dated September 30, 1996, required the electrolytic capacitors be replaced once every ten years. This requirement was subsequently removed on August 13, 1998, in Revision 4 of the procedure and replaced with a statement that because Quad Cities has redundant chargers, capacitors may be run to failure. In addition, Step 4.1.9 of this revision acknowledged the battery charger manufacturer's recommendation to replace the C1 filter capacitors every ten years; however, stated the capacitors would be replaced when necessary (signs of bulging, swelling or leakage or an increasing trend in ripple voltage) and not based on age. The licensee had revised the procedure to measure and trend the amount of AC ripple voltage at the charger DC output during testing and monitor changes in ripple voltage every two years to help predict capacitor failure.

The inspectors noted the licensee did not have an evaluation to justify not replacing the capacitors every ten years as required by the battery chargers vendor and the Exelon PCM program.

The inspectors also noted the procedure did not define a criterion or a specific tolerance for the measured output ripple voltage discrepancy at which value the capacitors needed to be replaced. The licensee stated guidance on monitoring and interpreting measured ripple voltages was provided in IEEE Standard 1491, "IEEE Guide for Selection and Use of Battery Monitoring Equipment in Stationary Applications," dated 2005. Section 7.8.3 of this standard stated in part, "Monitoring the exact value of the ripple voltage parameter is not as important as trending the value as the system ages. Higher than normal ripple voltages can often indicate a failure of the dc filter assembly." However, the inspectors determined the licensee had not trended past performance data and did not have an evaluation documenting the results of battery charger ripple voltage measurements.

The inspectors reviewed the last three work order histories, which documented the measured ripple output voltage of each of the seven battery chargers (125Vdc charger

No. 1, 1A, 2, 2A, and 250Vdc charger No. 1/2, 1 and 2). The ripple test was performed on a two-year frequency. The inspectors noted the most recent ripple voltage on U-1, 250Vdc battery charger No. 1 was performed on December 30, 2010, and the measured the ripple voltage was 1.412Vac. The electricians noted this value "increased significantly" compared to the ripple voltages of 0.522Vac and 0.475Vac recorded during previous testing performed on January 23, 2009, and on October 11, 2006, respectively. The inspectors identified the licensee did not follow Step 4.2.14 of procedure QCTS 0210 02, which required initiation of an Issue Report to investigate cause and determine the potential impact on operability. On October 20, 2011, the licensee initiated IR 01279207, "CDBI-Evaluate Discrepant Test Data – WO 125288-01," to evaluate the "significant increase" in recorded ripple voltage. The licensee removed the U1 250VDC Battery Charger No. 1 from service and aligned the U1/2 250VDC to Unit 1. The licensee performed a ripple test on the U1 250VDC Battery Charger No. 1 and measured the AC ripple voltage as 1.47Vac. Although this change in AC ripple voltage was insignificant to charger operation, the licensee planned to replace the capacitors in November 2011.

The licensee initiated several Issue Reports to address the concerns noted above. The licensee planned to review vendor and PCM template requirements and basis, review capacitors maintenance practices at other Exelon sites and determine future actions (i.e., revise the procedure to require periodic replacement the capacitors or justify present maintenance practices).

Analysis: The inspectors determined that failure to have appropriate maintenance procedures or instructions in place for periodic replacement of aging electrolytic capacitors in 125Vdc and in 250Vdc safety-related battery chargers every ten years, as required by the Exelon PCM program and the battery charger's Vendor was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Equipment Performance, and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, failing to periodically replace the electrolytic capacitors in the battery chargers as required by the vendor and the PCM program could result in the failure of the battery chargers to perform their safety function and respond to initiating events.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I - Initial Screening and Characterization of Findings," Table 4a for the Mitigating System cornerstone. The finding screened as very low safety significance (Green) because the finding was not a design or qualification deficiency, did not represent a loss of system safety function, and did not screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. In addition, the licensee provided reasonable assurance the battery chargers will remain capable of performing their safety-related function until replacements are performed.

The inspectors did not identify a cross-cutting aspect associated with this finding because the inadequate procedure was implemented in 1998; therefore, the performance deficiency was not representative of current performance.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, Procedures," requires, in part, that requires in part, 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.

Contrary to the above, as of 1998, Procedure QCEMS 0210-02, "Battery Charger Testing for Safety-Related 125 VDC and 250 VDC Batteries," Revision 002 was not appropriate for the circumstances. Specifically, the procedure did not require periodic replacement of the electrolytic capacitors in the 125Vdc and 250Vdc battery chargers every ten years, as required by the vendor and by Exelon's PCM program. Consequently, the electrolytic capacitors have not been replaced in five of the seven battery chargers in about 17 years. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as IR 01276063, this violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 5000254/2011009-03; 5000265/2011009-03, Safety-Related Battery Charger Testing and Maintenance Procedures Did Not Include Steps for Electrolytic Capacitor Replacement)

(4) Tornado Missile Protection of the Emergency Diesel Generator Air Intake and Exhaust

Introduction: The inspectors identified an unresolved item (URI) concerning the licensing bases requirement for the EDG exhaust silencer and air intake vents with respect to tornado protection.

Description: During a walkdown of the 1/2 EDG, the inspectors observed that the diesel exhaust silencer and air intake vent are mounted on the roof of the building and are not protected from tornado missiles by concrete structures. The safety evaluation report for the construction permit of the Quad Cities Station states:

> *Since the proposed site is in an area of relatively high tornado frequency, components which are required for safe shutdown of the plant will be located either under the protection of reinforced concrete or located underground.*

The Quad Cities Station UFSAR Section 3.1.1.2 also states:

> *Section 3.1.1.2 Criterion 2 - Performance Standards*
>
> *Those systems and components of reactor facilities which are essential to the prevention of accidents which could affect the public health and safety or to mitigation of their consequences shall be designed, fabricated, and erected to performance standards that will enable the facility to withstand, without loss of the capability to protect the public, the additional forces that might be imposed by natural phenomena such as earthquakes, tornadoes, flooding conditions, winds, ice, and other local site effects. The design bases so established shall reflect: (a) appropriate consideration of the most severe of these natural phenomena that have been recorded for the site and the surrounding area, and (b) an appropriate margin for withstanding forces greater than those recorded to reflect uncertainties about the historical data and their suitability as a basis for design*.
>
> *Response*
>
> *The plant equipment which is important to safety is designed to permit safe plant operation and to accommodate all design basis accidents for all appropriate*

environmental phenomena at the site without loss of their capability, taking into consideration historical data and suitable margins for uncertainties.

This information prompted the inspectors to question whether the diesel generator systems were installed in accordance with the Quad Cities licensing basis.

The licensee responded that the design had been previously approved and reviewed for the Dresden Station (the representative plant for Quad Cities) during the NRC Systematic Evaluation Program (SEP) as documented in NUREG-0823, "Integrated Plant Safety Assessment, Systematic Evaluation Program, Dresden Nuclear Power Station Unit 2." In this document the NRC determined that Dresden must protect the diesel air intakes and exhaust, however, NUREG-0823 Supplement 1, documents NRC acceptance of a probability analysis for Dresden in lieu of protection. The licensee further stated that the issue of tornado missile protection was resolved through issuance of Generic Letter 95-04, "Final Disposition of the Systematic Evaluation Program Lessons-Learned Issues."

The inspectors were unable to determine during the inspection if the Quad Cities licensing basis required the EDG intake and exhaust to be protected from tornado missiles. Therefore, this concern will be considered an unresolved item (URI 05000254/2011009-04; 05000265/2011009-04) pending NRC review of the Quad Cities licensing basis.

.4 Operating Experience

a. Inspection Scope

The inspectors reviewed 4 operating experience issues to ensure NRC generic concerns had been adequately evaluated and addressed by the licensee. The operating experience issues listed below were reviewed as part of this inspection:

- IN 1998-31, "Fire Protection System Design and Common-Mode Flooding of Emergency Core Cooling System Rooms at Washington Nuclear Project Unit 2";
- IN 2008-02, "Findings Identified During Component Design Bases Inspections";
- IN 2010-03, "Failures Of Motor-Operated Valves Due To Degraded Stem Lubricant"; and
- IN 2010-23, "Malfunctions of Emergency Diesel Generator Speed Switch Circuits."

b. Findings

(1) Diesel Generator Technical Specification Frequency and Voltage Variation not Considered in Loading Calculations

Introduction: The inspectors identified an unresolved item (URI) concerning possible non-conservative values for emergency diesel generator (EDG) frequency and voltage in Technical Specification 3.8.1.2. Specifically, the licensee has not fully evaluated the possible effects of emergency diesel generator (EDG) frequency and voltage variations on all safety-related structures, systems, and components (SSCs) over the allowable TS range of EDG voltage and frequency.

Description: While reviewing actions in response to NRC Information Notice (IN) 2008-002, the inspectors noted the licensee staff had evaluated the effects of lower than nominal frequency on pump flows and pressures and determined there were no adverse effects on pump flow and pressures and the upper frequency limit did not cause the EDG loading to exceed the 200 hour per year rating. The inspectors found that the current calculation (QDC-6700-E-1500, Rev 005A) determined diesel loading based on maximum loads during a design basis accident. The loading was based on nominal 60 hertz (Hz) operation of pumps and fans, and did not account for the +2 percent variations allowed by TS 3.8.1.2. Mechanical affinity laws show power demanded by centrifugal pumps and fans increases by the cube of the ratio of the speeds (1.02 cubed = 1.061). Since the EDG accident loading was comprised primarily of centrifugal loads, the inspectors determined this phenomenon should have been considered in loading calculations. In CR 591442, "Effect of EDG Frequency on Loading and Pump Flows," dated February 14, 2007, the licensee had noted this increase in loading and had determined that it was still within the 200 hr per year rating (2973 kW) for the EDGs. The evaluation of decreased frequency loading showed all pumps developed adequate pressure and flow. The inspectors were concerned the maximum loading exceeded the 2000 hr rating of 2864 kW. The inspectors consulted with the Office of Nuclear Reactor Regulations (NRR) and were informed the loading should be compared to the licensed value for the EDGs. Additionally, the licensee should have demonstrated there were no detrimental effects on all systems, structures, and components (SSCs) over the full range of frequency and voltage allowed by TS. Specifically, the torque developed by a motor is directly proportional to the square of the voltage and inversely proportional to the square of the frequency. The inspectors compared the TS limits to the nominal values for voltage and frequency and determined that torque developed by the motors supplied by the EDGs could vary as much as 14 percent from the nominal torque. The inspectors informed the licensee of their concerns about the operability of the supplied motors being able to meet the design requirements, particularly for pumps and motor-operated valves under the worst torque conditions (minimum voltage and maximum frequency) and EDG loading for the best conditions. Additionally, the inspectors noted the UFSAR loading limit was the 2000 hr rating. The inspectors asked for any licensing document that could support using the 200 hr load limit. In response to the inspectors' questions, the issue was entered into the licensee's corrective action program as AR 01288784, CDBI – Technical Specification Limits for EDG, dated November 10, 2011. A review of operating procedures provided reasonable assurance that the EDGs would be operated near the midpoint of the allowed TS range during a potential event until the licensee demonstrates operability over the full TS range. This will be an unresolved issue pending the results of the licensee's evaluation of the effects of the full TS voltage and frequency ranges on all SSCs and verifying the licensed load limit for the EDGs. (URI 5000254/2011009-05; 5000265/2011009-05).

.5 Modifications

a. Inspection Scope

The inspectors reviewed 2 permanent plant modifications related to selected risk significant components to verify the design bases, licensing bases, and performance capability of the components had not been degraded through modifications. The modifications listed below were reviewed as part of this inspection effort:

- EC 350637; Install an Override Switch in the Auto Open Logic for RCIC Torus Suction Valve 201301-25 and 26; Revision 2; and,

- EC 369034; RHR/RHRSW Flow Instrument Loop Upgrade ; Revision 4

b. Findings

No findings of significance were identified.

.6 Operating Procedure Accident Scenario Reviews

a. Inspection Scope

The inspectors performed a detailed reviewed of the procedures listed below associated with the two selected scenarios, the dual unit loss of offsite power and the loss of condenser vacuum. For the procedures listed, time critical operator actions were reviewed for reasonableness, in plant actions were evaluated and walked down with an operator, and any interfaces with other departments were evaluated. The procedures were compared to UFSAR, design assumptions, and training materials to ensure consistency. In addition, shift manager and both Unit 1 and Unit 2 crew interactions were observed in a simulator scenario of a dual-unit, loss-of-offsite-power involving the use of an SBO diesel.

The following operating procedures were reviewed in detail:

- QGA 200, “Primary Containment Control”;
- QCOA 6100-03, “Loss of Offsite Power”;
- QCOA 6100-04, “Station Blackout”;
- QCOP 1600-13, “Post-Accident Venting of the Primary Containment (H.7.b)”;
- QCOP 1600-28, “Installing Alternate Power to Primary Containment Vent and Purge Valves”; and
- QCOP 6500-08, “4KV Bus Cross-Tie Operation.”

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems

.1 Review of Items Entered Into the Corrective Action Program

a. Inspection Scope

The inspectors reviewed a sample of the selected component problems that were identified by the licensee and entered into the corrective action program. The inspectors reviewed these issues to verify an appropriate threshold for identifying issues and to evaluate the effectiveness of corrective actions related to design issues. In addition, corrective action documents written on issues identified during the inspection were

reviewed to verify adequate problem identification and incorporation of the problem into the corrective action program. The specific corrective action documents that were sampled and reviewed by the inspectors are listed in the Attachment to this report.

The inspectors also selected ten issues that were identified during previous CDBIs to verify the concerns were adequately evaluated and corrective actions were identified and implemented to resolve the concern, as necessary. The following issues were reviewed:

- NCV 2006003-01, Failure to Comply with TS SR 3.8.4.2 for 125 Vdc Battery Terminal Connection Corrosion and Resistance Measurements;
- NCV 2006003-02, Battery Connection Resistance Value Specified in TS SRs Insufficient to Ensure Operability;
- NCV 2006003-04, Licensee Used Inappropriate Vortex Analysis Methodology;
- NCV 2006003-06, Discrepant MCC Voltages Used in Degraded MOV Voltage Drop Calculations;
- NCV 2006003-08, Inconsistency in Procedures for Cleaning Batteries;
- NCV 2006003-09, Failure to Comply with Preventive Maintenance Procedure Requirements Concerning Re-Torquing of Corroded Electrical Terminal Connections;
- NCV 2006003-10, Non-Conservative HPCI Pump Test Acceptance Criteria;
- NCV 2006003-11, Non-Conservative Safety-Related Air Storage Tank Capacity Test;
- NCV 2008007-02, Inadequate Calculations/Analyses and Testing for Thermal Overload Relays (TOLs) on Safety-Related MOVs; and
- FIN 2008007-04, Inaccurate RCIC Instrument Setpoints.

b. Findings

No findings of significance were identified.

4OA5 Other Activities

.1 (Closed) NRC Temporary Instruction (TI) 2515/177, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems (NRC Generic Letter 2008-01)"

a. Inspection Scope

The inspectors verified the onsite documentation, system hardware, and licensee actions were consistent with the information provided in the licensee's response to NRC GL 2008-01, "Managing Gas Accumulation in Emergency Core Cooling (ECCS), Decay Heat Removal (DHR), and Containment Spray Systems." Specifically, the inspectors verified the licensee has implemented or was in the process of implementing the

commitments, modifications, and programmatically controlled actions described in the licensee's response to GL 2008-01. The inspection was conducted in accordance with TI 2515/177, "Managing Gas Accumulation in ECCS, DHR, and Containment Spray Systems (NRC Generic Letter 2008-01)," and considered the site-specific supplemental information provided by NRR to the inspectors.

The documents reviewed are listed in the Attachment to this report.

b. Inspection Documentation

The selected TI areas of inspection were licensing basis, design, testing, and corrective actions. The documentation of the inspection effort and any resulting observations are below.

(1) Licensing Basis: The inspectors reviewed selected portions of licensing basis documents to verify they were consistent with the NRR assessment report and they were processed by the licensee. This review included a verification of selected portions of TS, TS basis, and UFSAR. The inspectors noted that the licensee had not updated the UFSAR to reflect the analysis performed in response to GL 2008-01 to demonstrate the capability of the subject systems to shut down the reactor, maintain it in a safe shutdown condition, and prevent or mitigate the consequences of an accident with respect to potential gas accumulation. The details and enforcement of this issue are discussed in Section 4OA5.1.c(1) of this report.

The inspectors also verified applicable documents that described the plant and plant operation, such as calculations, piping and instrumentation diagrams (P&IDs), procedures, and corrective action program (CAP) documents, addressed the areas of concern and were changed if needed following plant changes. The inspectors confirmed that the frequency of selected surveillance procedures used for venting the discharge piping of the subject systems was at least as frequent as required by TSs. In addition, the inspectors confirmed the licensee had implemented a periodic monitoring program to monitor other gas susceptible locations via ultrasonic testing (UT) as part of their resolution to GL 2008-01. The licensee's basis for the UT periodicity was, in part, the results of the examinations performed up to the timeframe of this inspection. The inspectors also confirmed that the licensee's CAP captured the commitment to support the industry Technical Specification Task Force Traveler (TSTF) and Nuclear Energy Institute (NEI) Gas Accumulation Management Team activities regarding resolution of generic TS issues, evaluate the resolution of the TSTF, and submit a license amendment request, if deemed necessary based on this evaluation, within 180 days following NRC approval of the TSTF. This commitment was captured in the CAP as AR00832295.

(2) Design: The inspectors reviewed selected design documents, performed system walkdowns, and interviewed plant personnel to verify the design and operating characteristics were addressed by the licensee. Specifically:

(a). The inspectors assessed the licensee's efforts for identifying the gas intrusion mechanisms that apply to the licensee's plant and noted one example where the licensee failed to recognize a gas intrusion mechanism. Specifically, the RHR system design and operation did not preclude the formation of steam

voids at Mode 3 and this condition had not been analyzed. The details and enforcement of this issue are discussed in Section 4OA5.1.c(2) of this report.

The inspectors also verified the licensee had identified the gas intrusion mechanisms associated with operability evaluation EC371224, "NRC GL08-01 Venting and Gas Accumulation Evaluation for Core Spray (CS)," in an earlier inspection period. This additional activity counted towards the completion of this TI and was documented in Inspection Report 05000254/2009004; 05000265/2009004.

(b). The inspectors assessed if the licensee's void acceptance criteria was consistent with NRR's void acceptance criteria. The inspectors also confirmed that: (1) the licensee addressed the effect of pressure changes during system startup and operation since such changes could significantly affect the void fraction from the initial value; and (2) the range of flow conditions evaluated by the licensee was consistent with the full range of design basis and expected flow rates for various break sizes and locations.

The inspectors also reviewed the void acceptance criteria used by the licensee when reviewing operability evaluation EC371224, "NRC GL08-01 Venting and Gas Accumulation Evaluation for CS," in an earlier inspection period. This additional activity counted towards the completion of this TI and was documented in Inspection Report 05000254/2009004; 05000265/2009004.

(c). The inspectors reviewed selected documents, including calculations and engineering evaluations, with respect to gas accumulation in the subject systems. Specifically, the inspectors verified these documents addressed venting requirements, keep-full systems, void control during system realignments, and the effect of debris on strainers in the torus causing accumulation of gas under the upper elevation of strainers and the impact on NPSH requirements.

The inspectors noted an example where the licensee's design reviews failed to properly assess the subject of gas accumulation in piping. Specifically, procedure QCOP 1000-30, "Post-Accident RHR Operation," included a precaution to maintain a pressure greater than 2.5 psig at the torus airspace to ensure adequate NPSH. However, calculation QDC-1000-M-1019, "EPU Evaluation of RHR/CS NPSH Analysis: Post-LOCA for Short and Long Term Events," concluded that higher pressure values were required at different times during a LOCA. This issue was determined to be a minor procedure issue because the higher NPSH limit values established by the calculation were controlled through emergency operating procedures. This issue was captured in the CAP as AR01273475.

(d). The inspectors conducted a walkdown of selected regions of the GL 2008-01 scoped systems in sufficient detail to assess the licensee's walkdowns. The inspectors also verified the information obtained during the licensee's walkdown was consistent with the items identified during the inspectors' independent walkdown. The inspectors also assessed if the P&IDs accurately described the subject systems and were up-to-date with respect to recent hardware changes. In addition, the inspectors assessed if the licensee had

isometric drawings that describe the configurations of the GL 2008-01 scoped systems and had confirmed the accuracy of the drawings.

The inspectors noted two examples of minor drawing errors. Specifically, drawing M-3132, Sheet 2, did not show a vent line associated with the high pressure core injection (HPCI) discharge line and drawing M-984K did not show the ECCS fill pump discharge valve. These issues were captured in the CAP as AR01266420 and AR01266169.

The inspectors also conducted a similar walkdown of selected portions of the CS and HPCI systems in earlier inspection periods. These additional activities counted towards the completion of this TI and were documented in Inspection Report 05000254/2009004; 05000265/2009004 and Inspection Report 05000254/2010002; 05000265/2010002.

(e). The inspectors verified that licensee's walkdowns have been completed. In addition, the inspectors selectively verified that information obtained during the licensee's walkdowns were addressed in procedures, the CAP, and training documents.

(3) Testing: The inspectors reviewed selected surveillance and post-maintenance test procedures and results to assess if the licensee approved and was using procedures that were adequate to address the issue of gas accumulation and/or intrusion in the subject systems. Specifically:

(a). The inspectors reviewed procedures used for conducting periodic void monitoring and determination of void volumes to ensure that the void criteria was satisfied and will be reasonably ensured to be satisfied until the next scheduled void surveillance. The inspectors noted the following examples where the void monitoring program was deficient:

(i). The inspectors found an instance where the gas accumulation trend data indicated no gas was found whereas the work order package indicated gas was found. Trending is required by procedure ER-AA-2009, "Managing Gas Accumulation," to facilitate an understanding of the void accumulation history to preemptively identify degrading conditions and take reasonable actions to prevent an adverse condition such as re-evaluating the monitoring periodicity. This issue was determined to be a minor procedure adherence deficiency because the void size met the specified acceptance criteria, was not a programmatic deficiency, and no adverse trend resulted from the corrected data. This issue was captured in the CAP as AR1265516.

(ii). The licensee did not have a basis for the as-found acceptance criterion used for the surveillance requirement for venting the RHR discharge piping. The inspectors were concerned because the lack of calculations to support this acceptance criterion does not ensure the surveillance activity demonstrates that the design basis and specified functions of the system are met. As a result, the licensee performed a calculation that confirmed the acceptance criterion contained in the surveillance procedure was adequate. Therefore, this issue was

determined to be a minor test control deficiency and was captured in the CAP as AR01272675.

(b). The inspectors reviewed selected procedures used for void control, such as filling and venting, following conditions which may have introduced voids into the subject systems to verify the procedures addressed testing for such voids and provided processes for their reduction or elimination.

The inspectors also review selected portions of procedures used during the surveillance testing of HPCI, CS, and LPCI mode of operation of RHR in an earlier inspection period. This additional activity counted towards the completion of this TI and was documented in Inspection Report 05000254/2010002; 05000265/2010002.

(4) Corrective Actions: The inspectors reviewed selected licensee's assessment reports and CAP documents to assess the effectiveness of the licensee's CAP when addressing the issues associated with GL 2008-01. The inspectors also verified that commitments were included in the CAP.

Based on this review, the inspectors concluded there is reasonable assurance that the licensee will complete all outstanding items and incorporate this information into the design basis and operational practices. Therefore, this TI is considered closed

c. Findings

(1) Failure to Update the UFSAR With the Safety Analysis Performed In Response to GL 2008-01

Introduction: The inspectors identified a Severity Level IV Non-Cited Violation of 10 CFR 50.71, "Maintenance of Records, Making of Reports," for the failure to update the UFSAR. Specifically, the UFSAR was not updated to reflect the analysis requested by the NRC in GL 2008-01.

Description: On January 11, 2008, the NRC requested each addressee of GL 2008-01 to evaluate its ECCS, DHR, and containment spray systems licensing basis, design, testing, and corrective actions to ensure that gas accumulation was maintained less than the amount that would challenge the operability of these systems, and take appropriate actions when conditions adverse to quality were identified. As a consequence, the licensee performed analyses that resulted, in part, in the development of void acceptance criteria, identification of gas susceptible locations in piping, development of periodic gas monitoring procedures for these newly identified locations, and the acceptance of some locations that could potentially accumulate voids that were determined to be benign. However, on September 4, 2011, the inspectors noted the licensee had not updated the UFSAR to reflect these analyses.

Regulatory Guide 1.181, "Content of the Updated Final Safety Analysis Report in Accordance with 10 CFR 50.71(e)," stated that Revision 1 of NEI 98-03, "Guidance for Updating Final Safety Analysis Reports," provided methods that were acceptable to the NRC staff for complying with the provisions of 10 CFR 50.71(e). NEI 98-03 defined safety analyses, in part, as those performed pursuant to Commission requirement to demonstrate the capability to shut down the reactor and maintain it in a safe shutdown condition, or the capability to prevent or mitigate the consequences of accidents. In

addition, Section 6.1.3 of NEI 98-03 stated, in part, that the effects of analyses and evaluations performed in response to NRC generic letters must be reflected in UFSAR updates if, on the basis of the results of the requested analysis or evaluation, the existing design bases or UFSAR description are either not accurate or not bounding or both.

The inspectors determined the UFSAR description at the time of the inspection was not bounding with respect to the subject of gas accumulation management for the GL 2008-01 scoped systems. Specifically, the UFSAR did not contain a description associated with gas accumulation management in the GL 2008-01 scoped systems. As such, the allowance of gas in GL 2008-01 scoped systems was not considered part of the design basis as described in the UFSAR. The only description of gas accumulation management was included in the TS Basis and was limited to the discharge piping of some of the subject systems. However, the licensee, in response to GL 2008-01, develop analyses that established allowable gas sizes for all sections of piping that did not challenge operability of these systems. This information was used to create acceptance criteria for procedures used for monitoring a number of gas susceptible locations and to exclude other locations from monitoring. This represented a change from the UFSAR de facto allowance for gas accumulation (i.e., no gas allowed).

The licensee captured the inspectors concerns in the CAP as AR01279538. The corrective action that was considered at the time of this inspection was to update the UFSAR to summarize the analyses performed during the GL 2008-01 reviews.

Analysis: The inspectors determined the failure to update the UFSAR with the analysis performed for GL 2008-01 was contrary to 10 CFR 50.71, “Maintenance of Records, Making of Reports,” and was a performance deficiency. The performance deficiency was evaluated using IMC 0612, “Power Reactor Inspection Reports,” and was determined to be of minor significance. However, it was also determined to involve a traditional enforcement violation because it impacted the regulatory process. Specifically, failures to update the UFSAR challenges the regulatory process because it serves as a reference document used for recurring safety analyses, evaluating license amendment requests, and in preparation for and conduct of inspection activities. The traditional enforcement violation was determined to be more than minor in accordance with the NRC Enforcement Policy because the information that was not included in the UFSAR had a material impact on safety and licensed activities. Specifically, this information described the analyses performed pursuant to a Commission request via GL 2008-01 to demonstrate: (1) the capability of systems relied upon to shut down the reactor; (2) maintain it in a safe shutdown condition; and (3) to prevent or mitigate the consequences of an accident with respect to potential gas accumulation. This information is necessary for licensing and regulatory decisions.

The traditional enforcement violation was determined to be a SL IV violation in accordance with Section 6.1 of the NRC Enforcement Policy. Specifically, the failure to update the FSAR to reflect the analysis performed in response to GL 2008-01 did not result in an unacceptable change to the facility or procedures.

The inspectors determined an evaluation for cross-cutting aspect was not applicable because this is a traditional enforcement violation.

Enforcement: Title 10 CFR 50.71(e) requires, in part, that each person licensed to operate a nuclear power reactor shall update periodically the FSAR originally submitted

as a part of the application for the license to assure that the information included in the report contains the latest information developed. It also states that this submittal shall include the effects of all analysis of new safety issues performed by or on behalf of the licensee at Commission request.

Contrary to the above, as of October 20, 2011, the licensee had not updated the FSAR to reflect the analysis performed in response to the Commission request contained in GL 2008-01. Because this was a SL IV violation and was entered into the licensee's corrective action program as AR01279538, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000254/2011009-06; 05000265/2011009-06, Failure to Update the FSAR With the Safety Analysis Performed In Response to GL 2008-01).

(2) Failure to Ensure That RHR Would Be Capable to Respond to a Loss of Cooling Accident at Mode 3

Introduction: A finding of very low safety significance and associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," was identified by the inspectors for the failure to ensure that the ECCS mode of operation of RHR would be capable of performing its mitigating function at Mode 3.

Description: On September 4, 2011, the inspectors identified the RHR system would experience flash evaporation during a rapid system depressurization while in Mode 3. The inspectors were concerned this condition could lead to steam binding the RHR pumps and/or an adverse water hammer following system realignment to the contaminated condensate storage tank (CCST).

On August 27, 2009, the licensee completed an evaluation of Prairie Island's Licensee Event Report (LER) 1-09-04, "RHR System Inoperability While in Mode 4 due to Potential Steam Voiding." This operating experience was summarized in IN 2010-11 along with other similar examples. During this review the licensee recognized this operating experience had applicability to BWRs. However, the licensee concluded the station did not have a similar vulnerability because it has multiple low pressure injection systems. However, the inspectors determined this conclusion was incorrect because TS 3.5.1, "ECCS – Operating," required, in part, that each ECCS injection subsystem be operable in Mode 3. Thus, the licensee could not credit the availability of other systems to make up for the potential unavailability of the ECCS mode of RHR.

On June 30, 2010, the licensee completed an evaluation of NRC Information Notice (IN) 2010-11, "Potential for Steam Voiding Causing RHR System Inoperability." This operating experience discussed the potential for water flashing to steam in the RHR piping upon switching from DHR to ECCS mode of operation. High temperature water in the RHR system had the potential to flash to steam during a LOCA scenario while in Mode 3. Specifically, the RHR system operating in its DHR mode of operation would be at reactor cooling system (RCS) temperature and pressure. Following a LOCA, the trapped fluid in the RHR lines would flash because it would suddenly be exposed to lower pressures resulting from swapping the suction of RHR over to the CCST (or equivalent) following system realignment to its ECCS mode of operation. The CCST is open to the atmosphere. The licensee's evaluation of IN 2010-11 concluded this operating experience was not applicable to Boiling Water Reactors (BWRs) like Quad Cities Power Nuclear Station because the examples cited in the IN occurred at

pressurized water reactors. However, the IN stated that it was applicable to all holders of or applicants for an operating license for a nuclear power reactor.

The inspectors noted steam void formation would occur if a LOCA of sufficient size to depressurize the RCS occurred. Specifically, the RHR system is subjected to RCS temperature and pressure when operated in the DHR mode, which exceeds saturation conditions of water at containment pressure. During a shutdown-LOCA of sufficient size, the reactor would depressurize to containment pressure. This would result in the flash evaporation of water inside the RHR system because its temperature would be above the saturation temperature of water at containment pressure.

The inspectors concluded the RHR system would be significantly filled with steam. Specifically, assuming initial and final saturation conditions at 350^{o}F and 212^{o}F, respectively, a simplified thermodynamic analysis determined that approximately 14% of the mass of water will evaporate. However, the resulting steam volume will be approximately 257 times the final volume of water (i.e., the fraction of water that did not evaporate). The steam would condense rapidly due to the rapid increase in discharge pressure resulting from system initiation and when exposed to the injected coolant. The inspectors were concerned because the licensee had not evaluated this condition to ensure the system would not be adversely affected.

The licensee captured the inspectors' concerns in the CAP as AR01272614. The corrective actions considered at the time of this inspection included procedure changes to gradually cool down RHR prior to transitioning from the DHR to ECCS mode of operation and vent if necessary, and to participate in the long-term resolution of this issue via BWR Owners Group activities.

Analysis: The inspectors determined the failure to ensure that the ECCS mode of operation of RHR would be capable of performing its mitigating function at Mode 3 was contrary to 10 CFR Part 50, Appendix B, Criterion III, "Design Control," and was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the mitigating system cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the design of RHR did not ensure that its ECCS mode of operation would be capable of performing its mitigating function at Mode 3. Steam voids would form when transitioning from DHR to ECCS mode of operation in Mode 3 and this condition was not analyzed.

The inspectors reviewed IMC 0609 Appendix G, "Shutdown Operations Significance Determination Process" for this finding. Using checklist 5, "BWR Hot Shutdown: Time to Boil < 2 hours: RHR in Operation", the inspectors determined the finding required a Phase II SDP evaluation.

The inspectors determined the finding affected a single train of RHR at each unit for less than 2 hours. The senior reactor analysts (SRAs) performed the Phase II SDP using this information. The SRAs used the initiating event likelihoods (IEL) for the loss of RHR and loss of inventory event trees for an exposure period of less than three days. The safety function of manual low pressure injection was assigned an equipment credit of "2" to represent the availability of at least one train of low pressure injection. This is conservative because the low pressure core spray and condensate systems are unaffected by the finding. Additionally, the IEL is conservative, because the exposure

period is much less than three days. The result of the Phase II analysis was a finding of very low safety significance (Green). The dominant core damage sequence was a loss of inventory followed by failure of manual low pressure injection and failure of manual high pressure injection.

The inspectors determined this finding had a cross-cutting aspect in the area of problem identification and resolution because the licensee did not thoroughly evaluate relevant external operating experience. Specifically, the licensee's evaluation of IN 2010-11 and LER 1-09-04 incorrectly concluded the station was not vulnerable to the operating experience described therein. [P.2(a)]

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions.

Contrary to the above, as of October 5, 2011, the licensee did not correctly translate applicable regulatory requirements and the design basis into specifications. Specifically, the operability requirements of RHR in Mode 3 defined by TS 3.5.1 were not translated into applicable specifications of the system. The RHR design did not prevented steam void formation during system depressurization when transitioning from DHR to ECCS mode of operation and this condition was not analyzed. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as AR01272614, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000254/2011009-07; 05000265/2011009-07, Failure to Ensure that RHR Would Be Capable to Respond to a LOCA at Mode 3).

4OA6 Meeting(s)

.1 Exit Meeting Summary

On October 21, 2011, the inspectors presented the inspection results to Mr. M. Prospero, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors asked the licensee whether any material discussed during the exit should be considered proprietary. Several documents reviewed by the inspectors were considered proprietary information and were either returned to the licensee or handled in accordance with NRC policy on proprietary information.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

M. Prospero	Plant Manager
S. Darin	Engineering Director
K. O'Shea	Interim Operations Director
C. Alguire	Design Engineering Senior Manager
W. Beck	Regulatory Assurance Manager
T. Petersen	Regulatory Assurance
R. Buttke	Engineering Manager
J. Bailey	Engineering Manager
T. Rushing	Senior Engineer
D. Luebbe	Operations SRO

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

5000254/2011009-01; 5000265/2011009-01	NCV	Non-Conservative Calibration Tolerance Limits for Electrical Relay Settings (Section 1R21.3.b.(1))
5000254/2011009-02; 5000265/2011009-02	NCV	Failure to Perform Required In-Service Testing of Shutdown Cooling Suction Valves (Section 1R21.3.b.(2))
5000254/2011009-03; 5000265/2011009-03	NCV	Safety-Related Battery Charger Testing and Maintenance Procedures Did Not Include Steps for Electrolytic Capacitor Replacement (Section 1R21.3.b.(3))
5000254/2011009-04; 5000265/2011009-04	URI	Tornado Missile Protection of the Emergency Diesel Generator Air Intake and Exhaust (Section 1R21.3.b.(4))
5000254/2011009-05; 5000265/2011009-05	URI	Diesel Generator Technical Specification Frequency and Voltage Variation not Considered in Loading Calculations (Section 1R21.4.b.(1))
5000254/2011009-06; 5000265/2011009-06	NCV	Failure to Update the FSAR With the Safety Analysis Performed In Response to GL 2008-01 (Section 4OA5.1.c(1))
5000254/2011009-07; 5000265/2011009-07	NCV	Failure to Ensure that RHR Would Be Capable to Respond to a LOCA at Mode 3 (Section 4OA5.1.c(2))

Closed

5000254/2011009-01; 5000265/2011009-01	NCV	Non-Conservative Calibration Tolerance Limits for Electrical Relay Settings (Section 1R21.3.b.(1))
5000254/2011009-02; 5000265/2011009-02	NCV	Failure to Perform Required In-Service Testing of Shutdown Cooling Suction Valves (Section 1R21.3.b.(2))
5000254/2011009-03; 5000265/2011009-03	NCV	Safety-Related Battery Charger Testing and Maintenance Procedures Did Not Include Steps for Electrolytic Capacitor Replacement (Section 1R21.3.b.(3))
5000254/2011009-06; 5000265/2011009-06	NCV	Failure to Update the FSAR With the Safety Analysis Performed In Response to GL 2008-01 (Section 4OA5.1.c(1))
5000254/2011009-07; 5000265/2011009-07	NCV	Failure to Ensure that RHR Would Be Capable to Respond to a LOCA at Mode 3 (Section 4OA5.1.c(2))

LIST OF DOCUMENTS REVIEWED

The following is a partial list of documents reviewed during the inspection. Inclusion on this list does not imply the NRC inspector reviewed the documents in their entirety, but rather that selected sections or portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

CALCULATIONS

Number	Description or Title	Revision
	MOV MIDACALC Results	
004-E-005-1001	Quad 2 MOV Terminal Voltage Calculations	9
004-E-020	Quad 1&2 MOV Terminal Voltage Calculations	5
0591-171-008	Diesel Fuel Oil Consumption and Tank Volume	1A
0591-215-01	EDG Fuel Oil Transfer Pump NPSH and Return Line Sizing	2
0591-523-003	Diesel Fuel Oil Storage Tank Vortexing	1
4834-42-19-00	Calculation for Diesel Generator Neutral Grounding	0
5570-31-19-1	125 VDC Fault Currents	2A
7318-32-19-1	Calculation for Inputting 125Vdc Load Profiles into ELMS-DC for Units 1&2	041
7923-36-19-1	Safe Shutdown AC System Coordination for Appendix R	0
9149-20-19-1	125Vdc Bus Voltage Calculation for Quad Cities Station	010
EC 333328	For the Diesel Generator Heat Exchangers: Provide a Tube Plugging Limit, Tube Plugging Criteria, and Retubing Method	10/10/01
EC 362215	Determine Tube Fouling Limit for Diesel Generator Heat Exchangers	11/22/06
EC 391887	Engineering Evaluate 2-5746A RHR Room Cooler End Cover	09/16/09
EC 366525	Review of the Effects of EDG Frequency on ECCS Systems	0
EC 371223	NRC GL08-01 Follow-Up – Design Engineering Analysis HPCI	1
EC 371224	NRC GL08-01 Follow-Up – Design Engineering Analysis CS	1
EC 371225	NRC GL08-01 Follow-Up – Design Engineering Analysis RHR	1
EC 371440	GL08-01 System Evaluation Template – HPCI System	1
EC 371614	GL08-01 System Evaluation Template – CS System	1
EC 371619	GL08-01 System Evaluation Template – RHR System	1
EC 372516	Unit 1 (RCIC Setpoint and Head Correction Evaluation)	
EC 372517	Unit 2 (RCIC Setpoint and Head Correction Evaluation)	

CALCULATIONS

Number	Description or Title	Revision
GE-NE-A22-00103-56-01-Q	Dresden and Quad Cities Extended Power Uprate Task T611, Appendix R Fire Protection (Quad Cities Station), GE-NE-A22-00103-56-01-Q, Rev. 0, January 2001	0
NED-I-EIC-0277	RCIC Turbine Exhaust Pressure Setpoint Error Analysis	001
NED-M-MSD-93	The Thrust Seismic Limits of the Quad Cities Mark I MOVs	0
QC-019-E-002	4KV Bus 13-1/23-1&14-1/24-1 Cross Tie Coordination Study	3
QC-027-M-011	Fuel Oil Day Tank Spec (SBO)	0
QC-270-M-017	SBO Diesel Generator Fuel Pump Sizing	1
QC-27Q-E-002	Station Blackout (SBO) DG 125V DC Battery Sizing	004
QC-27Q-E-012	SBO Diesel Generator Grounding XFMR and Resistor Sizing	1
QC-27Q-E-017	SBO Bus-Ties Relay Settings and Coordination Study	0
QC-470-E-001	Thermal Overload Heater Sizing for MOVs1(2)-1001-34A/B	1
QC-58Q-E-001	Thermal Overload Heater Sizing for MOVs Requiring Motor Replacement at Quad Cities Station	2
QCD-1000-M-0627	Safe Shutdown NPSH Evaluation for RCIC and RHR Pumps	0A, 0B
QCD-2300-I-0940	HPCI/RCIC Suppression Pool and CST Level Setpoint Error Analysis	001
QDC-0000-E-0206	Motor Terminal Voltage Calculation for Quad Cities Unit 1 and Unit 2 GL 89-10 Motor Operated Valves	1
QDC-1000-M-0131	NPSH Available vs. Required for RHRSW and DGCW Pumps	3
QDC-1000-M-0419	Flow Model of ECCS Suction Piping with Core Spray and RHR System Discharge Piping	2
QDC-1000-M-0590	RHR and CS NPSH Limits for EOPs	5
QDC-1000-M-0592	RHR/CS Vortexing and NPSH Analysis for Suction from CCST	3A
QDC-1000-M-0627	Safe Shutdown NPSH Evaluation for RCIC and RHR Pumps	0
QDC-1000-M-0698	Design Basis Analysis of RHR Heat Exchanger Cooling Capacity	0
QDC-1000-M-1019	EPU Evaluation of RHR/CS NPSH Analysis: Post-LOCA for Short and Long Term Events	1
QDC-1300-M-0589	RCIC NPSH Limits for EOPs	1
QDC-1300-M-0800	Pressure Drop through RCIC Discharge Piping to Reactor Vessel	1
QDC-1300-M-0977	Overpressure Analysis of RCIC Pump Discharge for Postulated Turbine Control System Failure during Surveillance Testing (GE SIL 623)	0

CALCULATIONS

Number	Description or Title	Revision
QDC-1400-M-1170	Determination of Acceptance Criteria for RCIC and CS Monthly Vent Verifications	2
QDC-1600-M-0738	Determination of Vortex Level Limit Curve for Suppression Pool	0,6
QDC-1600-M-1233	Determination of Acceptable Hardened Wetwell Vent Flow Rate for EPU	0
QDC-2300-M-0921	Determination of Acceptance Criteria for QCOS 2300-09, HPCI Monthly Vent Verification	3
QDC-3300-M-0489	Useable Water Volume of Contaminated Condensate Storage Tanks for HPCI and RCIC, Including Vortexing Considerations	3
QDC-3900-M-1285	DGCW Cubicle Cooler Supply Line Restricting Orifice Mod	0
QDC-4600-M-1112	Design Review of Emergency Diesel Generator Starting Air System Capability	0
QDC-5700-M-0477	RHR Corner Room Heat Load vs. Cooler Capacity	0
QDC-5700-M-0806	ECCS Room Cooler Performance Calc Under Design Basis and Degraded Conditions	1
QDC-6600-E-0559	Design Analysis SBO Loading for Appendix R	1
QDC-6600-E-0881	Station Blackout Diesel Generator Loading Calculation	0
QDC-6700-E-1503	Analysis of Load Flow, Short Circuit, and Motor Starting using ETAP PowerStation	5,005A
QDC-8300-E-1587	Determination of Battery Intercell Connector Resistance Limits	000
QDC-8300-S-0673	Analysis – Review of Aged Battery Seismic Qualification Report	0
QUA-2-1001-36A	AC Motor Operated Globe Valve Calculation	5
VT-16	RHRSW and DGCW Pump Room Cooler Performance Evaluation	1
XCE064.0200.001	Determination of Required Hardened Wetwell Vent Flow Rate and Pipe Size	1

CORRECTIVE ACTION DOCUMENTS GENERATED DUE TO THE INSPECTION

Number	Description or Title	Date
1265516	GASM - Discrepencies Found in Trend Data	09/20/11
1265893	CDBI - Discrepencies in SBO Batt Walkdown	09/21/11
1266169	GASM - Discrepency on U1 Keepfill Isometric Drawing	09/21/11
1266186	GASM - ECCS Keep Fill Procedure Enhancement	09/21/11
1266395	CDBI - MOV TOL Calculation Discrepencies	09/22/11
1266420	GASM - Discrepancy on HPCI Isometric Drawing	09/22/11
1266665	CDBI - Untimley Completion of Corrective Work Order	09/22/11

CORRECTIVE ACTION DOCUMENTS GENERATED DUE TO THE INSPECTION

Number	Description or Title	Date
1267001	GASM - UFSAR ECCS Venting Description Requires Update	09/23/11
1267004	GASM - Noise in U2 HPCI Room Near Steam Inlet Piping	09/23/11
1267024	GASM - QCOA 1000-01 Not Consistent with QCOP 1000 Guidance	09/23/11
1267157	CDBI - SBO Battery Sizing Calculation Error	09/23/11
1267203	CDBI - NRC Identified Incorrect Reference in Calculation	09/23/11
1267218	CDBI - Lack of Formal Calculations for Protective Relays	09/23/11
1268150	CDBI - 125 VDC Battery Loading not Properly Modeled in ELMS	09/26/11
1268834	CDBI - SBO Mode Switch Not Tested in Station Procedure	09/27/11
1269377	GASM - Discrepancy Found in Procedure QOS 0005-01	09/28/11
1269861	CDBI - Paragragh B.2 of QCOS 6900-16 is incorrect	09/29/11
1270571	CDBI - Calculation 7923-36-19-1 Does Not Match RSOs	
1271534	CDBI - Remove Reference to Historical Document in Procedures	10/03/11
1271815	CDBI - Concerns Regarding Use of QCOP 1600-13 Attachment C	10/03/11
1272106	GASM - Procedure Enhancement for HPCI/RCIC	10/04/11
1272130	CDBI - Remove Historical Information From Fuel Oil Calculation	10/04/11
1272265	CDBI - RHR SW Flow Transmitter Historical Calibration Range Error	10/04/11
1272614	GASM - Potential for SDC Flashing During LOCA	10/05/11
1272675	GASM - Basis for Timing in RHR Venting Procedure	10/05/11
1272785	CDBI - NRC Identified No PM Established for Bus 2A	10/05/11
1272835	CDBI - No PM for Neutral Grounding Resistor EDG and SBO - 1238	10/05/11
1272918	CDBI Charge Load Test Template not Alligned to QCEMS 0210-02	10/05/11
1273443	CDBI - QOA 6900-04 Unvalidated Time Requirement - 1374	10/06/11
1273475	GASM - Incorrect Historical Statement in Procedure	10/06/11
1273635	CDBI - Procedure Improvement for EDG PM	10/07/11
1273641	CDBI - RCIC Local Controller Station Missing Label	10/07/11
1273647	Not CDBI - Planned NRC CDBI Simulator Demonstration Rescheduled	10/07/11
1273649	CDBI - Core Spray Local Controller Station Missing Label	10/07/11
1273650	CDBI - RHR Local Controller Station Missing Label	10/07/11
1273686	CDBI - Grounding Resistor Rating Error in 4 kV Bus Calculations	10/07/11
1273822	GASM - Procedure Revision for CCST Suction NPSH/Vortex Curves	10/07/11
1273823	CDBI - Calc 7318-32-19-1 Missing Reference Attachment	10/07/11
1276063	CDBI - ID Deviation from Vendor Replacement Guide for E. Caps	10/13/11

CORRECTIVE ACTION DOCUMENTS GENERATED DUE TO THE INSPECTION

Number	Description or Title	Date
1276106	CDBI - Seismic Housekeeping in U1 EDG Room	10/13/11
1278981	GASM - QCOP 1000-30 Attachment A and B Enhancements Needed	10/20/11
1279066	CDBI - Reclassification of SDC Suction Valve for IST	10/20/11
1279179	CDBI - Degraded Condition Not Reported (IR) See WO 1252888-01	10/20/11
1279207	CDBI - Evaluate Discrepant Test Data - WO 1252888-01	10/20/11
1279533	CDBI - 4 kV Protective Relay Tolerances	10/21/11
1279538	GASM - UFSAR Not Updated After GL 08-01 Reviews	10/21/11
1281009	Tornado Missile Protection Unresolved Item	10/25/11
1288784	CDBI - Technical Specifications Limits for EDG	11/10/11

CORRECTIVE ACTION DOCUMENTS REVIEWED DURING THE INSPECTION

Number	Description or Title	Date
0223815	Prepare a UFSAR Change to Document the Ability to Isolate RCIC Piping	09/14/04
0477581	Review Short Circuit Ratings for Busses 11, 12, 21, 22	03/15/07
0520627	CDBI – Performance of Corrective Maintenance Was Untimely	08/16/06
0521248	CDBI – Input Data for 1/2 EDG is Incorrect	08/18/06
0521252	CDBI – 125 VDC Battery Corrosion Is Not Acceptable	08/18/06
0521503	CDBI – Incorrect Input Parameters for Calc	08/18/06
0525113	CDBI-NRC ID'd Procedural Error in QOA 6900-040100-01	08/29/06
0525397	Non-Conservative Sizing Calculation for ADS/SRV Air Accumulator Storage Tank	08/30/06
0525492	CDBI-Battery Surveillance Guidance Differs from Vendor	08/30/06
0525592	NRC CDBI-HPCI Pumps Have Non-Conservative IST Criteria	08/30/06
0526361	CDBI Voltage Drop Calculation Discrepancies	09/01/06
0526373	CDBI – ETAP Input Discrepancies for EDG	09/01/06
0530544	Failure to Meet SR 3.8.4.2 Concerning Battery Corrosion	09/13/06
0534101	150 Micro-Ohms Battery Cell Connections	11/09/07
0540524-04	Draft OE/NER and Submit to R/A Reference also IR 543848 and 534101	11/30/06
0540524	Basis for Battery Inter-Cell Resistance in Technical Specifications	10/05/08
0543848	Non-Conservative TS SR for Battery Intercell Resistance	10/12/06
0591442	Effect of EDG Freq on Loading and Pump Flows	02/14/07
0606009	During Step F.1 FF QCOP 6900-24, the Float Pot Failed	03/19/07
0739417	Need New Vents and Confirmatory UTs – HPCI Piping	02/21/08
0739432	Need New Vent and Confirmatory UTs – CS Piping	02/21/08

CORRECTIVE ACTION DOCUMENTS REVIEWED DURING THE INSPECTION

Number	Description or Title	Date
0801914	CS Vents Not at Absolute High Point on Discharge	07/30/08
0822942	CDBI-TOL Relays For MOVs Not Periodically Tested	09/26/08
0823087	CDBI-MOV Thermal Overload Potential Trips	09/26/08
0829385	CDBI: RCIC PS 1(2)-1360-26A/B Head Correction Incorrect	10/10/08
0832295	Actions Associated with GL 2008-01	10/17/08
0845939	RHR Drawings Require Line Number Corrections and Additions	11/17/08
0904946	NER NC-09-014 Yellow Failure of MOVs Due to Hardened Grease	04/08/09
0935272	RHR Inoperability in Mode 4 Due to Steam Voiding	06/25/09
0966487	Cavitation Induced Wall Thinning 2A RHRSW Pp Rm Clr Piping	02/22/05
0972802	MOV Program FASA Reveals a Standards Deficiency	09/30/09
1050704	2A,2B, 2C RHR SW Pump Motors Require Cleaning	03/25/10
1086314	NRC IN 2010-11 Steam Void Causing RHR Inoperability	06/30/10
1113330	Transformer/Bus Ground Overcurrent Relay Settings	03/31/11
1131407	U2 125 Volt Normal Battery's Above 120 percent of Baseline	10/27/10
1182901	Opex Review of IN 2010-23, Malfunction of EDG Speed Switch	03/03/11
1189733	JER – Procedure Enhancement to QCOP 1600-13	03/20/11
1189736-02	Submit MOD Proposal to PHC Subcommittee Reference IR 189736	07/21/11
1189840	JER – Roll Up of OPS Response to IER 11-1 Thus Far	03/20/11
1222114	U2 125VDC Intermittent Ground	05/29/11
1224498	Received 902-8 B9 125VDC Ground Alarm	06/03/11
1224701	Unit 1 HPCI – Torus Suction Line – Failed UT Verification	06/04/11
1228294	Battery Intercell Resistance High	
1239437	RHR and Core Spray Technical Specification Venting Results not Trended	07/13/11
1243734	CDBI FASA Calculation Deficiency	07/25/11
1244967	U2 125 VDC Alt Battery, Cell 18, (-) Terminal 2D Corrosion	07/28/11
1245025	Unexpected U2 125VDC Level 2 Ground	07/28/11
1245672	NRC IN 2011-17 Calc Method for OP Determination of Gas	09/14/11
1252955	Unit 1 HPCI – Torus Suction Line – Failed UT	08/18/11
1262586	3D Corrosion Found on U1 (125V Alt., 24/48 1A1&1A2, SBO) Batt	09/13/11
1262616	Poor Housekeeping on U1 Station Battery	09/13/11
1265674	Intermittent Ground on U2 125 VDC Safety-Related Battery	09/20/11

DRAWINGS

Number	Description or Title	Revision
1602-01	Containment Atmosphere Control System (P&ID M-34, M-76)	4
4E-1301	Single Line Diagram	AJ

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Number	Description or Title	Revision
4E-1304	Key Diagram 4160V SWGRs 13-1 and 14-1	AE
4E-1304A	Key Diagram 4160V Switchgears 13-1 and 14-1	D
4E-1318B	Overall Key Diagram 125V DC Distribution Centers	J
4E-1328	Single Line Diagram Emergency Power System	F
4E-1337	Relay Metering and EXC Diagram Standby Diesel Gen 1-2	05/05/07
4E-1345 Sh. 1	Schematic Diagram 4160V Bus 13-1 Standby Diesel 1-2 Feed Breakers	BM
4E-1345 Sh. 2	Schematic Diagram 4160V Bus 13-1 Standby Diesel Half Feed Breakers	BC
4E-1345 Sh. 3	Schematic Diagram 4160V Bus 13-1 Standby Diesel Half Feed Breakers	BD
4E-1346A	Schematic Diagram Safe Shutdown System 4KV ACB 152-3101 and GCB 152-1425	G
4E-1351A Sh. 1	Schematic Control Diagram Engine Control and Generator Excitation Standby Diesel Generator 1/2	AT
4E-1351A Sh. 2	Schematic Control Diagram Engine Control and Generator Excitation Standby Diesel Generator 1/2	AN
4E-1438M	Schematic Diagram RHR System Motor Operated Valves DIV II	AB
4E-2067E	125VDC Battery Cell Connection Layout	E
4E-2301	Protective Relay Settings Emergency Diesel Generator	A
4E-2301	Single Line Diagram, Sheet 2	Z
4E-2301	Single Line Diagram, Sheet 3	AE
4E-2303	Key Diagram 4160V Switchgear's 21, 22, 23, and 24	N
4E-2304	Key Diagram 4160V Switchgear 23-1 and 24-1	X
4E-2318	Key Diagram 125V DC Distribution Center	AN
4E-2318A	Key Diagram Turbine Bldg. 125VDC Main Bus Distr. Panel	R
4E-2318B	Overall Key Diagram 125V DC Distribution Centers	H
4E-2342	Schematic Diagram 4160 Bus 23 Main and Reserve Feed Air Circuit Breakers	D
4E-2344	Schematic Diagram SBO Tie Feed Breaker 4160V SWGR Bus 23-1	B
4E-2438K	Schematic Diagram RHR System Motor Operated Valves DIV I	R
4E-2484E	Schematic Diagram Reactor Core Isolation Cooling System Part 5	T
4E-2484F	Schematic Diagram Reactor Core Isolation Cooling System Part 6	Q
4E-2501D	Schematic Diagram PCI System Switch Development	R

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Number	Description or Title	Revision
4E-2501E	Schematic Diagram APCVS Switch Development	A
4E-2509A Sh. 1	Schematic Diagram PCI System Atmospheric Control System Inboard	V
4E-2509A Sh. 2	Schematic Diagram PCI System Atmospheric Control System Inboard	U
4E-2509A Sh. 3	Schematic Diagram PCI/APCV System Atmospheric Control System Inboard	C
4E-2575BV	Schematic Diagram Control Room Annunciator Panel 902-8, Part 4 of 7	Q
4E-2655F	Internal Schematic and Device Location Diagram 4160V SWGR Bus 23-1 Cubicles 4 and 6	G
4E-2685C	Schematic Diagram Turb Bldg125VDC Main Bus 2 and 2A	Q
4E-2685D	Wiring Diagram Turb Bldg 125VDC Main Bus Distribution panel	K
4E-6623	Key Diagram 4160V SWGR Bus 31 Safe Shutdown System	D
4E-6869C	Key Diagram 4160V Switchgear Bus 61	A
4E-6870AB	Relay and Metering Diagram Station Blackout Diesel Generator Unit 1	A
4E-6870AB	Relay and Metering Diagram Station Blackout Diesel Generator Unit 2	A
4E-7869C	Key Diagram Station Blackout 4160V Switchgear Bus 71	A
4E-7869D	One Line Diagram Station Blackout Electrical Distribution	A
4E-7870C	Schematic Diagram SBO 4160V SWGR Bus 71 to Bus 23-1 Feed	A
B-23	Containment Vessels Suppression Chamber Penetration	AC
B-404	Containment Vessels Suppression Chamber Penetration	AC
M-3103 Sh. 3	Recirculation System	04/02/99
M-3104 Sh. 1	CS System	03/08/99
M-3104 Sh. 2	CS System	03//09/99
M-3105 Sh. 2	RHR System	03/09/99
M-3105 Sh. 3	RHR System	03/10/99
M-3114 Sh. 1	CS System	03/10/99
M-3114 Sh. 2	CS System	05/04/98
M-3130 Sh. 1	CS System	09/16/03
M-3130 Sh. 2	CS System	03/11/99
M-3131 Sh. 1	RHR System	09/16/03
M-3131 Sh. 10	RHR System	03/12/99
M-3131 Sh. 6	RHR System	09/17/03
M-3132 Sh. 1	HPCI System	09/18/03
M-3132 Sh. 2	HPCI System	08/20/99
M-3135 Sh. 1	CS System	03/15/99

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Number	Description or Title	Revision
M-3135 Sh. 2	CS System	03/16/99
M-3135 Sh. 3	CS System	03/16/99
M-3135 Sh. 4	CS System	03/16/99
M-3137 Sh. 1	HPCI System	03/17/99
M-36	CS P&ID	05/28/98
M-39 Sh. 1	RHR P&ID	12/15/97
M-39 Sh. 2	RHR P&ID	07/22/99
M-50	Diagram of Reactor Core Isolation Cooling RCIC Piping	BQ
QOP 6900-02, Att A	125V DC System (G.1)	33

MISCELLANEOUS

Number	Description or Title	Date or Revision
	U-2 RCIC Trends from QCOS 1300-05	03/08/05-08/30/11
	Oil Analysis Results RCIC Pump and Turbine	
	MOV PVT Interval Performance Review Data Collection	
	Quad Cities – Inservice Testing Bases Document	
	MOV Post-Test Data Review Worksheets	
	System Planning Memorandum No. 4-1	04/11/92
	4KV System Health Report Q3-2011	09/21/11
	RCIC System Health Report	7/01/11-9/30/11
	System Health Report-Primary Containment	2008, 09,10,11
	Letter from Commonwealth Edison Co. to USNRC, Subject: Generic Letter 89-16, Installation of a Hardened Wetwell Vent.	10/30/89
	Letter from Commonwealth Edison Co. to USNRC, Subject: IE Bulletin 88-04, Supplemental Response to IE Bulletin 88-04, Safety-Related Pump	
00069469	Item Equivalency Evaluation for the Baldor Motor ID 1429280-1	12/09/08
22A1264	GE Design Specification-Reactor Containment	0
257HA423AJ	GE RHR System Data Sheet	3
50.59 Screening QC-S-2006-0082	Post-Accident Venting of the Primary Containment	06/22/06
BWROG-9020	BWR Owners' Group: Hardened Vent General Design Criteria for Mark I Containment	03/08/90

MISCELLANEOUS

Number	Description or Title	Date or Revision
CC-AA-309-101	Technical Evaluation Replacement Motors for the Torus MOV Motors at 2-1001-34A/B	11
DRF A22-00103-25	RCIC System Operation Under Degraded Plant Conditions with Elevated Suction Water Temperatures	12/13/00
EPRI NP-6408	Guidelines for Establishing, Maintaining, and Extending the Shelf Like Capability of Limited Life Items (NCIG-13)	05/1992
GEI-90810	Voltage Relay Type IAV69A and IAV49B	0
GEK-45404	GE Instructions Overvoltage Relays	F
GES-6114C	General Electric E 100 Line Molded-Case Circuit Breaker Type TED 60-80 Amperes Time-current Curves	
GIP	Screenig Evaluation Work Sheet (SEWS), Fuel Oil Tank ID. No. 1/2 – 5201	0
IB 9201	Vendor Manual Model AMHG SF6 Circuit Breaker	08/14/97
IB 9203	Vendor Manual Model G26 SF6 Switchgear and Breaker	02/25/94
LN-6900	LN-6900 DC Distribution and Batteries	10/16/10
LS-AA-125-1001	AT 520627 -- Root Cause Investigation Report -- Inadequate Corrosion Management of Safety-Related Batteries	11/10/06
LSS-AA-126-1001	Quad Cities 2011 NRC CDBI FASA	6
NER QC-06-090	Nuclear /event Report – Safety-Related Battery Corrosion Issues	09/27/06
NRC AL 98-10	Dispositioning of Technical Specifications That are Insufficient to Assure Plant Safety	12/29/98
NTS 2541039803100	Review of NRC IE Notice Number 98-31, Fire Protection System Design Deficiencies and Common-Mode Flooding of ECCS Rooms at WNP2	12/18/98
OTC-387	Thrust Analysis, Required and Maximum	2
PMQR-00025606-02	Inspect/Clean RHR Pump Seal Cooler	0
PMQR-00169794-01	U2 RHR Pump Support Heat Exchanger Monitoring	0
QGA 200	Primary Containment Control	9
QGA 200-5	Hydrogen Control	5
RPS-TG-3	CECO Relay Planning Section – Technical Guide No. 3, (4KV and 6.9KV Switchgear in Nuclear Generating Stations	6
SAMG-1	Primary Containment Flooding	4
SAMG-2	RPV, Containment, and Radioactivity Release Control	6
TB-047056-01	Technical Bulletin – PCP Float/Equalize Switch	0
Z1600-02	Maintenance Rule Excerpt from Z1600 Pressure Suppression Evaluation	02/01/08

MODIFICATIONS

Number	Description or Title	Date or Revision
EC374106	New HPCI, RCIC, DGCW, CS Vent Valves Installed Per CC-QC-405	0

PROCEDURES

Number	Description or Title	Revision
CC-AA-102	Design Input and Configuration Change Impact Screening	21
ER-AA-300	Motor-Operated Valve Program Administrative Procedure	6
ER-AA-302-1003	MOV Margin Analysis and Periodic Verification Test Intervals	7
ER-AA-302-1006	Generic Letter 96-05 Program Motor-Operated Valve Maintenance and Testing Guidelines	11
ER-AA-335-007	UT Inspection for Determination of Sedimentation in Piping Systems or Components and Fluid Level Measurements	3
ER-AA-340-1002	Service Water Heat Exchanger Inspection Guide	4
MA-AA-716-210	Performance Centered Maintenance (PCM) Process	12
MA-AA-716-210-1001	Battery Chargers (Static) PCM Template	9
MA-AA-716-230-1001	Oil Analysis Interpretation Guideline	12
MA-AA-723-325	Molded Case Circuit Breaker Testing	10
MA-AB-725-114	Preventive Maintenance on Merlin Gerin G26 Type SF6 4KV Circuit Breakers	07/24/09
MA-AB-725-117	Preventive Maintenance and Receipt Inspection on Marlin Gerin SF6 4KV Type AMHG Circuit Breakers	TIC 2817 and 2832
MA-MW-772-701	Calibration of Overcurrent Protective Relays	1
MA-QC-773-524	Quad Cities NOAD Unit 2 Technical Specification Under Voltage Relay and Degraded Voltage Relay Calibration	4
OP-AA-108-106	Equipment Return to Service	4
PES-S-002	Shelf Life	6
QCAN 901(2)-3	CS/RHR Fill System Failure	5
QCAN 901(2)-4 C-14	High RCIC Turbine Exhaust Discharge Pressure	4
QCAN 901(2)-4 D-15	RCIC Turbine Trip	7
QCARP 0030-04	TB-II Unit 2 Injection with RCIC and Bringing the Unit to Cold Shutdown	19
QCARP 0050-02	SB-1-2 Injection with RCIC and Bringing the Unit to Cold Shutdown	22
QCEMS 0100-01	Station Battery Systems Preventive Maintenance	38

PROCEDURES

Number	Description or Title	Revision
QCEMS 0210-02	Battery Charger Testing and Safety-Related 125 VDC and 250 VDC Batteries	002
QCEPM 0400-14	Emergency Diesel Generator Electrical Preventive Maintenance	15
QCGP 1-1	Normal Unit Startup	87
QCIPM 0100-10	ECCS Instrumentation Check Prior to ECCS Logic Test	11
QCMMS 6620-03	SBO Diesel Generator (SBO) Periodic Preventive Maintenance Inspection	13
QCMPM 5700-01	Emergency Air Handling Unit Maintenance and Inspection (ECCS Room Coolers)	17
QCOA 1300-02	RCIC Automatic Initiation	14
QCOA 6100-03	Loss of Offsite Power	26
QCOA 6100-04	Station Blackout	15
QCOP 0010-02	Required Cold Weather Routines	37
QCOP 1000-01	RHR Fill and Vent	23
QCOP 1000-03	Shutdown Cooling Suction Header Fill and Vent	21
QCOP 1000-07	Torus Cooling with the Control Room Inaccessible	15
QCOP 1000-09	Torus Cooling Startup and Operation	23
QCOP 1000-30	Post-Accident RHR Operation	26
QCOP 1000-33	Filling and Draining RHR Heat Exchangers	12
QCOP 1300-01	RCIC System Preparation for Standby Operation	39
QCOP 1400-01	CS Preparation for Standby Operation	23
QCOP 1600-13	Post-Accident Venting of the Primary Containment (H.7.b)	24
QCOP 1600-25	Post LOCA Drywell Purge with Nitrogen for Hydrogen Control	10
QCOP 1600-26	Post LOCA Drywell Purge with Air for Hydrogen Control	13
QCOP 1600-28	Installing Alternate Power to Primary Containment Vent and Purge Valves	2
QCOP 2300-01	HPCI Preparation for Standby Operation	60
QCOP 6500-02	Racking Out a 4160 Volt Horizontal or G26 Circuit Breaker	26
QCOP 6500-08	4KV Bus Cross-Tie Operation	24
QCOS 0005-04	IST Valve Position Indication Verification	21
QCOS 0010-15	Security Event Support Equipment Surveillance (J.7.a, J.7.b)	0
QCOS 1000-06	RHR Pump/Loop Operability Test	51
QCOS 1000-07	Cold Shutdown RHR System Power Operated Valve Test	18
QCOS 1000-09	RHR Power Operated Valve Test	21
QCOS 1000-25	RHR Loop Venting	17

PROCEDURES

Number	Description or Title	Revision
QCOS 1000-27	RHR Pump Performance Test	12
QCOS 1300-10	RCIC Vent Verification	23
QCOS 1300-21	RCIC Keep Fill Valve Lineup Verification	4
QCOS 1400-01	Quarterly Core Spray System Flow Rate Test	40
QCOS 1400-04	Core Spray Pump Operability Test	15
QCOS 1400-07	Core Spray Pump Performance Test	10
QCOS 1400-10	CS Operability Verification	21
QCOS 1600-04	Pressure Suppression System Power Operated Valve IST	21
QCOS 2300-05	Quarterly HPCI Pump Operability Test	67
QCOS 2300-09	HPCI Vent Verification	22
QCOS 2300-13	HPCI System Manual Initiation Test	41
QCOS 2300-27	HPCI Pump Comprehensive/Performance Test	27
QCOS 6600-47	ECCS Simulated Automatic Actuation and DG Auto-Start	21
QCOS 6900-02	Station Safety-Related Battery Quarterly Surveillance	35
QCOS 6900-19	Documenting 125/250 VDC Grounds (H.7.a)	11
QCTS 0210-02	Battery Charger Testing and Safety-Related 125 VDC and 250 VDC Batteries	4
QIP 0100-17	Non-Outage Related Balance of Plant Calibration Schedule	16
QOA 3300-02	Loss of Condenser Vacuum	38
QOA 6900-04	Total Loss of Unit 2 125 VDC Supply	31
QOA 6900-07	Loss of AV Power to 125VDC Battery Chargers with Simultaneous Loss of Auxiliary Electrical Power	17

SURVEILLANCES (COMPLETED)

Number	Description or Title	Date
WO01436886 01	SBO 125VDC Battery Surveillance	08/04/11
QCOS 6600-43	1/2 Diesel Generator Monthly Load Test	08/04/11
QCOS 6620-01	SBO Diesel Generator Quarterly Load Test	06/13/11
QCTS 0210-02	Battery Charger Testing and Safety-Related 125 VDC and 250 VDC Batteries	09/30/96
WO01450552	1A CS Operability Verification	07/22/11
WO01457663	1A CS Operability Verification	08/19/11
WO01458104	1B CS Operability Verification	08/19/11
WO01450555	2A CS Operability Verification	07/23/11
WO01457664	2A CS Operability Verification	08/20/11
WO01457667	2B CS Operability Verification	08/20/11
WO01457659	HPCI Vent Verification	08/20/11
WO01450547	HPCI Vent Verification	07/23/11
WO01452573	HPCI Vent Verification	07/31/11
WO01459399	HPCI Vent Verification	08/28/11

SURVEILLANCES (COMPLETED)

Number	Description or Title	Date
WO01452000	1A RHR Loop Venting	07/27/11
WO01458378	1A RHR Loop Venting	08/24/11
WO01458377	1B RHR Loop Venting	08/24/11
WO01454334	2A RHR Loop Venting	08/06/11
WO01461299	2A RHR Loop Venting	09/03/11

TRAINING DOCUMENTS

Number	Description or Title	Revision
JPM LS-053-I-A	Vent Containment Irrespective of Release Rates with APCV (Failure of Torus Valve to Open, Requiring Venting Through the Drywell)	02
MLL2011-01	Mods and Lessons Learned	01/13/11
N-BY-ENG-3T10-GAS-VOIDS	Basic Overview of Gas Accumulation	06/25/10

VENDOR INFORMATION

Number	Description or Title	Date
VETIP Binder C0100	Power Conversion 125V Battery Charger	002
Exide Section 58.00	Instruction for Installing and Operating Stationary Batteries	1988

WORK ORDERS

Number	Description or Title	Date
00738127	Bus 23-1 Feed From Bus 23 Relay Routine	03/28/06
00798792	U-1 250V Battery Charger 4 Hour Load Test	10/11/06
00854342	Unit 1/2 EDG Periodic (12-Yr.) Inspection	01/10/08
00900242	Eddy Current Test (ET) Diesel Generator Heat Exchanger	01/08/08
00900243	Eddy-Current Test (ET) Diesel Generator Heat Exchangers, Open and Inspect	01/07/08
00909398	250 VDC Battery Charger No. 2 4Hr Load Test	10/03/07
00962764	2A RHR Air/Water Side Room Cooler Clean/Inspect	09/14/09
00969793	4KV Breaker 213	01/08/08
01016663	Performance Test of SBO Batteries	09/12/08
01022172	U-1 250V Battery Charger 4 Hour Load Test	01/23/09

WORK ORDERS

Number	Description or Title	Date
01027138	RCIC Turbine 1-1303 Discharge Hi Pressure	01/21/09
01027139	RCIC Turbine 1-1303 Discharge Hi Pressure	01/21/09
01056316	Preventive Maintenance on Merlin Gerin G26 Type SF6 4KV Circuit Breakers	12/12/09
01093386	2A RHRSW Pump Area Cooler Clean/Inspect	09/17/09
01121775	250 VDC Battery Charger No. 2 4Hr Load Test	10/19/09
01123431	4KV Breaker 203 (PM)	03/03/10
01132461	125VDC Battery Charger No. 2 4Hr Load Test	12/08/09
01143413	T22 Relay Routine	03/21/10
01143906	T21 Relay Routine	03/18/10
01143985	Bus 23-1 Feed From Bus 23 Relay Routine	04/06/10
01144212	Drywell Purge and Pressure Bleed SBGTS LLRT	03/1810
01144242	Suppression Chamber Exhaust LLRT (IST)	03/19/10
01144506	RCIC Turbine 2-1303 Discharge Hi Pressure	12/01/09
01144507	RCIC Turbine 2-1303 Discharge Hi Pressure	12/01/09
01147298	Undervoltage Relay Calibration Bus 23-1	04/08/10
01147437	PCI Group 2 Isolation Test	04/04/10
01152616	DG Relay Routine	01/06/10
01165003	Unit 1/2 EDG (2-Yr.) Inspection	01/07/08
01173608	CDBI – Need to Determine Water Column in Sensing Line	10/07/08
01197061	SBO DG Periodic (2-yr.) Inspection	09/01/10
01200596	Pressure Suppression Valve Position Indication Test (IST)	06/27/10
01208383	U2 125 VDC Battery Inspection	07/29/10
01221740	Sample and Change Oil for 2A RHRSW Motor Bearing (LP Sump Side)	09/13/10
01221741	Sample and Change Oil for 2A RHRSW Motor Bearing (HP Sump Side)	09/13/10
01229211	Bus 23-1 Degraded Voltage Relay Routine	12/08/10
01252888	U-1 250V Battery Charger 4 Hour Load Test	12/29/10
01254690	RCIC Setpoint and Head Correction Evaluation EC 372517	10/08/10
01255933	MCC 1B Cub W2 “1-1301-61 RCIC Steam to Turbine Vlv”	05/17/11
01256451	Transformer 12 Relay Routine	05/12/11
01256475	Transformer 11 Relay Routine	05/11/11
01259947	Bus 13-1 Under voltage Relay Routine	06/03/11
01260421	ECCS Simulated Automatic Actuation and DG Auto-Start Div1	06/03/11
01295831	Inspect U2 SBO Battery Per QCEPM0100-01	06/13/11
01295936	Bus 23-1 Cub 8 Fed From SBO Bus 71 4KV Cub Insp	09/06/11
01302538	Bus 13-1 Degraded Voltage Relay Routine	04/05/11
01329690	250 VDC Battery Charger No. 2 4Hr Load Test	10/13/11
01332196	CS UT Vent Verifications	10/15/10

WORK ORDERS

Number	Description or Title	Date
01332197	CS UT Vent Verifications	10/25/10
01344128	CS UT Vent Verifications	12/02/10
01347409	Sample 2A RHR Motor Lower Upper Bearing Oil	06/11/11
01347410	Sample 2A RHR Motor Lower Bearing Oil	06/11/11
01348721	RHR System UT Vent Verifications	12/08/10
01348722	RHR System UT Vent Verifications	12/08/10
01349982	CS UT vent verifications	12/20/10
01370291	Sample and Change Oil for 2A RHRSW Pump Inboard Bearing	03/17/11
01370292	Sample and Change Oil for 2A RHRSW Pump Outboard Bearing	03/17/11
01370931	RHRSW Pump A Flow Rate-IST	12/14/10
01379253	CS UT Vent Verifications	04/15/11
01381059	CS UT Vent Verifications	04/22/11
01395782	CS UT Vent Verifications	06/04/11
01395783	RHR System UT Vent Verifications	06/10/11
01395784	RHR System UT Vent Verifications	06/10/11
01395785	RHR System UT Vent Verifications	06/10/11
01395786	RHR System UT Vent Verifications	06/10/11
01396965	CS UT Vent Verifications	06/23/11
01396971	RHR A Pump Flow Rate-IST	03/16/11
01410307	HPCI System UT Vent Verification	06/04/11
01413565	HPCI System UT Vent Verification	05/27/11
01417753	SBO DG Load Test	06/14/11
01423705	Pressure Suppression Valve Timing Test (IST)	06/27/11
01429475	125VDC Station Batteries – Quarterly Surveillance	07/31/11
01436886	SBO125 VDC Battery Surveillance	08/04/11
01442215	HPCI System UT Vent Verification	08/29/11
01444108	HPCI System UT Vent Verification	08/19/11
01453615	Diesel Generator Load Test	08/04/11
01467766	Station Safety-Related Battery Monthly Surveillance	09/28/11
99200252	Bus 23 Feed To Bus 23-1 Relay Routine	02/23/02

LIST OF ACRONYMS USED

AC	Alternating Current
ADAMS	Agencywide Document Access Management System
APCV	Augmented Primary Containment Vent
AR	Action Request
ASME	American Society of Mechanical Engineers
BWR	Boiling Water Reactor
CAP	Corrective Action Program
CDBI	Component Design Bases Inspection
CFR	Code of Federal Regulations
CS	Core Spray
DC	Direct Current
DGCW	Diesel Generator Cooling Water
DHR	Decay Heat Removal
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EPRI	Electric Power Research Institute
GE	General Electric
GL	Generic Letter
HPCI	High Pressure Coolant Injection
IEEE	Institute of Electrical & Electronic Engineers
IN	Information Notice
IP	Inspection Procedure
IR	Inspection Report
IR	Issue Report
IST	In Service Test
kV	Kilovolt
LCO	Limiting Condition for Operation
LER	Licensee Event Report
LLRT	Local Leak Rate Testing
LOCA	Loss of Coolant Accident
LOOP	Loss of Off-site Power
LPCI	Low Pressure Coolant Injection
MOV	Motor-Operated Valve
NCV	Non-Cited Violation
NEI	Nuclear Energy Institute
NPSH	Net Positive Suction Head
NRR	NRC Office of Nuclear Reactor Regulation
NRC	U.S. Nuclear Regulatory Commission
OM	Operations and Maintenance
PARS	Publicly Available Records System
PCM	Performance Centered Maintenance
P&ID	Piping and Instrumentation Diagram
psid	Pounds Per Square Inch Differential
psig	Pounds Per Square Inch Gauge
RCIC	Reactor Core Isolation Cooling
RCS	Reactor Coolant System
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RIS	Regulatory Information Summary

SBO	Station Blackout
SDC	Shutdown Cooling
SDP	Significance Determination Process
SEP	Systematic Evaluation Program
SSC	Systems, Structures, and Components
TI	Temporary Instruction
TS	Technical Specification
TSTF	Technical Specification Task Force
UFSAR	Updated Final Safety Analysis Report
UT	Ultrasonic Testing
URI	Unresolved Item
Vac	Volts Alternating Current
Vdc	Volts Direct Current
WO	Work Order

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records System (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Ann Marie Stone, Chief
Engineering Branch 2
Division of Reactor Safety

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

Enclosure: Inspection Report 05000254/2011009; 05000265/2011009
w/Attachment: Supplemental Information

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