



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION III  
2443 WARRENVILLE ROAD, SUITE 210  
LISLE, IL 60532-4352

October 25, 2012

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

**SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2 -  
NRC INTEGRATED INSPECTION REPORT 05000254/2012004  
AND 05000265/2012004**

Dear Mr. Pacilio:

On September 30, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed an integrated 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 2, 2012, with Mr. T. Hanley, 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, two self-revealed findings of very low safety significance were identified. Each of 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. Additionally, two licensee-identified violations are listed in Section 4OA7 of this report.

If you contest the subject or severity of any NCV, 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.

M. Pacilio

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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 Agencywide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at [http://www.nrc.gov/reading\\_rm/adams.htm](http://www.nrc.gov/reading_rm/adams.htm) (the Public Electronic Reading Room).

Sincerely,

**/RA/**

Mark A. Ring, Branch Chief  
Branch 1  
Division of Reactor Projects

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

Enclosure: Inspection Report 05000254/2012004 and 05000265/2012004  
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: 05000254/2012004; 05000265/2012004

Licensee: Exelon Generation Company, LLC

Facility: Quad Cities Nuclear Power Station, Units 1 and 2

Location: Cordova, IL

Dates: July 1 through September 30, 2012

Inspectors: J. McGhee, Senior Resident Inspector  
B. Cushman, Resident Inspector  
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Approved by: Mark Ring, Branch Chief  
Branch 1  
Division of Reactor Projects

Enclosure

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## SUMMARY OF FINDINGS

Inspection Report 05000254/2012004 and 05000265/2012004; 07/01/2012 - 09/30/2012;  
Quad Cities Nuclear Power Station, Units 1 and 2; Post-Maintenance Testing.

This report covers a 3-month period of inspection by resident inspectors and announced baseline inspections by regional inspectors. Two 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. A self-revealed finding of very low safety significance (Green) and associated NCV of Technical Specification (TS) 5.4.1.a was identified for the failure to develop a preventative maintenance schedule appropriate to the environmental conditions and potential failure mechanisms for the 1-2301-29 high pressure coolant injection (HPCI) system steam line drain valve. After a through-body leak was identified on the 1-2301-29 valve on July 15, 2012, inspectors determined that although the preventative maintenance template for this valve was supposed to be condition based, the frequency for internal inspection was designated "as required" when the valve was exposed to an erosive environment. Inspectors reviewed the work history for the valve, operating experience, and issue timeline to determine that the performance deficiency was a legacy issue, and no cross-cutting aspect was identified. Based on the licensee's reaction to more recent operating experience, inspectors determined that the performance deficiency was not indicative of current performance. When presented with operating experience from another facility earlier this year, the licensee recognized the vulnerability and scheduled internal inspections for valves at the next opportunity. Given that the licensee had no indication of degradation at the time and the replacement would require cold shutdown conditions, since both HPCI and reactor core isolation cooling would be unavailable during the repair, the 2013 schedule was reasonable. The licensee replaced the degraded valve and performed limited inspections of associated piping. Additional inspections for similar valves were scheduled.

The performance deficiency was more than minor because it affected the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems to respond to initiating events to prevent undesirable consequences. In this instance, the licensee later determined through calculation that the HPCI system could have performed its safety mission for a loss of coolant accident. However, inspectors determined that HPCI reliability could be impacted, in that, HPCI would not be available for other risk significant operating events that the system could be utilized to mitigate if the steam leak were not present. The inspectors performed an SDP Phase 1 screening for the finding using IMC 0609, Attachment 04, "Initial Characterization of Findings," and IMC 0609, Appendix A, Exhibit 2, "Mitigating Systems Screening Questions," and

answered the first four questions “No.” Therefore, the finding screened as very low safety significance, or Green. (Section 1R19.1.b(1))

- Green. A self-revealed finding of very low safety significance (Green) and associated NCV of TS 5.4.1.a was identified for the licensee’s failure to specify torque values for the control room ventilation refrigeration condensing unit condenser head in the work instructions performed on January 19, 2012. The inspectors identified that this issue had a cross-cutting aspect in the area of Human Performance - Decision Making (H.1(b)). Inspectors determined that a contributor to this finding was that the Maintenance and Engineering Departments did not verify the assumptions or identify unintended consequences with possible variance in the interpretation and implementation of work instructions stating, “tighten bolts using a crisscross pattern and good mechanical judgment,” vice specifying a torque value from MA-MW-736-600. Although this work practice had been in place for years, mechanics questioned the lack of a torque value during the post leak repair to restore operability. Engineering replied with “mechanical judgment” rather than specifying a torque value indicating that the practice was indicative of current performance. The heat exchanger leak was repaired and the head reassembled with nominal torque values.

The performance deficiency was more than minor because the performance deficiency, if left uncorrected, had the potential to lead to a more significant event. The inspectors performed an SDP Phase 1 screening for the finding using IMC 0609, Attachment 04, “Initial Characterization of Findings,” and IMC 0609, Appendix A, Exhibit 2, “Mitigating Systems Screening Questions,” and answered the first four questions “No.” Therefore, the finding screened as very low safety significance, or Green. (Section 1R19.1.b(2))

## **B. Licensee-Identified Violations**

Violations of very low safety significance that were identified by the licensee have been reviewed by inspectors. Corrective actions planned or taken by the licensee have been entered into the licensee’s corrective action program. These violations and corrective action tracking numbers are listed in Section 4OA7 of this report.

## REPORT DETAILS

### Summary of Plant Status

#### **Unit 1**

Unit 1 operated at 100 percent thermal power throughout the evaluated period from July 1 through September 30, 2012, with the exception of planned power reductions for routine surveillances, main condenser flow reversals, planned equipment repair, and control rod maneuvers.

#### **Unit 2**

Unit 2 operated at 100 percent thermal power throughout the evaluated period from July 1 through August 10, 2012, with the exception of planned power reductions for routine surveillances and main condenser flow reversals. During control rod exercising on August 11, 2012, rod K-11 drifted in without latching after being given a single notch insert signal. Reactor power lowered to 96 percent of rated power during the transient. Operators returned the unit to 100 percent power later the same day after the rod was verified to be fully inserted and appropriately disarmed.

Unit 2 then operated at 100 percent thermal power until August 25, 2012, when the unit maneuvered power for main turbine testing and control rod recovery. The unit continued to operate at 100 percent power until September 2 when operators identified a steam packing leak on the 2A feedwater regulating valve. Operators performed an emergency power drop to 78 percent power to allow the valve to be isolated. The unit was restored to 100 percent power on September 3 after packing adjustment stopped the leak. The unit operated at full power through the closure of the reporting period.

### **1. REACTOR SAFETY**

#### **Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity**

#### 1R04 Equipment Alignment (71111.04)

##### .1 Quarterly Partial System Walkdowns

##### a. Inspection Scope

The inspectors performed partial system walkdowns of the following risk-significant systems:

- Unit 2 reactor building component cooling water system;
- Unit 2 high pressure coolant injection system;
- Unit 2 125 Vdc system;
- Unit 2 'A' core spray system; and
- Unit 1/2 emergency diesel generator.

The inspectors selected these systems based on their risk significance relative to the Reactor Safety Cornerstones at the time they were inspected. The inspectors attempted to identify any discrepancies that could impact the function of the system and, therefore,

potentially increase risk. The inspectors reviewed applicable operating procedures, system diagrams, Updated Final Safety Analysis Report (UFSAR), Technical Specification (TS) requirements, outstanding work orders (WOs), condition reports, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have rendered the systems incapable of performing their intended functions. The inspectors also walked down accessible portions of the systems to verify system components and support equipment were aligned correctly and operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no obvious deficiencies. The inspectors also verified that the licensee had properly identified and resolved equipment alignment problems that could cause initiating events or impact the capability of mitigating systems or barriers and entered them into the corrective action program (CAP) with the appropriate significance characterization. Documents reviewed are listed in the Attachment to this report.

These activities constituted five partial system walkdown samples as defined in Inspection Procedure (IP) 71111.04-05.

b. Findings

No findings were identified.

.2 Semi-Annual Complete System Walkdown

a. Inspection Scope

On August 7, 2012, the inspectors performed a complete system alignment inspection of the Unit 2 250 Vdc system to verify the functional capability of the system. This system was selected because it was considered both safety significant and risk significant in the licensee's probabilistic risk assessment. The inspectors walked down the system to review mechanical and electrical equipment lineups; electrical power availability; system pressure and temperature indications, as appropriate; component labeling; component lubrication; component and equipment cooling; hangers and supports; operability of support systems; and to ensure that ancillary equipment or debris did not interfere with equipment operation. A review of a sample of past and outstanding WOs was performed to determine whether any deficiencies significantly affected the system function. In addition, the inspectors reviewed the CAP database to ensure that system equipment alignment problems were being identified and appropriately resolved. Documents reviewed are listed in the Attachment to this report.

These activities constituted one complete system walkdown sample as defined in IP 71111.04-05.

b. Findings

No findings were identified.



1R05 Fire Protection (71111.05)

.1 Routine Resident Inspector Tours (71111.05Q)

a. Inspection Scope

The inspectors conducted fire protection walkdowns which were focused on availability, accessibility, and the condition of firefighting equipment in the following risk-significant plant areas:

- Fire Zone 11.3.2, Unit 2 Reactor Building, Elevation 544'-0", SE Corner Room - 2B RHR Room;
- Fire Zone 6.3, Service Building, Elevation 595'-0", Auxiliary Electric Room;
- Fire Zone 3.0, Service Building, Elevation 609'-0", Cable Spreading Room;
- Fire Zone 7.2, Unit 2 Turbine Building, Elevation 628'-6", 250V Battery Room;
- Fire Zone 8.2.5, Unit 1/2 Turbine Building, Elevation 580'-0", Unit 2 Cable Tunnel; and
- Fire Zone 8.2.4, Unit 1 Turbine Building, Elevation 580'-0", Cable Tunnel.

The inspectors reviewed areas to assess if the licensee had implemented a fire protection program that adequately controlled combustibles and ignition sources within the plant, effectively maintained fire detection and suppression capability, maintained passive fire protection features in good material condition, and implemented adequate compensatory measures for out-of-service, degraded or inoperable fire protection equipment, systems, or features in accordance with the licensee's fire plan.

The inspectors selected fire areas based on their overall contribution to internal fire risk as documented in the plant's Individual Plant Examination of External Events with later additional insights, their potential to impact equipment which could initiate or mitigate a plant transient, or their impact on the plant's ability to respond to a security event.

Using the documents listed in the Attachment to this report, the inspectors verified that fire hoses and extinguishers were in their designated locations and available for immediate use; that fire detectors and sprinklers were unobstructed; that transient material loading was within the analyzed limits; and fire doors, dampers, and penetration seals appeared to be in satisfactory condition. The inspectors also verified that minor issues identified during the inspection were entered into the licensee's CAP.

Documents reviewed are listed in the Attachment to this report.

These activities constituted six quarterly fire protection inspection samples as defined in IP 71111.05-05.

b. Findings

No findings were identified.

.2 Annual Fire Protection Drill Observation (71111.05A)

a. Inspection Scope

On August 9, 2012, the inspectors observed the fire brigade activation for a simulated fire in MCC 18/19-5. Based on this observation, the inspectors evaluated the readiness of the plant fire brigade to fight fires. The inspectors verified that the licensee staff

identified deficiencies, openly discussed them in a self-critical manner at the drill debrief, and took appropriate corrective actions. Specific attributes evaluated were:

- proper wearing of turnout gear and self-contained breathing apparatus;
- proper use and layout of fire hoses;
- employment of appropriate fire fighting techniques;
- sufficient firefighting equipment brought to the scene;
- effectiveness of fire brigade leader communications, command, and control;
- search for victims and propagation of the fire into other plant areas;
- smoke removal operations;
- utilization of pre-planned strategies;
- adherence to the pre-planned drill scenario; and
- drill objectives.

Documents reviewed are listed in the Attachment to this report.

These activities constituted one annual fire protection inspection sample as defined in IP 71111.05-05.

b. Findings

No findings were identified.

1R06 Flooding (71111.06)

.1 Internal Flooding

a. Inspection Scope

The inspectors reviewed selected risk important plant design features and licensee procedures intended to protect the plant and its safety-related equipment from internal flooding events. The inspectors reviewed flood analyses and design documents, including the UFSAR; engineering calculations; and abnormal operating procedures to identify licensee commitments. The specific documents reviewed are listed in the Attachment to this report. In addition, the inspectors reviewed licensee drawings to identify areas and equipment that may be affected by internal flooding caused by the failure or misalignment of nearby sources of water, such as the fire suppression or the circulating water systems. The inspectors also reviewed the licensee's corrective action documents with respect to past flood-related items identified in the corrective action program to verify the adequacy of the corrective actions. The inspectors performed a walkdown of the following plant area to assess the adequacy of watertight doors and verify drains and sumps were clear of debris and were operable, and that the licensee complied with its commitments:

- Unit 2 reactor building corner rooms.

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

This inspection constituted one internal flooding sample as defined in IP 71111.06-05.

b. Findings

No findings were identified.

.2 Underground Vaults

a. Inspection Scope

The inspectors selected underground bunkers/manholes subject to flooding that contained cables whose failure could disable risk-significant equipment. The inspectors determined that the cables were not submerged, that splices were intact, and that appropriate cable support structures were in place. In those areas where dewatering devices were used, such as a sump pump, the device was operable and level alarm circuits were set appropriately to ensure that the cables would not be submerged. In those areas without dewatering devices, the inspectors verified that drainage of the area was available, or that the cables were qualified for submergence conditions. The inspectors also reviewed the licensee's corrective action documents with respect to past submerged cable issues identified in the corrective action program to verify the adequacy of the corrective actions. The inspectors performed a walkdown of the following underground bunkers/manholes subject to flooding:

- Manholes #3 and #4.

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

This inspection constituted one underground vault sample as defined in IP 71111.06-05.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07T)

.1 Triennial Review of Heat Sink Performance

a. Inspection Scope

The inspectors reviewed operability determinations, completed surveillances, vendor manual information, associated calculations, performance test results and cooler inspection results associated with the 1B core spray pump room cooler (1-5748-B). This heat exchanger/cooler was chosen based on risk significance in the licensee's probabilistic safety analysis, important safety-related mitigating system support functions, operating history, and relatively low margin.

For the 1B core spray pump room cooler, the inspectors verified that testing, inspection, maintenance, and monitoring of biotic fouling and macrofouling programs were adequate to ensure proper heat transfer. This was accomplished by verifying: (1) the test method used was consistent with accepted industry practices, or equivalent; (2) the test conditions were consistent with the selected methodology; (3) the test acceptance criteria were consistent with the design basis values; and (4) results of heat exchanger performance testing. The inspectors also verified that the test results appropriately

considered differences between testing conditions and design conditions, the frequency of testing based on trending of test results was sufficient to detect degradation prior to loss of heat removal capabilities below design basis values, and test results considered test instrument inaccuracies and differences.

For the 1B core spray pump room cooler, the inspectors reviewed the methods and results of heat exchanger performance inspections. The inspectors verified the methods used to inspect and clean the heat exchanger were consistent with as found conditions identified and expected degradation trends and industry standards; the licensee's inspection and cleaning activities had established acceptance criteria consistent with industry standards; and the as-found results were recorded, evaluated, and appropriately dispositioned such that the as-left condition was acceptable.

In addition, the inspectors verified the condition and operation of the 1B core spray pump room cooler were consistent with design assumptions in heat transfer calculations and as described in the final safety analysis report. This included verification that the number of plugged tubes was within pre-established limits based on capacity and heat transfer assumptions. The inspectors verified the licensee evaluated the potential for water hammer and established adequate controls and operational limits to prevent heat exchanger degradation due to excessive flow-induced vibration during operation. In addition, eddy current test reports and visual inspection records were reviewed to determine the structural integrity of the heat exchanger.

The inspectors also verified the performance of ultimate heat sinks and safety-related service water systems and their subcomponents such as piping, intake screens, pumps, valves, etc. by tests or other equivalent methods to ensure availability and accessibility to the in-plant cooling water systems.

Inspectors were not able to complete all elements of the inspection within this inspection period and the inspection is continued into the next reporting period. The remainder of the inspection elements and documentation of the completed sample will be included in NRC Inspection Report 05000254/2012005; 05000265/2012005.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program (71111.11)

.1 Resident Inspector Quarterly Review (71111.11Q)

a. Inspection Scope

On August 27, 2012, the inspectors observed a crew of licensed operators in the plant's simulator during licensed operator requalification examinations to verify that operator performance was adequate, evaluators were identifying and documenting crew performance problems, and training was being conducted in accordance with licensee procedures. The inspectors evaluated the following areas:

- licensed operator performance;
- crew's clarity and formality of communications;
- ability to take timely actions in the conservative direction;

- prioritization, interpretation, and verification of annunciator alarms;
- correct use and implementation of abnormal and emergency procedures;
- control board manipulations;
- oversight and direction from supervisors; and
- ability to identify and implement appropriate TS actions and emergency plan actions and notifications.

The crew's performance in these areas was compared to pre-established operator action expectations and successful critical task completion requirements.

This inspection constituted one quarterly licensed operator requalification program sample as defined in IP 71111.11.

b. Findings

No findings were identified.

.2 Resident Inspector Quarterly Observation of Heightened Activity or Risk (71111.11Q)

a. Inspection Scope

On July 28, 2012, the inspectors observed the on shift operating crew response to a fire alarm in the service building. Additionally, on September 28, 2012, the inspectors observed licensed operator performance in the control room during a period of multiple surveillances and post-maintenance tests as risk significant equipment was restored to an operable status. These were activities that required heightened awareness or were related to increased risk. The inspectors evaluated the following areas:

- licensed operator performance;
- crew's clarity and formality of communications;
- ability to take timely actions in the conservative direction;
- prioritization, interpretation, and verification of fire protection alarms;
- correct use and implementation of procedures;
- oversight and direction from supervisors; and
- ability to identify and implement Emergency Plan actions and notifications.

The performance in these areas was compared to existing expectations for operator actions, procedural compliance, and task completion requirements. Documents reviewed are listed in the Attachment to this report.

This inspection constituted one quarterly licensed operator heightened activity/risk sample as defined in IP 71111.11.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

.1 Routine Quarterly Evaluations (71111.12Q)

a. Inspection Scope

The inspectors evaluated degraded performance issues involving the following risk-significant systems:

- Z8000: Reactor Protection;
- Z0012-01: Reactor Building Flood Protection; and
- Z5795: Control Room Area HVAC System.

The inspectors reviewed events such as where ineffective equipment maintenance had resulted in valid or invalid automatic actuations of engineered safeguards systems and independently verified the licensee's actions to address system performance or condition problems in terms of the following:

- implementing appropriate work practices;
- identifying and addressing common cause failures;
- scoping of systems in accordance with 10 CFR 50.65(b) of the maintenance rule;
- characterizing system reliability issues for performance;
- charging unavailability for performance;
- trending key parameters for condition monitoring;
- ensuring 10 CFR 50.65(a)(1) or (a)(2) classification or re-classification; and
- verifying appropriate performance criteria for structures, systems, and components/functions classified as (a)(2), or appropriate and adequate goals and corrective actions for systems classified as (a)(1).

The inspectors assessed performance issues with respect to the reliability, availability, and condition monitoring of the system. In addition, the inspectors verified maintenance effectiveness issues were entered into the CAP with the appropriate significance characterization. Documents reviewed are listed in the Attachment to this report.

This inspection constituted three quarterly maintenance effectiveness samples as defined in IP 71111.12-05.

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13)

.1 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

The inspectors reviewed the licensee's evaluation and management of plant risk for the maintenance and emergent work activities affecting risk-significant and safety-related equipment listed below to verify that the appropriate risk assessments were performed prior to removing equipment for work:

- Emergent Unit 1 high pressure coolant injection system inoperability and unavailability with core spray and reactor core isolation cooling system work scheduled in work week 12-30-05;
- Maintenance on 2A residual heat removal loop and 2A residual heat removal service water modification resulting in yellow risk on multiple occasions and significant number of protected systems during work week 12-38-13; and
- Emergent 1B residual heat removal service water room cooler repair and unit station blackout diesel speed sensor failure, 2B residual heat removal system and 2B residual heat removal service water loop maintenance during work week 12-040-02.

These activities were selected based on their potential risk significance relative to the Reactor Safety Cornerstones. As applicable for each activity, the inspectors verified that risk assessments were performed as required by 10 CFR 50.65(a)(4) and were accurate and complete. When emergent work was performed, the inspectors verified that the plant risk was promptly reassessed and managed. The inspectors reviewed the scope of maintenance work, discussed the results of the assessment with the licensee's probabilistic risk analyst or shift technical advisor, and verified plant conditions were consistent with the risk assessment. The inspectors also reviewed TS requirements and walked down portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met. Specific documents reviewed during this inspection are listed in the Attachment to this report.

These maintenance risk assessments and emergent work control activities constituted three samples as defined in IP 71111.13-05.

b. Findings

No findings were identified.

1R15 Operability Determinations and Functional Assessments (71111.15)

.1 Operability Evaluations

a. Inspection Scope

The inspectors reviewed the following issues:

- Issue Report (IR) 1382569: Title 10 CFR Part 21 Notification for Rosemount 710DU Trip Units;
- IR 1385755: Unit 1B Refuel Radiation Monitor Failed Channel Check;
- IR 1392446: Alternator Overcurrent Relay Hot Connection;
- Engineering Change (EC) 390137: Part 21 Issued on Conoflow Transducer and Air Regulator;
- EC 389855: Evaluate Head Leak on 0-9400-102 (control room ventilation chiller condenser); and
- EC 390469: Determine Structural Integrity of Residual Heat Removal Service Water (RHRSW) 2" Threaded Inlet Connection on 2A RHRSW Cubicle Room Cooler, 2-5745A.

The inspectors selected these potential operability issues based on the risk significance of the associated components and systems. The inspectors evaluated the technical adequacy of the evaluations to ensure that TS operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the TS and UFSAR to the licensee's evaluations to determine whether the components or systems were operable. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled. The inspectors determined, where appropriate, compliance with bounding limitations associated with the evaluations. Additionally, the inspectors reviewed a sampling of corrective action documents to verify that the licensee was identifying and correcting any deficiencies associated with operability evaluations. Documents reviewed are listed in the Attachment to this report.

This operability inspection constituted six samples as defined in IP 71111.15-05.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18)

.1 Plant Modifications

a. Inspection Scope

The inspectors reviewed the following modification:

- EC 385475: Probe Manifold Replacement and Installation of Noble Metal Skid.

The inspectors reviewed the configuration changes and associated 10 CFR 50.59 safety evaluation screening against the design basis, the UFSAR, and the TS, as applicable, to verify that the modification did not affect the operability or availability of the affected system(s). The inspectors, as applicable, observed ongoing and completed work activities to ensure that the modifications were installed as directed and consistent with the design control documents; the modifications operated as expected; post-modification testing adequately demonstrated continued system operability, availability, and reliability; and that operation of the modifications did not impact the operability of any interfacing systems. As applicable, the inspectors verified that relevant procedure, design, and licensing documents were properly updated. Lastly, the inspectors discussed the plant modification with operations, engineering, and training personnel to ensure that the individuals were aware of how the operation with the plant modification in place could impact overall plant performance. Documents reviewed in the course of this inspection are listed in the Attachment to this report.

This inspection constituted one permanent plant modification sample as defined in IP 71111.18-05.

b. Findings

No findings were identified.



## 1R19 Post-Maintenance Testing (71111.19)

### .1 Post-Maintenance Testing

#### a. Inspection Scope

The inspectors reviewed the following post-maintenance activities to verify that procedures and test activities were adequate to ensure system operability and functional capability:

- WO 1557058: Support Furmanite/Repair 1-2301-29 Valve Body Leak;
- WO 1576054: No Remote/Local RPM (rotations per minute) Indications for Unit 1 Station Blackout Diesel Generator;
- WO 1458258: Replace the 2C LP [low pressure] RHRSW Discharge Elbow; and
- WO 1557541: 'B' HVAC RCU HX Has Gasket Leak.

These activities were selected based upon the structure, system, or component's ability to impact risk. The inspectors evaluated these activities for the following (as applicable): the effect of testing on the plant had been adequately addressed; testing was adequate for the maintenance performed; acceptance criteria were clear and demonstrated operational readiness; test instrumentation was appropriate; tests were performed as written in accordance with properly reviewed and approved procedures; equipment was returned to its operational status following testing (temporary modifications or jumpers required for test performance were properly removed after test completion); and test documentation was properly evaluated. The inspectors evaluated the activities against TSs, the UFSAR, 10 CFR Part 50 requirements, licensee procedures, and various NRC generic communications to ensure that the test results adequately ensured that the equipment met the licensing basis and design requirements. In addition, the inspectors reviewed corrective action documents associated with post-maintenance tests to determine whether the licensee was identifying problems and entering them in the CAP and that the problems were being corrected commensurate with their importance to safety. Documents reviewed are listed in the Attachment to this report.

This inspection constituted four post-maintenance testing samples as defined in IP 71111.19-05.

#### b. Findings

##### (1) Through-body Steam Leak on High Pressure Coolant Injection Steam Line Drain Valve

Introduction: A self-revealed finding of very low safety significance (Green) and associated non-cited violation (NCV) of TS 5.4.1.a was identified for the failure to develop a preventative maintenance schedule appropriate to the environmental conditions and potential failure mechanisms for the 1-2301-29 high pressure coolant injection (HPCI) system steam line drain valve. After a through-body leak was identified on the 1-2301-29 valve on July 15, 2012, inspectors determined that although the preventative maintenance template for this valve was supposed to be condition based, the frequency for internal inspection was designated "as required" when the valve was exposed to an erosive environment.

Discussion: On July 15, 2012, two pinhole leaks were identified through the valve body wall of the 1-2301-29 HPCI system steam line drain valve. Operators declared the HPCI system inoperable because the valve was part of the safety related American Society of Mechanical Engineers Class 2 pressure boundary. The air operated valve provides a flowpath for condensate in the steam line to be drained to the main turbine condenser. The valve automatically closes to isolate that flowpath when the HPCI turbine is started.

The valve was removed from the system on July 21 using WO 1557058. The internal inspection of the valve indicated that a portion of the valve webbing and approximately 1/3 of the valve seat were eroded away. The licensee's investigation concluded that the erosion was caused by liquid drop impingement erosion, which is the impact of high-velocity water droplets on the valve internals or piping. The licensee postulated that the valve body erosion occurred after the webbing was penetrated, and flashing occurred in the upper body area of the valve. This flashing caused the valve body erosion and ultimately the through-wall leaks.

This valve had been replaced in 2000. Work Order 99139403 removed a leak seal clamp on the associated piping where the leak was thought to have been caused by flow accelerated corrosion impacting the carbon steel piping. Under that same work order, the Unit 1 HPCI drain line valves (1-2301-29 and 1-2301-30) and piping were replaced with A-216 (carbon) valve bodies and chrome-moly piping material. No inspections of the valve bodies had been performed since replacement.

The licensee had responded to operating experience from another Exelon facility that experienced a through-body leak of valves in a similar configuration. As a result of the licensee's evaluation of the operating experience, internal inspections of the valve were scheduled during the next refueling outage in 2013.

Analysis: The inspectors concluded that the failure to specify a preventative maintenance frequency for the internal inspection that was appropriate to the potential failure mechanism is a performance deficiency and a finding. The performance deficiency was more than minor because it affected the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems to respond to initiating events to prevent undesirable consequences. In this instance, the licensee later determined through calculation that the HPCI system could have performed its safety mission for a loss of coolant accident. However, inspectors determined that HPCI reliability could be impacted, in that, HPCI would not be available for other risk significant operating events that the system could be utilized to mitigate if the steam leak were not present.

The inspectors performed a SDP Phase 1 screening for the finding using IMC 0609, Attachment 04, "Initial Characterization of Findings," and IMC 0609, Appendix A, Exhibit 2, "Mitigating Systems Screening Questions," and answered the first four questions "No." Therefore, the finding screened as very low safety significance, or Green.

Inspectors reviewed the work history for the valve, operating experience, and issue timeline to determine that the performance deficiency was a legacy issue, and no cross-cutting aspect was identified. Based on the licensee's reaction to more recent operating experience, inspectors determined that the performance deficiency was not indicative of current performance. When presented with operating experience from another facility earlier this year, the licensee recognized the vulnerability and scheduled internal

inspections for valves at the next opportunity. Given that the licensee had no indication of degradation at the time and the replacement would require cold shutdown conditions since both HPCI and reactor core isolation cooling would be unavailable during the repair, the 2013 schedule was reasonable.

Enforcement: Technical Specification 5.4.1.a required that written procedures be established, implemented, and maintained covering the applicable procedures recommended in Regulatory Guide 1.33, Quality Assurance Program Requirements (Operation).

Regulatory Guide 1.33, Appendix A, Section 9, "Procedures for Performing Maintenance," states in part that maintenance that can affect the performance of safety-related equipment should be properly pre-planned and performed in accordance with written procedures, or documented instructions appropriate to the circumstances.

Contrary to the above, in October of 2000, after the licensee replaced valve bodies and piping in the affected steam line drain, the preventative maintenance task for internal inspections was not changed to a frequency that would allow degradation of susceptible components due to erosion/corrosion to be identified before the system reliability, availability, or operability were impacted. Because this violation was determined to be of very low safety significance, and this issue has been entered into the licensee's CAP as IR 1388890, this violation is being treated as an NCV consistent with Section 2.3.2 of the NRC Enforcement Policy (**NCV 05000254/2012004-01, "Unit 1 HPCI Steam Line Drain Valve Through-body Leak"**). The valve was replaced with a new valve and a limited review of accessible piping was performed. The licensee verified inspections on other valves in similar environmental conditions are planned for the next outage opportunity.

(2) No Torque Value Specified for Control Room Heating, Ventilation, and Air Conditioning Refrigeration Condensing Unit Head Bolts

Introduction: A self-revealed finding of very low safety significance (Green) and associated NCV of TS 5.4.1.a was identified for the licensee's failure to specify torque values for the control room heating, ventilation, and air conditioning (HVAC) refrigeration condensing unit (RCU) condenser head in the work instructions performed on January 19, 2012.

Description: On January 19, 2012, the control room HVAC RCU condenser head was reassembled following an interior inspection of the heat exchanger. This component is part of the single-train, safety-related control room HVAC system required for Technical Specifications. As part of WO 1334414, the control room HVAC RCU condenser head was reinstalled after the inspection. The step in the work instruction stated, "tighten bolts using a crisscross pattern and good mechanical judgment." No torque value was specified for this step. All other bolted connections in WO 1334414 specified a torque value. The system was run successfully for post-maintenance testing following the work with no leakage identified. This system was run successfully several times between January 2012 and July 2012 with no leakage identified at the RCU condenser head.

On July 17, 2012, an operator noted a leak had developed between the condenser head and the body of the condenser at the gasket for the control room HVAC RCU. The leakage rate at the time of discovery was approximately one drop per second. Issue Report 1389491 was written by Operations to document the leak. At the time of discovery, Operations determined the leakage rate was minor in nature and did not

impact operability of the control room HVAC. Later that day, a Fix It Now mechanic attempted to tighten the bolting. The leakage rate increased to approximately 1 gpm. The decision was then made to declare the control room HVAC inoperable and to isolate the RCU to facilitate replacement of the gasket.

Repairs were completed and the post-maintenance test was completed satisfactorily on July 18, 2012. The work instructions completed on July 18, 2012, were identical to the work instructions that were performed on January 19, 2012. Neither of these instructions stated a torque value for the RCU condenser heads. MA-MW-736-600, "Torquing and Tightening of Bolted Connections," purpose step 1.1 states, "This procedure provides instructions for proper tightening of bolted connections and recommended torque values for pressure retaining bolted connections where none are provided by equipment manufacturer, and for tightening requirements for structural joints." Step 4.2.1 of that procedure states, "Obtain torque value from applicable design drawing, vendor manual, Plant Design Specifications, or Attachment." There is a note for this step that directs the user to Attachment 2 in cases that the torque value is not available or insufficient to prevent leakage. Attachment 2 is a series of torque value tables for different mating surfaces and gaskets based on diameter of the connections. During the gasket replacement for the leak repair, Engineering Change Request (ECR) 405928 was generated to verify the condenser head reassembly instructions. The licensee contacted the vendor of the RCU to verify the assembly instructions. The vendor stated that they do not specify a torque value for the fasteners, but would recommend good mechanical judgment. Engineering's review on July 17, 2012, determined that the previous work instruction was adequate, and Maintenance planned the reassembly of the condenser head identical to the work instructions performed in January 2012.

Analysis: The inspectors concluded that the failure to specify torque values for a safety related bolted connection in accordance with MA-MW-736-600, "Torquing and Tightening of Bolted Connections," was a performance deficiency and a finding. The performance deficiency was more than minor because the performance deficiency, if left uncorrected, had the potential to lead to a more significant event.

The inspectors performed an SDP Phase 1 screening for the finding using IMC 0609, Attachment 04, "Initial Characterization of Findings," and IMC 0609, Appendix A, Exhibit 2, "Mitigating Systems Screening Questions," and answered the first four questions "No." Therefore, the finding screened as very low safety significance, or Green.

Inspectors determined that a contributor to this finding was that the Maintenance and Engineering Departments did not verify the assumptions or identify unintended consequences with possible variance in the interpretation and implementation of work instructions stating, "tighten bolts using a crisscross pattern and good mechanical judgment," vice specifying a torque value from MA-MW-736-600. This work practice has been performed for this bolted connection for many years without any observable consequence. During the gasket replacement for the leak repair, ECR 405928 was generated to verify the condenser head reassembly instructions. Engineering's review on July 17, 2012, determined that the previous work instruction was adequate and Maintenance planned the reassembly of the condenser head identical to the work instructions performed in January 2012. MA-MW-736-600 was not referenced nor was "good mechanical judgment" defined. As a result, this performance deficiency is

indicative of current performance. The inspectors identified that this issue had a cross-cutting aspect in the area of Human Performance - Decision Making (H.1(b)). Because the same direction for tightening the bolts that resulted in the finding was used for re-installation, the licensee implemented a plan to check the condenser head for leakage after each run of the system.

Enforcement: Technical Specification 5.4.1.a required that written procedures be established, implemented, and maintained covering the applicable procedures recommended in Regulatory Guide 1.33, Quality Assurance Program Requirements (Operation).

Regulatory Guide 1.33, Appendix A, Section 9, "Procedures for Performing Maintenance," states in part that maintenance that can affect the performance of safety-related equipment should be properly pre-planned and performed in accordance with written procedures, or documented instructions appropriate to the circumstances.

Contrary to the above, on January 19, 2012, the licensee failed to implement MA-MW-736-600, "Torquing and Tightening of Bolted Connections," because the work instructions to reassemble the control room HVAC RCU condenser head did not specify a torque value for the fasteners and no vendor value was provided. "Good mechanical judgment" is not an appropriate value that is measurable for acceptance criteria for safety-related work that would provide reasonable assurance of continued operability. Because this violation was determined to be of very low safety significance, and this issue has been entered into the licensee's CAP as IR 1389668, this violation is being treated as an NCV consistent with Section 2.3.2 of the NRC Enforcement Policy (**NCV 05000254/2012004-02; 05000265/2012004-02, "Control Room HVAC RCU Head Bolts Not Torqued"**).

1R22 Surveillance Testing (71111.22)

.1 Surveillance Testing

a. Inspection Scope

The inspectors reviewed the test results for the following activities to determine whether risk-significant systems and equipment were capable of performing their intended safety function and to verify testing was conducted in accordance with applicable procedural and TS requirements:

- QCMMS 1500-12: Portable Emergency Flood Pump Capacity Test (Routine);
- QCOS 1100-07: Standby Liquid Flow Rate Test for 1 'B' SBLC pump (IST); and
- QCOS 1600-07: Reactor Coolant Leakage in the Drywell (RCS).

The inspectors observed in-plant activities and reviewed procedures and associated records to determine the following:

- did preconditioning occur;
- were the effects of the testing adequately addressed by control room personnel or engineers prior to the commencement of the testing;
- were acceptance criteria clearly stated, demonstrated operational readiness, and consistent with the system design basis;

- plant equipment calibration was correct, accurate, and properly documented;
- as-left setpoints were within required ranges; and the calibration frequency was in accordance with TSs, the UFSAR, procedures, and applicable commitments;
- measuring and test equipment calibration was current;
- test equipment was used within the required range and accuracy; applicable prerequisites described in the test procedures were satisfied;
- test frequencies met TS requirements to demonstrate operability and reliability; tests were performed in accordance with the test procedures and other applicable procedures; jumpers and lifted leads were controlled and restored where used;
- test data and results were accurate, complete, within limits, and valid;
- test equipment was removed after testing;
- where applicable for inservice testing activities, testing was performed in accordance with the applicable version of Section XI, American Society of Mechanical Engineers code, and reference values were consistent with the system design basis;
- where applicable, test results not meeting acceptance criteria were addressed with an adequate operability evaluation or the system or component was declared inoperable;
- where applicable for safety-related instrument control surveillance tests, reference setting data were accurately incorporated in the test procedure;
- where applicable, actual conditions encountering high resistance electrical contacts were such that the intended safety function could still be accomplished;
- prior procedure changes had not provided an opportunity to identify problems encountered during the performance of the surveillance or calibration test;
- equipment was returned to a position or status required to support the performance of its safety functions; and
- all problems identified during the testing were appropriately documented and dispositioned in the CAP.

Documents reviewed are listed in the Attachment to this report.

This inspection constituted one routine surveillance testing sample, one inservice testing sample, and one reactor coolant system leak detection inspection sample as defined in IP 71111.22, Sections -02 and -05.

b. Findings

No findings were identified.

1EP6 Drill Evaluation (71114.06)

.1 Emergency Preparedness Drill Observation

a. Inspection Scope

The inspectors evaluated the conduct of a routine licensee emergency drill on August 30, 2012, to identify any weaknesses and deficiencies in classification, notification, and protective action recommendation development activities. The inspectors observed emergency response operations in the Technical Support Center to determine whether the event classification, notifications, and protective action

recommendations were performed in accordance with procedures. The inspectors also attended the licensee drill critique to compare any observed weakness with those identified by the licensee staff in order to evaluate the critique and to verify whether the licensee staff was properly identifying weaknesses and entering them into the CAP.

This emergency preparedness drill inspection constituted one sample as defined in IP 71114.06-05.

b. Findings

No findings were identified.

#### 4. OTHER ACTIVITIES

##### **Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity, and Emergency Preparedness**

#### 4OA1 Performance Indicator Verification (71151)

##### .1 Safety System Functional Failures

a. Inspection Scope

The inspectors sampled licensee submittals for the Safety System Functional Failures performance indicator for Quad Cities Units 1 and 2 for the period from the second quarter of 2011 through the third quarter of 2012. To determine the accuracy of the performance indicator data reported during those periods, performance indicator definitions and guidance contained in the Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6, dated October 2009, and NUREG-1022, "Event Reporting Guidelines 10 CFR 50.72 and 50.73" definitions and guidance, were used. The inspectors reviewed the licensee's operator narrative logs, operability assessments, maintenance rule records, maintenance work orders, issue reports, event reports, and NRC integrated inspection reports for the period of July 1, 2011 through June 30, 2012, to validate the accuracy of the submittals. The inspectors also reviewed the licensee's issue report database to determine if any problems had been identified with the performance indicator data collected or transmitted for this indicator, and none were identified.

This inspection constituted two safety system functional failure samples as defined in IP 71151-05.

b. Findings

No findings were identified.

## 4OA2 Identification and Resolution of Problems (71152)

### **Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity, Emergency Preparedness, Public Radiation Safety, Occupational Radiation Safety, and Physical Protection**

#### .1 Routine Review of Items Entered into the Corrective Action Program

##### a. Inspection Scope

As part of the various baseline inspection procedures discussed in previous sections of this report, the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that they were being entered into the licensee's CAP at an appropriate threshold, that adequate attention was being given to timely corrective actions, and that adverse trends were identified and addressed. Attributes reviewed included: identification of the problem was complete and accurate; timeliness was commensurate with the safety significance; evaluation and disposition of performance issues, generic implications, common causes, contributing factors, root causes, extent of condition reviews, and previous occurrences reviews were proper and adequate; and that the classification, prioritization, focus, and timeliness of corrective actions were commensurate with safety and sufficient to prevent recurrence of the issue. Minor issues entered into the licensee's CAP as a result of the inspectors' observations are included in the Attachment to this report.

These routine reviews for the identification and resolution of problems did not constitute any additional inspection samples. Instead, by procedure they were considered an integral part of the inspections performed during the quarter and documented in Section 1 of this report.

##### b. Findings

No findings were identified.

#### .2 Daily Corrective Action Program Reviews

##### a. Inspection Scope

In order to assist with the identification of repetitive equipment failures and specific human performance issues for followup, the inspectors performed a daily screening of items entered into the licensee's CAP. This review was accomplished through inspection of the station's daily condition report packages.

These daily reviews were performed by procedure as part of the inspectors' daily plant status monitoring activities and, as such, did not constitute any separate inspection samples.

##### b. Findings

No findings were identified.



.3 Selected Issue Followup Inspection: Emergency Operating Procedure Equipment Staging

a. Inspection Scope

During a review of items entered into the licensee's CAP, the inspectors recognized a corrective action item documenting that the Unit 1 jumper packets staged for emergency operating procedure (QGA) implementation in the main control room needed to be updated. A licensed operator performing procedure review and walkdown identified the deficiency and entered the issue into the CAP as IR 1386431. While this deficiency did not prevent the staged jumpers from being used successfully, the modification process should have updated the staged jumpers to the banana jack connections to make use of the improved electrical reliability and ease of installation. The licensee performed an extent of condition walkdown and identified six other procedures that had staged jumper packets which were deficient. The packets were appropriately updated, and corrective action was put in place requiring the emergency procedure coordinator to sign off on procedure revisions.

This review constituted one in-depth problem identification and resolution sample as defined in IP 71152-05.

b. Findings

No NRC or self-revealed findings were identified. One licensee-identified finding is discussed in Section 4OA7 of this report.

4OA5 Other Activities

.1 (Discussed) NRC Temporary Instruction (TI) 2515/182, Review of the Industry Initiative to Control Degradation of Underground Piping and Tanks

a. Inspection Scope

Leakage from buried and underground pipes has resulted in ground water contamination incidents with associated heightened NRC and public interest. The industry issued a guidance document, Nuclear Energy Institute (NEI) 09-14, "Guideline for the Management of Buried Piping Integrity" (ADAMS Accession No. ML1030901420) to describe the goals and required actions (commitments made by the licensee) resulting from this underground piping and tank initiative. On December 31, 2010, NEI issued Revision 1 to NEI 09-14, "Guidance for the Management of Underground Piping and Tank Integrity," (ADAMS Accession No. ML110700122), with an expanded scope of components which included underground piping that was not in direct contact with the soil and underground tanks. On November 17, 2011, the NRC issued Temporary Instruction (TI)-2515/182, "Review of the Industry Initiative to Control Degradation of Underground Piping and Tanks," to gather information related to the industry's implementation of this initiative.

The inspectors reviewed the licensee's programs for buried pipe, underground piping and tanks in accordance with TI-2515/182 to determine if the program attributes and completion dates identified in Sections 3.3 A and 3.3 B of NEI 09-14, Revision 1 were contained in the licensee's program and implementing procedures. For the buried pipe and underground piping program attributes with completion dates that had passed, the

inspectors reviewed records to determine if the attribute was, in fact, complete and to determine if the attribute was accomplished in a manner which reflected good or poor practices in program management.

Based upon the scope of the review described above, Phase I of TI-2515/182 was completed.

b. Observations

The licensee's buried piping and underground piping and tanks program was inspected in accordance with Paragraphs 03.01.a through 03.01.c of TI-2515/182 and was found to meet all applicable aspects of NEI 09-14, Revision 1, as set forth in Table 1 of the TI.

c. Findings

No findings were identified.

.2 (Discussed) Temporary Instruction 2515/187, Inspection of Near-Term Task Force Recommendation 2.3 Flooding Walkdowns

a. Inspection Scope

Inspectors accompanied the licensee on a sampling basis, during their flooding and seismic walkdowns, to verify that the licensee's walkdown activities were conducted using the methodology endorsed by the NRC. These walkdowns are being performed at all sites in response to a letter from the NRC to licensees, entitled "Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," dated March 12, 2012 (ADAMS Accession No. ML12053A340).

Enclosure 3 of the March 12, 2012, letter requested licensees perform seismic walkdowns using an NRC-endorsed walkdown methodology. Electric Power Research Institute document 1025286 titled, "Seismic Walkdown Guidance," (ADAMS Accession No. ML12188A031) provided the NRC-endorsed methodology for performing seismic walkdowns to verify that plant features, credited in the current licensing basis for seismic events, are available, functional, and properly maintained.

Enclosure 4 of the letter requested licensees to perform external flooding walkdowns using an NRC-endorsed walkdown methodology (ADAMS Accession No. ML12056A050). Nuclear Energy Industry document 12-07 titled, "Guidelines for Performing Verification Walkdowns of Plant Protection Features," (ADAMS Accession No. ML12173A215) provided the NRC-endorsed methodology for assessing external flood protection and mitigation capabilities to verify that plant features, credited in the CLB for protection and mitigation from external flood events, are available, functional, and properly maintained.

b. Findings

Findings or violations associated with the flooding and seismic walkdowns, if any, will be documented in the 4<sup>th</sup> quarter integrated inspection report, NRC Inspection Report 05000254/2012005 and 05000265/2012005.

.3 (Closed)Temporary Instruction 2515/188, Inspection of Near-Term Task Force Recommendation 2.3 Seismic Walkdowns

a. Inspection Scope

The inspectors accompanied the licensee on their seismic walkdowns of the Unit 2 direct current distribution system and safety-related batteries on August 7, 2012, and the Unit 2 high pressure coolant injection system on August 9, 2012. The inspectors accompanied the licensee and verified that the licensee confirmed that the following seismic features associated with the Unit 2 direct current distribution system, safety-related batteries, and Unit 2 high pressure coolant injection system were free of potential adverse seismic conditions:

- anchorage was free of bent, broken, missing or loose hardware;
- anchorage was free of corrosion that is more than mild surface oxidation;
- anchorage was free of visible cracks in the concrete near the anchors;
- anchorage configuration was consistent with plant documentation;
- systems, structures, and components will not be damaged from impact by nearby equipment or structures;
- overhead equipment, distribution systems, ceiling tiles and lighting, and masonry block walls are secure and not likely to collapse onto the equipment;
- attached lines have adequate flexibility to avoid damage;
- the area appears to be free of potentially adverse seismic interactions that could cause flooding or spray in the area;
- the area appears to be free of potentially adverse seismic interactions that could cause a fire in the area; and
- the area appears to be free of potentially adverse seismic interactions associated with housekeeping practices, storage of portable equipment, and temporary installations (e.g., scaffolding, lead shielding).

The inspectors independently performed their walkdown and verified that the following areas were properly inspected with discrepancies documented per the walkdown guidance:

- Unit 0 emergency diesel generator room including the Unit 0 emergency diesel generator, starting air compressors, and day tank room on August 14, 2012.

Observations made during the walkdown that could not be determined to be acceptable were entered into the corrective action program for evaluation.

Additionally, inspectors verified that items that could allow the spent fuel pool to drain down rapidly were evaluated for addition to the seismic walkdown equipment list. Due to the construction of the spent fuel pool, fuel pool cooling, and inventory water control for the spent fuel pool, there are no components that meet the guidance to be included in the seismic walkdown equipment list for the spent fuel pool.

b. Findings

No NRC-identified or self-revealing findings were identified. One licensee-identified finding is discussed in Section 4OA7 of this report.

#### 4OA6 Management Meetings

##### .1 Exit Meeting Summary

On October 2, 2012, the inspectors presented the inspection results to Site Vice President, T. Hanley, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

##### .2 Interim Exit Meetings

Interim exits were conducted for:

- The Review of the Industry Initiative to Control Degradation of Underground Piping and Tanks (TI -2515/182) with Site Vice President, Mr. T. Hanley, and other members of the licensee staff on July 12, 2012.
- The technical issues and ongoing elements of the Triennial Heat Exchanger inspection (documented in Section 1R07 of this report) with S. Darin and other members of the licensee staff on September 21, 2012.

The inspectors confirmed that none of the potential report input discussed was considered proprietary. Proprietary material received during the inspections was returned to the licensee.

#### 4OA7 Licensee-Identified Violations

The following violations of very low significance (Green) were identified by the licensee and are violations of NRC requirements which meet the criteria of the NRC Enforcement Policy for being dispositioned as NCVs.

- A licensee-identified finding of very low safety significance (Green) and associated NCV of 10 CFR 50, Appendix B, Criterion V, "Procedures," was identified on August 9, 2012. Station personnel performing walkdowns for TI 2515/188 identified that a cart and recorder assembly staged in the Unit 2 main control room for troubleshooting of Intermediate Range Monitor 15 was not installed per the station seismic housekeeping procedure. The finding is more than minor because it adversely affected the equipment reliability attribute of the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems responding to initiating events to prevent undesirable consequences (i.e., core damage). MA-QC-716-026-1001, "Seismic Housekeeping," provided instructions to prevent temporarily stored or transient materials from adversely impacting safety-related components required for safe shutdown of the plant or continued decay heat removal during or following a seismic event. Step 4.2.3 of that procedure addressed the potential for the object overturning and stated in sub-step 3 that the projected fall distance for unsecured, stacked items was determined based on the height plus a minimum of 1 foot. Step 4.2.3.4 required stacked items to be secured together and/or relocated a safe distance away from safety-related equipment or components since the potential interaction distances for loose items would be difficult to predict. Step 4.2.3.5 required restraints where safe distances could not be maintained for unstable items. Contrary to the above, the licensee did not

implement the requirements of MA-QC-716-026-1001, "Seismic Housekeeping," while executing the Intermediate Range Monitor 15 troubleshooting under WO1542900. Specifically, the licensee placed the unsecured cart and recorder assembly too close to the safety-related equipment and did not restrain the assembly as required by the procedure. The licensee entered the issue into CAP as IR 1399135 and immediately placed the recorder on the floor to remove the tipping hazard.

- A licensee-identified finding of very low safety significance (Green) and associated NCV of 10 CFR 50, Appendix B, Criterion V, "Procedures," was identified on August 9, 2012. Station personnel performing a procedure review and walkdown identified that the jumpers in the staged jumper packet for QCOP 0250-02 had not been updated after installation of banana jacks on the installation terminals. Failure to update the jumpers after the modification was installed is a performance deficiency. The individual entered the issue into the CAP as IR 1386431. The finding is more than minor because it adversely affected the equipment reliability attribute of the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems responding to initiating events to prevent undesirable consequences (i.e., core damage). The extent of condition walkdown for this issue identified six other jumper packets that contained the wrong number or type of jumpers, the wrong type of relay blocks, or the wrong tools. Title 10 CFR 50, Appendix B, Criterion V, "Procedures," requires in part that activities affecting quality shall be prescribed by procedures of a type appropriate to the circumstances and shall be accomplished in accordance with those procedures. Contrary to the above, jumpers supporting emergency procedure required actions were not updated after plant modifications were implemented. While inspectors deemed that the procedural action could probably have been accomplished using other materials available to the control room personnel, the wrong staged material could result in unnecessary delays or human performance errors that would impact emergency actions and result in undesirable consequences. As immediate corrective actions for this condition, the appropriate jumpers and relay blocks were placed in the staged packets.

ATTACHMENT: SUPPLEMENTAL INFORMATION

## SUPPLEMENTAL INFORMATION

### KEY POINTS OF CONTACT

#### Licensee

T. Hanley, Site Vice President  
Dan Collins, Radiation Protection Manager  
Doug Collins, Design Engineering Manager  
J. Garrity, Maintenance Director  
G. Harris, Human performance Manager  
G. Kaegi, Exelon Corporate Licensing  
B. Magnuson, Operations Shift Manager  
A. Misak, Nuclear Oversight Manager  
K. O'Shea, Acting Operations Director  
K. Ohr, Site Engineering Director  
T. Petersen, Regulatory Assurance Lead  
T. Scott, Work Management Director  
T. Wojcik, Online Work Control Manager

#### Nuclear Regulatory Commission

M. Ring, Chief, Reactor Projects Branch 1

#### Illinois Emergency Management Agency (IEMA)

C. Settles, IEMA

### LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

#### Opened

05000254/2012004-01	NCV	Unit 1 HPCI Steam Line Drain Valve Through-body Leak (Section 1R19.1.b(1))
05000254/2012004-02; 05000265/2012004-02	NCV	Control Room HVAC RCU Head Bolts Not Torqued (Section 1R19.1.b(2))

#### Closed

05000254/2012004-01	NCV	Unit 1 HPCI Steam Line Drain Valve Through-body Leak (Section 1R19.1.b(1))
05000254/2012004-02; 05000265/2012004-02	NCV	Control Room HVAC RCU Head Bolts Not Torqued (Section 1R19.1.b(2))
2515/188	TI	Inspection of Near-Term Task Force Recommendation 2.3 Seismic Walkdowns (Section 4OA5.3)

#### Discussed

2515/182	TI	Review of the Industry Initiative to Control Degradation of Underground Piping and Tanks (Section 4OA5.1)
2515/187	TI	Inspection of Near-Term Task Force Recommendation 2.3 Flooding Walkdowns (Section 4OA5.2)

## LIST OF DOCUMENTS REVIEWED

The following is a partial list of documents reviewed during the inspection. Inclusion on this list does not imply that 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.

### Section 1R04

- USFAR 9.2.3; Reactor Building Closed Cooling Water System
- QCOP 2300-01; HPCI Preparation for Standby Operation; Revision 62
- QCOP 1400-01; Core Spray System Preparation for Standby Operation; Revision 25
- QCOP 6900-02; 125 Vdc Electrical System; Revision 34
- QCOP 6900-01; 250 Vdc Electrical System; Revision 35
- QCOP 6600-04; Diesel Generator (0) Preparation for Standby Operation; Revision 30

### Section 1R05

- Pre-fire Plan FZ 11.3.2; Unit 2 RB 544'-0" Elev., SE Corner Room - 2B RHR Room
- Pre-fire Plan FZ 6.3; SB 595'-0" Elev., Auxiliary Electric Room
- Pre-fire Plan FZ 3.0; SB 609'-0" Elev., Cable Spreading Room
- Pre-fire Plan FZ 7.2; Unit 2 TB 628'-6" Elev., 250V Battery Room
- Pre-fire Plan FZ 8.2.5; Unit ½ TB 580'-0" Elev., U-2 Cable Tunnel
- Pre-fire Plan FZ 8.2.4; Unit 1 TB 580'-0" Elev., Cable Tunnel
- Fire Drill Scenario for RX BLDG 595 MCC 18/19-5 Cubicle A3 Fire

### Section 1R06

- UFSAR Section 3.4.1.2; Internal Flood Protection Measures
- UFSAR Section 3.6; Protection Against Dynamic Effects Associated with the Postulated Rupture of Piping
- WO 1509928; (LR) Annual Cable Vault Water Intrusion Inspection; 8/3/12
- WO 1539192; (LR) Quarterly Cable Vault Water Intrusion Inspection; 8/3/12

### Section 1R11

- QCOA 0010-12; Fire Explosion; Revision 39

### Section 1R12

- Enterprise Maintenance Rule Production Database for the following systems:
  - Z0500: Reactor Protection
  - Z0012-01: Reactor Building Flood Protection
  - Z5795: Control Room Area HVAC System
- IR 1274619; 2A CS Door Throw Lever Broken
- ER-AA-310-1005; Maintenance Rule – Dispositioning Between (a)(1) and (a)(2); Revision 6
- IR 01201502; Unexpected Breaker Trip on Bus 18-4 Cubicle 1D
- IR 01237065; Elevated Vibration Data on the 0-9400-102 Control Room HVAC Chiller
- IR 01290940; Instrument Air Soldered Connection Broke – PRV No Longer Connected to System

- IR 01292678; B CR HVAC Autostart Due to Shredded A CR HVAC Area Heating unit Fan Belt
- IR 01322025; CDBI – Degraded Condition Not Reported (IR) See WO 1252888-01
- IR 01322407; B Control Room HVAC RCU Breaker Found Tripped
- IR 01333434; Maintenance Rule: Performance Criteria Exceeded (Control Room HVAC)
- IR 01343197; A Control Room HVAC System – Chiller A Tripped on Loss of Oil
- IR 01389491; B HVAC RCU Heat Exchanger Gasket Leak
- IR 01391837; Maintenance Rule: Performance Criteria Exceeded (B Control Room HVAC RCU)
- IR 1227524; “TCV Load Reject Pressure Switch Chatter”
- IR 1294079; “Relay 590-123C Did Not Drop Out When Press Switch Opened”
- IR 1297650; “Unexpected Channel A ½ Scram on U1”
- IR 1322913; “U-1 Unexpected Channel A ½ Scram”
- IR 1356907; “Unexpected Channel A ½ Scram on Unit Two”
- IR 1362646; “Unexplained Adverse Condition Admin – RPS ½ Scrams”
- IR 1385467; “U1 Spurious Half Scram EACE 1371123-03 Actions”
- IR 1385468; “U2 Spurious Half Scram EACE 1371123-03 Actions”
- IR 1410473; “Spurious RPS A Half Scrams During Load Drop”
- ACE 1371123, “Spurious ½ Scram on both units at Quad Cities Station during changes in reactor power”
- ER-AA-1200; “Critical Component Failure Clock,” Revision 8

#### Section 1R13

- IR 138890; Steam Leak Identified on the 1-2301-29, HPCI Stm Line Drain
- IR 1389013; QCOS 1400-08, 1A CS Valve Timing Not Completed as Scheduled
- IR 138914; QCOS 1400-01, 1A CS Flow Rate Not Completed as Scheduled

#### Section 1R15

- IR 1382569; 10 CFR Part 21 Notification for Rosemount 710DU Trip Units
- IR 1385755; Unit 1B Refuel Rad Monitor Failed Channel Check
- EC389751; Refuel floor Radiation Monitor Channel Check Agreement Criteria Evaluation
- QCOS 00005-S01; Operations Department Weekly Summary of Daily Surveillance Unit One
- TS Bases 3.3.6.2.1; Secondary Containment Isolation Instrumentation Surveillance Requirements
- QC-S-20112-055; 50.59 Screening for EC 389751
- IR 1392446; Alternator Overcurrent Relay Hot Connection; 7/24/12
- EC 389950; Evaluate Elevated Temperature on Right Connection of Unit 2 EDG Field Overcurrent Relay (40-OC); Revision 0
- IR 1399044; Part 21 Issued on Conoflow I/P Transducer and Air Regulator; 8/9/12
- EC 390137; Evaluate Part 21 Issued on Conoflow I/P Transducer and Air Regulator
- IR 1411577; 2A RHRSW Vault Cooler UT Results
- IR 1411625; 2A RHRSW Vault Cooler Degraded Threads-Inlet Header
- EC 390469; Determine Structural Integrity of RHRSW 2” Threaded Inlet Connection on 2A RHRSW Cubicle Room Cooler, 2-5745A

#### Section 1R18

- EC 385475; Installation and Implementation of On-line NobleChem™ Injection Skid
- WO 1467705; Installation of Noble Metal Skid per EC 385475
- QC-S-2012-0056, 50.59 Screening for EC 385475
- EC 377274; Effect of On-line NobleChem™ on OPTIMA2 Fuel



- CY-QC-110-503; On-line Noble Metals Chemical Injection

#### Section 1R19

- WO 1557058; MM Support Furmanite/ Repair 1-2301-29 Valve Body Leak
- QCOS 2300-06; HPCI System Power Operated Valve Test
- CO 103328; U-1 HPCI Steam Line to Condenser Upstream Drn Vlv AOV 1-2301-29
- WO 1576054; No Remote/Local RPM Indications for U-I SBO DG
- IR 1416812; No Remote/Local RPM Indications for U-I SBO DG
- QCOS 6620-09; SBO DG 1(2) Unloaded Operability Run; Revision 14
- WO 1458258; Replace the 2C LP RHRSW Discharge Elbow
- QCOS 1000-04; RHR Service Water Operability Test

#### Section 1R22

- QCMMS 1500-12; Portable Emergency Flood Pump Capacity Test; Revision 1
- QCOA 0010-16; Flood Emergency Procedure; Revision 15
- QCOS 1600-07; Reactor Coolant Leakage in the Drywell (RCS)
- QCOS 1100-07; Stand-by Liquid Flow Rate Test; Revision 33
- IR 1389491; B HVAC RCU HX Has Gasket Leak
- WO 1557541; B HVAC RCU HX Has Gasket Leak
- QCOP 5750-09; Control Room Ventilation System

#### Section 1EP6

- EP Drill Scenario, Team 'B', September 13, 2012

#### Section 4OA1

- LS-AA-2140; Monthly PI Data Elements; April 2011 – June 2012
- LS-AA-2090; Monthly Data Elements for NRC Safety System Functional Failures

#### Section 4AO2

- IR 1381997; ASME OM Code Non-conformance – No As-found Seat Leakage Test
- WO1399094; Replace and Test relief Valve 1-4699-306B
- QCMMS 1500-01; IST Relief Valve Set-point Testing
- IR 1386431; U1 QGA Jumper Packet Hardware Needs To Be Updated
- QCOP 0250-02; Bypassing MSIV Group 1 Isolation Signal From Low Low Reactor Water Level
- IR 1394519; QCOP 0201-10 Packet Does Not Have Enough Jumpers
- IR 1394524; QCOP 1000-39 QGA Packet Has Wrong Type of Blocks
- IR 1394525; QCOP 1000-39 QGA Packet Has Wrong Type of Blocks
- IR 1394526; QCOP 1000-45 QGA Packet Has Wrong Type of Blocks
- IR 1394527; QCOP 1000-45 QGA Packet Has Wrong Type of Blocks
- IR 1394531; QCOP 1300-10 QGA Packet Has Wrong Blocks
- IR 1394532; QCOP 1300-10 QGA Packet Has Wrong Blocks
- IR 1394533; QCOP 1000-39 QGA Packet On Unit 2 Has Wrong Style of Jumper

#### Section 4AO5

- NES-G-01; Quad Cities Buried Pipe Inspection Plan Template; Revision 1

- NES-MS-15.2; Guidance for Determining Reasonable Assurance for Structural and/or Leakage Integrity for Buried Piping; Revision 0
- ER-AA-5400; Buried Piping and Raw Water Corrosion Program (BPRWCP) Guide; Revision 5
- ER-AA-5400-1002; Buried Piping Examination Guide; Revision 4
- ER-AA-5400-1003; Buried Pipe and Raw Water Corrosion Program (BPRWCP) Performance Indicators; Revision 4
- Buried Pipe and Raw Water Systems Long Term Asset Management Strategy; Revision 5
- Report No. 0609-02; Exelon Buried Piping Risk-Analysis; Revision 0
- FASA 997163-03; Buried Piping Raw Water Corrosion Program
- AR 01330854; Check-In; NRC Buried Piping TI Inspection-Phase I
- AR 01293221; Results Binder Summary Issues: Buried Tank Components; November 21, 2011
- AR 01125488; Deficiency Noted During Buried Pipe FASA
- 2011 Cathodic Protection Re-survey Report; January 2012
- Technical Report AM1292-344277; Long range Guided Wave Ultrasonic Pipe Screening Results; October 6, 2011

#### Section 4AO7

- IR 1386431; FUK: Seismic, Recorder on IRM is Not Seismically Correct
- MA-QC-716-026-1001; Seismic Housekeeping
- Work Order 1542900; Received Unexpected Alarms, 902-5 A-5/C-15 For Unit 2 IRM 15
- IR 1386431; U1 QGA Jumper Packet Hardware Needs To Be Updated
- QCOP 0250-02; Bypassing MSIV Group 1 Isolation Signal From Low Low Reactor Water Level

## LIST OF ACRONYMS USED

ADAMS	Agencywide Document Access Management System
CAP	Corrective Action Program
CFR	Code of Federal Regulations
DRP	Division of Reactor Projects
EC	Engineering Change
ECR	Engineering Change Request
HPCI	High Pressure Coolant Injection
HVAC	Heating, Ventilation, and Air Conditioning
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Issue Report
NCV	Non-cited Violation
NEI	Nuclear Energy Institute
NRC	U.S. Nuclear Regulatory Commission
PARS	Publicly Available Records System
RCU	Refrigeration Condensing Unit
SDP	Significance Determination Process
TI	Temporary Instruction
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
WO	Work Order

M. Pacilio

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Sincerely,

**/RA/**

Mark A. Ring, Branch Chief  
Branch 1  
Division of Reactor Projects

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

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Letter to M. Pacilio from M. Ring dated October 25, 2012

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2 -  
NRC INTEGRATED INSPECTION REPORT 05000254/2012004  
AND 05000265/2012004

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