



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

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

May 12, 2009

Mr. Charles G. Pardee  
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  
NRC INTEGRATED INSPECTION REPORT 05000254/2009002;  
05000265/2009002

Dear Mr. Pardee:

On March 31, 2009, the U. S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Quad Cities Nuclear Power Station Units 1 and 2. The enclosed inspection report documents the inspection results, which were discussed on April 7, 2009, with Mr. T. Tulon 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.

The report documents one NRC-identified finding and four self-revealed findings of very low safety significance (Green). Four of the findings were determined to involve violations of NRC requirements. Additionally, a licensee-identified violation which was determined to be of very low safety significance is listed in this report. However, because of the very low safety significance and because they are entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs) consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest 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 copies to the Regional Administrator, Region III; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Quad Cities Nuclear Power Station. In addition, if you disagree with the characterization of 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 Quad Cities Nuclear Power Station. The information you provide will be considered in accordance with Inspection Manual Chapter 0305.

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 (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/**

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

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

Enclosure: Inspection Report 05000254/2009002; 05000265/2009002  
w/Attachment: Supplemental Information

cc w/encl: Site Vice President - Quad Cities Nuclear Power Station  
Plant Manager - Quad Cities Nuclear Power Station  
Manager Regulatory Assurance -  
Quad Cities Nuclear Power Station  
Senior Vice President - Midwest Operations  
Senior Vice President - Operations Support  
Vice President - Licensing and Regulatory Affairs  
Director Licensing - Licensing and Regulatory Affairs  
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Jeff Gust, VP Energy Supply Management, MidAmerican Energy  
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J. Klinger, State Liaison Officer,  
Illinois Emergency Management Agency  
M. Rasmusson, Chief, Bureau of Radiological Health,  
Iowa Department of Public Health  
Chairman, Illinois Commerce Commission  
Chief Radiological Emergency Preparedness Section,  
Dept. Of Homeland Security

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Letter to C. Pardee from M. Ring dated May 12, 2009

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2  
NRC INTEGRATED INSPECTION REPORT 05000254/2009002;  
05000265/2009002

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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: 05000254/2009002 and 05000265/2009002

Licensee: Exelon Nuclear

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

Location: Cordova, IL

Dates: January 1 through March 31, 2009

Inspectors: J. McGhee, Senior Resident Inspector  
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W. Slawinski, Senior Radiation Protection Inspector  
R. Jickling, Senior Emergency Preparedness Inspector  
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J. Corujo-Sandín, Reactor Engineer  
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C. Mathews, Illinois Emergency Management Agency

Approved by: M. Ring, Chief  
Branch 1  
Division of Reactor Projects

Enclosure

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## SUMMARY OF FINDINGS

IR 05000254/2009002, 05000265/2009002; 01/01/2009 - 03/31/2009; Quad Cities Nuclear Power Station, Units 1 & 2; Equipment Alignment, Post-Maintenance Testing, Access Control to Radiologically Significant Areas and Other Activities.

This report covers a 3-month period of inspection by resident inspectors and announced baseline inspections by regional inspectors. Five findings of very low safety significance were identified; four of which were associated with Non-Cited Violations (NCVs). 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. Inspectors identified a NCV of License Condition 3.F, having very low safety significance for failure to ensure that fire door 145 could be positively latched. Section 2-8.4.4 of National Fire Protection Association (NFPA) 80-1975, "Fire doors and Windows," required that closing mechanisms be adjusted to overcome the resistance of the latch mechanism so that positive latching is achieved on each door operation. As a result of the discovery of a broken latch that prevented fire door 145 from positively latching, the licensee initiated an action request report (AR 864090), and established immediate actions to return fire door 145 to service. The licensee declared the fire door inoperable, issued fire impairment No. 1612 and established an hourly watch. Repairs to the door were completed and the fire door was declared operable the same day.

The finding was determined to be more than minor because a lack of positive latching could result in the door opening during a fire, thereby allowing a fire to affect additional equipment important to safety in the exposed fire zone. Based on screening under IMC 0609, Appendix F, "Fire Protection Significance Determination Process," the inspectors determined that a Phase 2 analysis was required. The inspectors determined that the change in core damage frequency associated with the finding was significantly less than  $1 \times 10^{-6}$  per year. As such, the finding was determined to be of very low safety significance (i.e., Green). This finding has a cross-cutting aspect in the area of Human Performance for the Resources component because the licensee did not provide adequate training to personnel. Specifically, as noted in the licensee's corrective action document, annual training on fire barriers was inadequate in that equipment operators did not consistently challenge fire doors in accordance with training (H.2(b)). (Section 1R04)

- Green. A self-revealed finding of very low safety significance (Green) and NCV of Technical Specification 5.4.1.a was identified on January 15, 2009, when the 2A core spray pump discharge check valve, 2-1402-8A, failed to close. Specifically, the valve failed to close because mechanics did not follow work instructions and ensure the valve was assembled as required. Corrective actions for this event included repair of the valve, briefings with the licensee staff, reinforcement with the operating staff on the differences between operability and post-maintenance testing requirements, and revision

of the steps in the “model” work order and the operation’s department surveillance procedure to more clearly delineate the acceptance criteria.

The inspectors determined that the failure to follow the work instructions for the 2A core spray pump discharge check valve was more than minor because the non-conforming valve impacted the Mitigating Systems Cornerstone attribute of equipment performance to ensure the reliability and capability of the core spray system to respond to initiating events when returned to service. The inspectors concluded that the issue was of very low safety significance (Green) because the plant operators were able to manually perform the required function and thus maintain both functionality and operability of the system until the valve was repaired. The inspectors determined that failure to provide enough detail in the post-maintenance test acceptance criteria to ensure that the valve was able to perform as designed without operator assistance was a significant contributor to the valve’s subsequent return to service in a degraded condition. The inspectors concluded that this event is cross-cutting in Human Performance, Resources for failure to provide accurate procedures (H.2(c)). (Section 1R19)

- Green. A self-revealed finding of very low safety significance was identified for incorrect wiring of the circuit breaker for the 1F drywell cooler following system restoration from a breaker cubicle inspection. The wiring discrepancy was not detected in the post-maintenance testing and resulted in the drywell cooler motor rotating in the wrong direction. This equipment malfunction resulted in a high temperature alarm in the upper area of the Unit 1 drywell. The wiring deficiency was corrected and the 1F drywell cooler was restored to service. Temperatures in the Unit 1 drywell returned to normal.

The inspectors determined that the incorrect wiring of the circuit breaker for the 1F drywell cooler was a performance deficiency and was more than minor because, if left uncorrected, the failure to correctly reinstall wiring could lead to unplanned unavailability of safety-related or risk-significant equipment and would become a more significant safety concern. This performance deficiency also challenged the Mitigating Systems Cornerstone attribute of availability for equipment operated per emergency operating procedures. The inspectors concluded that the issue was of very low safety significance (Green) because the issue involved a single drywell cooler and did not impact the function, reliability or capability of the other six drywell coolers or any other equipment that would be operated per the emergency operating procedures. The inspectors determined that this finding was cross-cutting in the area of Human Performance, Work Practice because inadequate documentation of work activities was a significant contributor to the performance deficiency (H.4(a)). (Section 1R19)

- Green. A self-revealed finding of very low safety significance (Green) and NCV of 10 CFR 50, Appendix B, Criterion III, Design Control was identified when the Unit 2 diesel generator cooling water pump failed on November 12, 2008, due to damage caused by inter-granular stress corrosion cracking (IGSCC). The licensee’s staff failed to apply appropriate rigor during the design and procurement process for pump replacement parts resulting in installation of vendor-supplied components that were not suited to the application and operating methodology for the emergency diesel generator cooling water system. The pump was repaired and returned to service the next day. Additionally, the remaining pumps were started to demonstrate that they were functional at the time of the Unit 2 pump failure.

The inspectors concluded that the failure to implement measures that assured the equipment was suitable for the process environment was of very low safety significance (Green) because only one pump of three subsystems was degraded to the point where operability and function was affected. Additionally, the licensee process did not validate the pump vendor's compliance with all procurement specifications, instead assuming that the vendor's communications were complete, resulting in no evaluation of changes to wear ring materials. Inspectors have determined that this behavior is cross-cutting in Human Performance, Decision-making, for failure to use conservative assumptions in communications with the vendor and ensuring all of the vendor supplied parts were appropriate to support the pump function (H.1(b)). (Section 4OA3)

### **Cornerstone: Occupational Radiation Safety**

- Green. A self-revealed finding of very low safety significance and an associated NCV of Technical Specification 5.7.1 was identified for the failure to comply with the requirements of the radiation work permit during work activities in the radwaste basement, an area controlled as a locked high radiation area. Specifically, on January 13, 2009, an equipment operator failed to inform the radiation protection staff prior to access into overhead areas above seven feet. Consequently, the worker entered areas, which had not been surveyed, and, therefore, the radiological conditions were unknown. As a result, the worker encountered radiation levels greater than those anticipated for the work activity. The licensee's corrective actions included counseling of the involved individual and conducting a standdown with the operations department to reinforce radiological requirements along with communication expectations. The licensee was also in the process of completing an apparent cause evaluation to formulate additional actions to prevent recurrence.

The finding was more than minor because it impacted the program and process attribute of the Occupational Radiation Safety Cornerstone and affected the cornerstone objective of ensuring adequate protection of worker health and safety from exposure to radiation, in that, access into high radiation areas whose radiological conditions were unknown placed the worker at risk for unnecessary radiation exposure. The finding was determined to be of very low safety significance because it was not an as-low-as-is-reasonably-achievable (ALARA) planning issue, there was no overexposure or substantial potential for an overexposure, and the licensee's ability to assess worker dose was not compromised. The finding involved a cross-cutting aspect in the area of Human Performance related to Work Practices, in that, radiation work permit (RWP) compliance for access into overhead areas was not effectively communicated to the worker and the worker failed to follow the RWPs (H.4(b)). (Section 2OS1.2)

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

One violation of very low safety significance that was identified by the licensee was reviewed by inspectors. Corrective actions planned or taken by the licensee have been entered into the licensee's corrective action program. This violation 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 or near full electrical output for most of the reporting period with the exception of planned power reductions for routine surveillances and control rod maneuvers. The one exception was a power reduction at midnight on the morning of March 15, 2009, to perform control rod channel distortion monitoring. This surveillance activity was performed during the same downpower as rod scram timing, turbine valve testing, and a control rod pattern adjustment. Power was restored to full electrical load on March 16 at 07:00 a.m.

#### Unit 2

Unit 2 operated at or near full electrical output for most of the reporting period with the exception of planned power reductions for routine surveillances and control rod maneuvers. The one exception was on February 22, 2009, the shift performed a power reduction to 76 percent to allow isolation of the 2B feedwater regulating valve (FRV). A 10-20 gpm packing leak had developed on the 2B FRV. The 2B FRV was isolated and repaired that same night and returned to service the next morning. Power was returned to full electrical power at 07:30 a.m. on February 23.

### 1. REACTOR SAFETY

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

#### 1R01 Adverse Weather Protection (71111.01)

##### .1 Readiness For Impending Adverse Weather Condition - High Wind Conditions

##### a. Inspection Scope

Since high winds of 50 mph were forecast in the vicinity of the facility for March 11, 2009, the inspectors reviewed the licensee's overall preparations/protection for the expected weather conditions. On March 10, 2009, the inspectors walked down the Units 1 and 2 main power transformers and the licensee's emergency alternating current power systems because their safety-related functions could be affected or required as a result of high wind generated missiles or the loss of offsite power. The inspectors evaluated the licensee staff's preparations against the site's procedures and determined that the staff's actions were adequate. During the inspection, the inspectors focused on plant specific design features and the licensee's procedures used to respond to specified adverse weather conditions. The inspectors also toured the plant grounds to look for any loose debris that could become missiles during high wind conditions. Additionally, the inspectors reviewed the Updated Final Safety Analysis Report (UFSAR) and performance requirements for systems selected for inspection, and verified that operator actions were appropriate as specified by plant specific procedures. Specific documents reviewed during this inspection are listed in the Attachment.

This inspection constituted one readiness for impending adverse weather condition sample as defined in Inspection Procedure (IP) 71111.01-05.

b. Findings

No findings of significance were identified.

.2 Readiness For Impending Adverse Weather Condition – Extreme Cold Conditions

a. Inspection Scope

Since extreme cold conditions were forecast in the vicinity of the facility for January 13 through January 17, 2009, the inspectors reviewed the licensee's overall preparations/protection for the expected weather conditions. On January 14, the inspectors walked down the 125 Vdc and 250 Vdc safety-related battery rooms for Units 1 and 2 because their safety-related functions could be affected or required as a result of the extreme cold conditions forecast for the facility. The inspectors observed insulation, heat trace circuits, space heater operation, and weatherized enclosures to ensure operability of affected systems. The inspectors reviewed licensee procedures and discussed potential compensatory measures with control room personnel. The inspectors focused on plant management's actions for implementing the station's procedures for ensuring adequate personnel for safe plant operation and emergency response would be available. Specific documents reviewed during this inspection are listed in the Attachment.

This inspection constituted one readiness for impending adverse weather condition sample as defined in IP 71111.01-05.

b. Findings

No findings of significance were identified.

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 1 Emergency Diesel Generator,
- 1B Core Spray, and
- Unit 2 Residual Heat Removal (RHR) Service Water.

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, UFSAR, Technical Specification (TS) requirements, outstanding work orders, 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.

These activities constituted three partial system walkdown samples as defined in IP 71111.04-05.

b. Findings

No findings of significance were identified.

.2 Semi-Annual Complete System Walkdown

a. Inspection Scope

During the week of January 12-16, 2009, the inspectors performed a complete system alignment inspection of the Unit 2 reactor core isolation cooling system (RCIC) 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 line ups; 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 work orders (WOs) was performed to determine whether any deficiencies significantly affected the system function. In addition, the inspectors reviewed the corrective action program database to ensure that system equipment alignment problems were being identified and appropriately resolved. Documents reviewed are listed in the Attachment.

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

b. Findings

Broken Latch on Fire Door 145

Introduction: The inspectors identified a NCV of License Condition 3.F, having very low safety significance (Green) for the failure to ensure that Fire Door 145 could be positively latched.

Description: On January 8, 2009, when passing through the RCIC rooms, the inspectors noted that fire door 145, located between Unit 1 northwest corner room and Unit 2 southwest corner room, did not appear to latch. When an inspector challenged the door, by pushing with one hand, the door opened.

Fire door 145 separates the Unit 1 northwest corner room (Fire Zone 11.2.3) from the Unit 2 southwest corner room (Fire Zone 11.3.1). Both corner rooms contain a RCIC pump and a core spray pump for their respective units. The Updated Fire Hazards Analysis establishes credit for fire door 145 to provide a 3-hour fire barrier between the two fire zones.

Table 2.1-2 of the Quad Cities Fire Protection Report identifies National Fire Protection Association (NFPA) 80-1975 as the code of record for fire doors. Section 2-8.4.4 of NFPA 80-1975 points out that all closing mechanisms shall be adjusted to overcome the resistance of the latch mechanism so that positive latching is achieved on each door operation. The inspectors concluded that the requirement for positive latching of the door could not be satisfied because the latch was broken. A lack of positive latching of the fire door could result in the door opening during a fire, thereby allowing a fire to affect additional equipment important to safety in the exposed fire zone.

As result of this discovery, the licensee initiated Assignment Report (AR) 864090, and established immediate actions to return fire door 145 to service. The licensee declared the fire door inoperable, issued Fire Impairment No. 1612 and established an hourly watch. Repairs to the door were completed and the fire door was declared operable the same day. The licensee plans to present to the Curriculum Review Committee that the expectations for fire doors be included in the initial equipment operator (EO) qualifications (AR 864090-03) and has published an article in the Site Newsletter relating to the requirement to verify that all fire doors are shut and latched properly (AR 864090-04).

Additionally, the licensee examined the reason why the broken latch was not identified by the licensee's personnel. The licensee polled six EOs as to their understanding of the expectations for fire doors. The licensee's guidance for ensuring fire doors are securely closed is included in the annual training manual (Nuclear General Employee Training), in the section covering Fire Barriers, Step C; it is stated that, "When in the station and a fire door is opened, make sure the fire door is firmly closed and latched before leaving, again check the door!" Only one of the polled EOs stated he always ensures the door is secured by testing it after passing through. The licensee planned to issue a Shift Training Notebook Log ("required reading") to communicate the expectation to verify a fire door is closed by physically testing the door (ACIT 864090-02).

Analysis: The inspectors determined that the failure to ensure that fire door 145 could be positively latched was contrary to NFPA 80-1975, "Fire Doors and Windows," and was a performance deficiency. The finding was determined to be more than minor because failure to ensure that fire door 145 could be positively latched was associated with the Mitigating Systems Cornerstone attribute of Protection Against External Factors (fire) and affected the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, a lack of positive latching could result in the door opening during a fire, thereby allowing a fire to affect additional equipment important to safety in the exposed fire zone.

In accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 - Initial Screening and Characterization of Findings," Table 3b, the inspectors determined the finding degraded the fire protection defense-in-depth strategies. Therefore, screening under IMC 0609, Appendix F, "Fire Protection

Significance Determination Process,” was required. The inspectors determined that a Phase 2 analysis was required. The inspectors evaluated the risk associated with a fire in one of the affected corner rooms (Fire Zone 11.2.3 for Unit 1 and Fire Zone 11.3.1 for Unit 2). Based on discussions with licensee engineering personnel, the inspectors confirmed that even if both corner rooms were affected by fire, both units could be shut down using normal emergency operating procedures, (as opposed to alternative shutdown procedures for fire). In Step 2.9 of IMC 0609, Appendix F it identifies the equation for determining significance as:

$$\Delta\text{CDF} = \text{DF} \times \text{F} \times \text{SF} \times \text{AF} \times \text{PNS} \times \text{CCDP}$$

Where:

The change in core damage frequency attributed to the finding is  $\Delta\text{CDF}$ .

It was unknown how long the door latch had been broken. The inspectors conservatively assumed that the door latch had been broken for more than 30 days. As such, a value of 1.0 was assigned to the duration factor (DF) in this finding.

The inspectors noted that each corner room had a RCIC pump, a core spray pump, and associated equipment cables. Based on review of IMC 0609, Appendix F, Attachment 4, “Fire Ignition Source Mapping Information: Fire Frequency, Counting Instructions, Applicable Fire Severity Characteristics, and Applicable Manual Fire Suppression Curves,” the inspectors determined that the contributing fire frequencies for each corner room were:  $1.6 \times 10^{-5}$  per year (for non-qualified cables, low loading) +  $2.3 \times 10^{-5}$  (hot work, low) +  $2.7 \times 10^{-3}$  (RCIC pump turbine, assumed to be bounded by the value for main feedwater pump oil fire) +  $5.5 \times 10^{-5}$  per year (for the core spray pump, other pumps greater than 100 horsepower, electrical fire) +  $5.5 \times 10^{-5}$  per year (for the core spray pump, other pumps greater than 100 horsepower, oil fire) +  $1.7 \times 10^{-4}$  (transient fuels, medium). As such, the inspectors determined that the total fire frequency for a single corner room was approximately  $3.0 \times 10^{-3}$ .

The inspectors conservatively assumed a value of 1.0 for the severity factor because no specific fire scenario was developed to evaluate this issue.

Adjustment Factor (AF) is the ignition source specific frequency. Since this finding was not related to fire prevention and administrative controls, no adjustment was applied and a value of 1.0 was used.

Probability of non-suppression (PNS). The inspectors conservatively assumed a value of 1.0 because no credit for suppression was assumed for this analysis.

Conditional core damage probability (CCDP). Based on review of Table 3.1, “SDP Worksheet for Quad Cities Nuclear Power Station, Units 1 and 2 – Transients (Reactor Trip),” of the “Risk-Informed Inspection Notebook For Quad Cities Nuclear Power Station, Units 1 and 2,” Revision 2.1a, the inspectors determined that the conditional core damage probability associated with a fire damaging the equipment in a corner room was  $1 \times 10^{-9}$ . This conclusion was based on the RCIC pump and one core spray pump being affected. The power conversion system, safe shutdown makeup pump, depressurization, containment heat removal, containment venting, late inventory

makeup, survivability, and late inventory harsh environment functions were assumed to be unaffected by the finding.

Based on the above information, the inspectors determined that the change in core damage frequency associated with the finding was significantly less than  $1 \times 10^{-6}$  per year. As such, the finding was determined to be of very low safety significance (i.e., Green).

This finding has a cross-cutting aspect in the area of Human Performance for the Resources component because the licensee did not provide adequate training to personnel. Specifically, as noted in the licensee's corrective action document, annual training on fire barriers was inadequate in that EOs did not consistently challenge fire doors in accordance with training. There is a personnel deficiency with the internalization of the true expectations conveyed during training (H.2(b)).

Enforcement: License Condition 3.F required the licensee to, in part, implement and maintain in effect all provisions of the approved fire protection program as described in the UFSAR. In Section 9.5.1 of the UFSAR it is stated that the design of the fire protection system and safe shutdown methodology is contained in the Fire Protection Reports including the Updated Fire Hazards Analysis and Safe Shutdown Analysis Report. Table 2.1-2 of the Quad Cities Nuclear Power Station, Fire Protection Report states that NFPA 80-1975, "Fire Doors and Windows," is the code of record for fire doors. In Section 2-8.4.4 of NFPA 80-1975 it is required that closing mechanisms be adjusted to overcome the resistance of the latch mechanism so that positive latching is achieved on each door operation.

Contrary to the above, as of January 8, 2009, the licensee failed to meet Section 2-8.4.4 of NFPA 80-1975 for fire door 145. Specifically, the closing mechanism could not be adjusted to overcome the resistance of the latch mechanism so that positive latching was achieved on each door operation because the latch for fire door 145 was broken. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as Issue Report (IR) 864090, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. **(NCV 05000254/2009002-01; 05000265/2009002-01)**

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:

- Unit 2 Reactor Bldg. El. 666'-6", Standby Gas Treatment 4<sup>th</sup> Floor East;
- Unit 1 Reactor Bldg. El. 666'-6", Standby Gas Treatment 4<sup>th</sup> Floor East;
- Unit 1 Reactor Bldg. El. 554'-0", NW Corner Room – 1A Core Spray;
- Unit 2 Turbine Bldg. El. 615'-6", 'B' Battery Charger Room Unit 2; and
- Unit 1 Turbine Bldg. El. 639'-0", Main Turbine Floor (Outside Shield Wall).

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 had 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, 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 five quarterly fire protection inspection samples as defined in IP 71111.05-05.

b. Findings

No findings of significance were identified.

1R06 Flooding (71111.06)

.1 Internal Flooding

a. Inspection Scope

On February 22, 2009, the inspectors responded to the 2B feedwater regulating valve packing failure event documented in Issue Report 883737 where a 20 gallon per minute feedwater leak was identified in the turbine building. 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 and abnormal operating procedures to verify the plant responded as expected. 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 595 ft. elevation and mezzanine level of the Unit 2 turbine building following the leak to assess the pathways taken by the leakage and potential impact to risk-significant plant equipment. Operator actions taken in response to the event were also evaluated by the inspectors.

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

b. Findings

No findings of significance were identified.

1R07 Triennial 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 Unit 2 emergency diesel generator (EDG) 2A engine cooler and the Unit 1 high pressure coolant injection (HPCI) room cooler. These heat exchangers/coolers were chosen based on their risk significance in the licensee's probabilistic safety analysis, their important safety-related mitigating system support functions and operating/inspection history.

For the Unit 2 emergency diesel generator 2A engine cooler and the Unit 1 HPCI room cooler, the inspectors verified that performance testing, inspection, maintenance, and monitoring of biotic fouling and macrofouling programs were adequate to ensure proper heat transfer. This was accomplished by verifying the test method used was consistent with accepted industry practices, or equivalent; the test conditions were consistent with the selected methodology; the test acceptance criteria were consistent with the design basis values; and 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 Unit 2 emergency diesel generator 2A engine cooler and the Unit 1 HPCI room cooler, the inspectors reviewed the methods and results of heat exchanger performance inspections. The inspectors verified the methods used to inspect and clean heat exchangers 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 Unit 2 emergency diesel generator, 2A engine cooler, and the Unit 1 HPCI 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 verified the performance of the following aspects of the ultimate heat sink (UHS) and their subcomponents such as piping, intake structures, etc. by tests, inspections, and other equivalent methods to ensure availability and accessibility to the in-plant cooling water systems.

The inspectors reviewed the results of the licensee's inspection and cleaning of the residual heat removal service water (RHRSW) bay. The inspectors verified that identified settlement or movement indicating loss of structural integrity and/or capacity was appropriately evaluated and dispositioned by the licensee. In addition, the inspectors verified the licensee ensured sufficient reservoir capacity by trending and removing debris or sediment buildup in the UHS.

The inspectors performed a system walkdown on accessible portions of the diesel generator cooling water (DGCW) and RHRSW system piping to verify the licensee's assessment on structural integrity. In addition, the inspectors reviewed available licensee testing and inspection results, licensee disposition of active through-wall pipe leaks, and the history of through-wall pipe leakage to identify any adverse trends since the last NRC inspection. For buried or inaccessible piping, the inspectors reviewed the licensee's pipe testing, inspection, or monitoring program to verify structural integrity, and ensured that any leakage or degradation had been appropriately identified and dispositioned by the licensee.

In addition, the inspectors reviewed condition reports related to the heat exchangers/coolers and heat sink performance issues to verify that the licensee had an appropriate threshold for identifying issues and to evaluate the effectiveness of the corrective actions. The documents that were reviewed are included in the Attachment to this report.

These inspection activities constituted two heat sink inspection samples as defined in IP 71111.07-02.02.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Regualification Program (71111.11)

.1 Resident Inspector Quarterly Review (71111.11Q)

a. Inspection Scope

On February 20, 2009, the inspectors observed a crew of licensed operators in the plant's simulator during licensed operator regualification 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 of crew performance:

- 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 of significance 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:

- Core Spray (Function Z1400);
- Control Rod Drive Hydraulics (Function Z0300); and
- Containment Atmosphere Monitoring System (Function Z2400).

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 (SSCs)/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 of significance 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:

- Units 1 and 2 online risk profile during the work week of January 26 - 31, 2009, for impact and consideration of planned work activities (Unit 1 1A core spray and 1/2 emergency diesel generator banana jack installation, 1B circulating water bay inspection, 1B service water pump and service water strainer, and emergent unavailability of the 1A instrument air compressor);
- Emergent work to 1B standby liquid control (SBLC) system due to 1-1101-22 failure to close;
- Units 1 and 2 online risk profile during week of March 9 – 22, 2009, for impact and consideration of planned work activities (1B circulating water pump overhaul, 1B service water pump maintenance, Unit 2 station blackout diesel maintenance, 1A core spray banana jack installation and testing, and safe shutdown makeup pump maintenance); and
- Units 1 and 2 online risk profile during the work week of March 23 – 27, 2009, for impact and consideration of planned work activities (Unit 1 1A core spray and Unit 1 emergency diesel generator banana jack installation and logic testing, Unit 1 1B core spray and 1/2 emergency diesel generator banana jack installation and logic testing, 2B service water pump, Unit 1 service water strainer and emergent work on the Unit 2 1C/2C main steam isolation valve (MSIV) scram closure relay and 2B RHRSW pump).

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.

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

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15)

.1 Operability Evaluations

a. Inspection Scope

The inspectors reviewed the following operability evaluations:

- Unit 1/2 Emergency Diesel Generator Silencer Inner Baffle Pipe Support Welds Broken;
- Containment Atmospheric Monitoring (CAM) System Solenoid Beyond Design Analysis;
- Unit 1 HPCI Turbine Inlet Drain Pot Alarm Will Not Clear;
- Unit 1 SBLC Configuration Change for Pressure Boundary Extension Past the Pump Recirculation Valve, 1-1101-22;
- Fuel Channel Distortion and Control Rod Drive System Operability Evaluation; and
- Upper Compartment Doors Unlatched on Safety-Related 4kV Cubicles.

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 also 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.

These operability inspections constituted six samples as defined in IP 71111.15-05.

b. Findings

No findings of significance were identified. One licensee-identified, Green NCV is detailed in Section 4OA7 of this report.

## 1R19 Post-Maintenance Testing (PMT) (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:

- 1/2 DGCWP Contactor Replacement;
- 1/2 EDG Voltage Regulator Selector Switch;
- 2A Core Spray Pump Discharge Check Valve Inspect/Repair;
- 1F Drywell Cooler; and
- 1B SBLC Pump Overhaul.

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 TS, 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 five PMT samples as defined in IP 71111.19-05.

#### b. Findings

Two findings of very low safety significance were identified.

##### (1) Unit 2 'A' Core Spray Check Valve Failed to Close After Maintenance

Introduction: A self-revealed finding of very low safety significance (Green) and NCV of Technical Specification 5.4.1.a was identified on January 15, 2009, for failure to follow work instructions for safety-related equipment.

Description: On March 7, 2008, mechanics disassembled the Unit 2 'A' core spray pump discharge stop check valve, 2-1402-8A, using Work Order (WO) 688962. This valve is a stop check valve designed to work as a disc check valve when the valve stem is in the open position. Guides, integral to the lower portion of the valve body, direct the valve disc as it moves up and down the valve body-bore.

Several non-conforming conditions were identified within the valve and repaired during the maintenance activity. The conditions included weld repairs on the valve disc assembly, machining/lapping the valve seating area, and repair of a scratch on the valve stem. The valve disc was verified to seat correctly using the blue check method after repairs. Additionally, the body-bore seal ring area was found out of round and machining was performed. The as-left valve body guide bore and the as-left disc outer diameter measurements were documented by the workers in the work package with some measurements out of specification. These measurements were not recognized as out of specification by the mechanics or the first line supervisor in charge of the work. During subsequent investigations, the licensee could not determine how or why the mechanical team failed to identify the measurements were outside the acceptance criteria, but the outcome was that the non-conforming valve was reassembled and turned over to operations for PMT on March 21, 2008. The non-conforming condition was not entered into the corrective action program or evaluated for acceptability prior to work package closure.

Two activities were identified in the work package for the valve PMT. First, since the system boundary was breached, an external leak check was performed with the system pressurized and core spray pump in operation. Secondly, QCOS 1400-01, "Quarterly Core Spray System Flow Rate Test," was identified to prove the safety functions supported by the valve. The procedure as written would also demonstrate operability of the system upon successful completion of the test. Section B.3 of the procedure states, "The following safety-related components and IST [Inservice Test] test requirements are accountable to this procedure:" and then goes on to list the operating characteristics of the core spray pump and motor, the open function of the discharge check valve, and the close function of several check valves, including the discharge stop check valve.

The check valve opened when required during QCOS 1400-01 and no external leakage was observed. However, when the pump was stopped, the check valve did not close. Operators closed down on the valve hand wheel until the valve stem contacted the valve disc. When the valve stem contacted the disc, the disc fell and seated to maintain system pressure and the valve operator was returned to the full open position. The procedure acceptance criteria is provided in step G.6 and states, "1(2) -1402 - 8A(B), 1(2) A/B CORE SPRAY PMP DISCHARGE STOP CK VLV, is verified to have fully closed if Core Spray system fill pressure can be maintained following the securing of the Core Spray pump."

The step to establish this acceptance criteria is performed in step H.1.y and states, "**Verify** 1(2) -1402 - 8A(B), 1(2) A/B CORE SPRAY PMP DISCH STOP CK VLV, is fully closed as indicated by Core Spray system fill pressure being maintained." This step was signed off as being met successfully. The step was signed off by the operators because the verb "verify" as used in this application is a defined action in the Quad Cities Procedure Writer's Guide, Revision 6; "To make sure by taking the necessary or appropriate actions." In this instance, the operators took action to manually close down on the hand wheel and were then able to verify that the valve was fully closed. While this operation of the valve met the operations department procedure requirements and operability of the system could be justified because of the manual intervention of the operating crew, the check valve was not working correctly and the nature of the non-conformance was not understood by the operating crew or the engineering staff.

In step 4.2.2, MA-AA-716-012, "Post Maintenance Testing," states "A satisfactory test verifies a particular component or system is able to perform its intended function, the original deficiency has been corrected, and no new or related problems were created by the maintenance activity or configuration change." Since the check valve functioned correctly before the maintenance and clearly did not work correctly after the maintenance, the PMT should have been determined to be unsatisfactory. In this instance, because of the way the procedural step was worded, operators judged the acceptance criteria as met. As a result, operators treated this issue as an operability concern rather than a failed post-maintenance test. Only cursory reviews of the work order were performed with the initial determination that no work problems were identified and no work was performed that could be causing the symptoms seen by the operators performing the test. The maintenance crew returned to other duties, and plans were made to open the valve at the next available opportunity. On January 15, 2009, the non-conforming condition was identified.

Analysis: The inspectors determined that the failure to follow the work instructions for the 2A core spray pump discharge check valve was a performance deficiency. The inspectors determined the finding was more than minor because the non-conforming valve impacted the Mitigating Systems Cornerstone attribute of Equipment Performance to ensure the reliability and capability of the core spray system to respond to initiating events when returned to service. The inspectors performed a Phase 1 SDP evaluation and determined that the issue is Green because the plant operators were able to manually perform the required function and thus maintain both functionality and operability of the system until the valve was repaired (answer to question 1 of IMC 0609, Attachment 4, Table 4a, Mitigating Systems Cornerstone was "yes" and the issue screened as Green).

The inspectors also determined that the failure to identify the malfunction of the valve as a failed preventative maintenance test prevented immediate correction of the non-conformance and resulted in temporary organizational acceptance of a degraded equipment condition later identified as an operator workaround. The inspectors determined that failure to provide enough detail in the PMT acceptance criteria to ensure that the valve was able to perform as designed without operator assistance was a significant contributor to the valve's subsequent return to service in a degraded condition. The failure to consider operator procedure standards in preparation of the acceptance criteria in QCOS 1400-01 contributed to the failure to identify the failed PMT. Inspectors determined that this event is cross-cutting in the area of Human Performance, Resources for failure to provide accurate procedures (H.2(c)).

Enforcement: Technical Specification 5.4.1.a states in part that written procedures shall be established, implemented, and maintained for the applicable procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978. Regulatory Guide 1.33, Revision 2, Appendix A, February 1978, requires, in part, that maintenance that can affect the performance of safety-related equipment should be properly planned and performed in accordance with written procedures, documented instructions, or drawings appropriate to the circumstances.

Contrary to the above, the mechanics who performed WO 688962 in March of 2008 failed to follow the work instructions provided for 2-1402-8A, 2A core spray pump discharge stop check valve. Specifically, the valve mechanics documented work as completed satisfactorily when as-left tolerances were outside design limits and did not

notify the work supervisor or the work planner of the non-conforming condition as required by the work instructions. As a result, the non-conforming valve was reassembled and turned over to operations for PMT on March 21, 2008, and was subsequently returned to service with manual operation credited for being able to close the valve. Because this violation is of very low safety significance, and because the issue was entered into the corrective action program as Issue Report 867904, this issue is being treated as a NCV consistent with Section VI.A.1 of the NRC Enforcement Policy **(NCV 05000265/2009002-02)**. Corrective actions for this event included repair of the valve internals, human performance and supervisory briefings with the licensee staff, reinforcement with the operating staff on the differences between operability and post-maintenance testing requirements, and revision of the steps in the "model" work order, and the operations surveillance procedure to more clearly delineate the acceptance criteria.

(2) Unit 1 'F' Drywell Unit Cooler Fan Ran Backward After Maintenance

Introduction: A self-revealed finding was identified of very low safety significance (Green) for the failure to correctly reinstall wiring associated with the circuit breaker for the 1F drywell cooler. This resulted in the drywell cooler motor rotating in the wrong direction, providing much less airflow than designed. This equipment deficiency led to a high temperature alarm in the upper area of the Unit 1 drywell.

Description: At 12:45 a.m. on February 12, 2009, the 1F drywell cooler was removed from service to facilitate a circuit breaker cubicle inspection. At 5:45 a.m. on February 13, 2009, the 1F drywell cooler was returned to service and the 1C drywell cooler was removed from service for a similar cubicle inspection. Later on February 13, a drywell high air temp alarm was received in the main control room. While this temperature point was in alarm above 180 degrees, at no time did the Technical Specification volumetric temperature requirement rise above the limit of 150 degrees.

A review of temperature trends indicated a lack of air flow through the 1F drywell cooler as indicated by air inlet temperatures to the cooler and lower than expected reactor building closed cooling water (RBCCW) outlet temperatures.

Followup troubleshooting on February 16, 2009, confirmed that two motor leads were swapped for the 1F drywell cooler. The wiring deficiency was corrected and the 1F drywell cooler was returned to service. Temperatures in the Unit 1 drywell returned to normal.

Two contributing factors were associated with this issue. The first issue was the documentation of work activities. As-found wiring conditions were documented when the breaker was removed from service. This documentation was used to return the wiring to the as-found conditions while returning the breaker to service. Alterations performed to the wiring of the breaker were not documented during work performed in the electrical maintenance shop. This is not in accordance with work practice expectations of the maintenance department.

The second issue was the failure of the post-maintenance testing to verify proper operation of the system before declaring the system functional. The associated post-maintenance test for this maintenance activity was a task for operations to cycle the breaker and verify the breaker was able to open and close. Once this post-maintenance

testing was performed, the Unit 1C drywell cooler breaker was removed from service for similar maintenance without verifying proper operation of the Unit 1F drywell cooler.

Analysis: The inspectors determined that the failure to correctly reinstall the wiring of the breaker for the 1F drywell cooler per design documentation was a performance deficiency and a finding. The same work process for tracking maintenance alterations is used independent of the risk significance of the system being worked. Therefore, this finding was more than minor because, if left uncorrected, the failure to correctly reinstall wiring could lead to unplanned unavailability of safety-related or risk-significant equipment and would become a more significant safety concern. This performance deficiency challenged the Mitigating Systems Cornerstone attribute of availability for equipment operated per emergency operating procedures.

The inspectors performed a Phase 1 SDP screening and concluded that the issue was of very low safety significance (Green) because the problems with a single drywell cooler did not impact the function, reliability or capability of the other six drywell coolers, and the issue did not affect other equipment that would be operated per the emergency operating procedures. The inspectors determined that this finding was cross-cutting in the area of Human Performance Work Practice because of the inadequate documentation of work activities (H.4(a)).

Enforcement: Failure to correctly reinstall the wiring of the breaker for the 1F drywell cooler cubicle before returning the equipment to service is a finding of very low safety significance (**FIN 05000254/2009002-03**) and was documented in the CAP as Issue Reports 881225, 880664 and 880396. Corrective actions included identifying and correcting the wiring deficiency and returning the cooler to service after verifying the repairs were adequate. A Quick Human Performance Investigation was also initiated for this issue.

Failure to correctly wire a circuit breaker cubicle in non-safety-related equipment application is not an activity affecting quality subject to 10 CFR Part 50, Appendix B. Therefore, while a performance deficiency was identified that affected risk-significant equipment, no violation of NRC regulatory requirements occurred.

## 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:

- Unit 1 RCIC Flow Test (IST);
- Unit 1/2 Emergency Diesel Generator Monthly Load Test (Routine);
- Unit 2 HPCI Valve Timing (IST);
- Unit 1 Reactor Boundary Leakage (RCS);
- Unit 2 PCI Group 2 Partial Isolation Test at Power (Routine); and
- Unit 1 Fuel Channel Distortion Monitoring (Routine).

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

b. Findings

No findings of significance were identified.

1EP2 Alert and Notification System Evaluation (71114.02)

.1 Alert and Notification System Evaluation

a. Inspection Scope

The inspectors reviewed documents and conducted discussions with emergency preparedness (EP) staff and management regarding the operation, maintenance, and periodic testing of the alert and notification system (ANS) in the Quad Cities Nuclear Power Station's plume pathway emergency planning zone. The inspectors reviewed monthly trend reports and the daily and monthly operability records from February 2007 through February 2009. Information gathered during document reviews and interviews was used to determine whether the ANS equipment was maintained and tested in accordance with emergency plan commitments and procedures. Additionally, the inspectors observed a siren test to evaluate procedure usage and interaction between licensee staff and county officials. Documents reviewed are listed in the Attachment to this report.

This alert and notification system inspection constituted one sample as defined in IP 71114.02-05.

b. Findings

No findings of significance were identified.

1EP3 Emergency Response Organization Augmentation Testing (71114.03)

.1 Emergency Response Organization Augmentation Testing

a. Inspection Scope

The inspectors reviewed and discussed with plant EP management and staff the emergency plan commitments and procedures that addressed the primary and alternate methods of initiating an emergency response organization (ERO) activation to augment the on-shift ERO as well as the provisions for maintaining the station's ERO qualification and team lists. The inspectors also reviewed reports and a sample of corrective action program records of unannounced off-hour augmentation tests, which were conducted between February 2007 and December 2008, to determine the adequacy of the drill critiques and associated corrective actions. The inspectors also reviewed a sample of the EP training records, approximately 30 records for ERO personnel who were assigned to key and support positions, to determine the status of their training as it related to their assigned ERO positions. Documents reviewed are listed in the Attachment to this report.

This ERO augmentation testing inspection constituted one sample as defined in IP 71114.03-05.

b. Findings

No findings of significance were identified.

1EP5 Correction of Emergency Preparedness Weaknesses and Deficiencies (71114.05)

.1 Correction of Emergency Preparedness Weaknesses and Deficiencies

a. Inspection Scope

The inspectors reviewed a sample of nuclear oversight staff's 2007 and 2008 audits of the Quad Cities Nuclear Power Station's EP program to determine that these independent assessments met the requirements of 10 CFR 50.54(t). The inspectors also reviewed critique reports and samples of corrective action program records associated with the 2008 biennial exercise, as well as various EP drills conducted in 2007 and 2008, in order to determine that the licensee fulfilled its drill commitments and to evaluate the licensee's efforts to identify, track, and resolve concerns identified during these activities. The inspectors reviewed a sample of EP items and corrective actions related to the facility's EP program and activities to determine whether corrective actions were completed in accordance with the sites corrective action program. The inspectors toured the Technical Support Center, the Operations Support Center, and the Rock Island County Emergency Operations Center to evaluate the material condition and readiness of the equipment and facilities. The inspectors reviewed the licensee's response to the October 27, 2008, declared Unusual Event and the April 18, 2008, earthquake. Additionally, the inspectors reviewed Action Request 00889346, "Local Governments Not Contacted during Quad Cities Emergency Preparedness Annual Program Audit," against NRC Manual Chapter 0612, Appendix E, "Examples of Minor Issues," to determine the characterization of this issue. Documents reviewed are listed in the Attachment to this report.

This correction of emergency preparedness weaknesses and deficiencies inspection constituted one sample as defined in IP 71114.05-05.

b. Findings

No findings of significance 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 March 12, 2009, 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 inspector-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 corrective action program. As part of the inspection, the inspectors reviewed the drill package and other documents listed in the Attachment to this report.

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

b. Findings

No findings of significance were identified

**2. RADIATION SAFETY**

2OS1 Access Control to Radiologically Significant Areas (71121.01)

.1 Review of Licensee Performance Indicators for the Occupational Exposure Cornerstone

a. Inspection Scope

The inspectors reviewed the licensee's occupational exposure control cornerstone Performance Indicator (PI) to determine whether the conditions resulting in any PI occurrences had been evaluated and whether identified problems had been entered into the licensee's CAP for resolution.

This inspection constitutes one sample as defined in IP 71121.01-5.

b. Findings

No findings of significance were identified.

.2 Review of Radiation Worker Performance Problem in Radiologically Significant Area

a. Inspection Scope

The inspectors reviewed an incident revealed to the licensee through an alarming electronic dosimeter that occurred on January 13, 2009, during work in the radwaste basement, an area controlled as a locked high radiation area (LHRA). The inspectors reviewed the licensee's condition report, associated radiation survey data and RWP, followup human performance evaluation, and discussed the incident with members of the radiation protection staff.

No samples were accredited for this review.

b. Findings

One finding of very low safety significance was identified.

Introduction: A self-revealed finding of very low safety significance (Green) and an associated NCV of Technical Specification 5.7.1 was identified for the failure to comply with the exposure control requirements of the RWP that governed work activities in a posted locked high radiation area.

Description: On January 13, 2009, an EO unexpectedly received a dose rate alarm on his electronic dosimeter (ED) while performing valve lineup verifications in the radwaste basement (an area controlled and posted as a LHRA) in support of a spent resin tank transfer evolution. The alarm occurred because the worker used a ladder to gain access

into an overhead area that was approximately 8 feet above floor level, an area that had not been surveyed by the radiation protection staff. Dose rates in the overhead area measured by the worker's ED ranged up to 744 mrem/hour, while the ED rate alarm setpoint was 500. Upon hearing the alarm, the worker exited the area as a radiation protection technician (RPT), who also heard the alarm, responded to the area. The worker's radiation dose for the entry was 8 mrem.

Prior to the work activity, an RPT surveyed those areas, which the technician understood were to be accessed to perform the valve lineups and briefed the worker on the radiological condition of those areas. The radiation levels in those areas, which did not include areas above a height of 7 feet, ranged from approximately 50 to 250 mrem/hour. The worker logged onto the proper RWP (as provided by the RP staff), which had ED alarm setpoints established consistent with the radiological conditions expected to be encountered. The RP survey and high radiation area briefing did not address entry into any overhead areas, because the RP staff was unaware that entry into those areas was necessary. While the EO performed the valve lineup work in the radwaste basement, the RPT was stationed at the LHRA boundary at the top of the stairs that led into the basement to maintain positive control over access into the area.

As the EO proceeded with the valve lineup directed by procedure, the individual noted that the procedure indicated that one of the valves was located about 8 feet above the waste surge pump. The EO retrieved a ladder which was nearby to access that overhead area. As the EO ascended the ladder, the worker's ED alarmed. The alarm was unexpected because the individual mistakenly assumed that the high radiation area briefing provided by the RP staff before the work commenced included overhead areas. Therefore, the EO failed to notify the RP staff prior to entry into the overhead area greater than 7 feet above the floor level as required by the RWP.

Subsequent to the incident, surveys in the overhead areas accessed by the EO revealed radiation levels of 600–800 mrem/hour at 30 centimeter distances from the valves. Subsequently, as part of the licensee's followup efforts, other areas in the radwaste basement accessible to the EO were found with dose rates ranging up to 850 mrem/hour at 30 centimeter distances from the source of the radiation. Although posted as a LHRA, no accessible areas of the basement exhibited dose rates at or greater than 1000 mrem/hour.

As corrective actions, the licensee counseled the involved individual, completed a standdown with the operations department to reinforce radiological requirements along with communication expectations and was in the process of completing an apparent cause evaluation to formulate additional actions to prevent recurrence.

Analysis: The inspectors determined that the issue was a performance deficiency because area radiological conditions were not fully determined consistent with the work scope and because the worker failed to comply with the exposure control requirements of the RWP. The inspectors determined that the cause of the performance deficiency was reasonably within the licensee's ability to foresee and correct and should have been prevented.

The finding was not subject to traditional enforcement since the issue did not have an actual or potentially significant safety consequence, did not impact the NRC's ability to perform its regulatory function, and was not willful.

In accordance with NRC Manual Chapter 0612, the inspectors determined that the finding was more than minor because it impacted the program and process attribute of the Occupational Radiation Safety Cornerstone and affected the cornerstone objective of ensuring adequate protection of worker health and safety from exposure to radiation. Specifically, worker access into overhead areas of a locked high radiation area without knowledge of the radiological conditions placed the worker at risk for unnecessary radiation exposure.

The finding was assessed using the Occupational Radiation Safety Significance Determination Process (SDP) and was determined to be of very low safety significance because it was not an ALARA planning issue, there was no overexposure or substantial potential for an overexposure, and the licensee's ability to assess worker dose was not compromised. The finding was determined to involve a cross-cutting aspect in the Work Practices component of the Human Performance Area, in that, RWP compliance for access into overhead areas was not effectively communicated to the worker as part of the pre-job briefing and the worker failed to follow the RWP (H.4(b)).

Enforcement: Technical Specification 5.7.1 specifies that radiation levels in high radiation areas be established and that workers be made aware of the conditions prior to entry. The TS also requires that work in high radiation areas be controlled by an RWP. Radiation Work Permit No. 10010478, Revision 1, "Radwaste Operations Activities" which governed valve lineup activities in the radwaste basement required that all individuals contact RP prior to access into areas above seven feet. The RWP also required that workers verify with RP that the work area had been surveyed. Contrary to the RWP, on January 13, 2009, a worker used a ladder to access areas in the radwaste basement more than 7 feet above floor level without RP knowledge or approval and before the radiological conditions had been established and communicated to the worker. Since the failure to comply with Technical Specifications was of very low safety significance, corrective actions were taken as described above, and the issue was entered into the licensee's corrective actions program as Action Request 00866242, the violation is being treated as an NCV consistent with Section VI.A of the NRC Enforcement Policy (**NCV 05000254/2009002-04; 05000265/2009002-04**).

## 2OS3 Radiation Monitoring Instrumentation and Protective Equipment (71121.03)

### .1 Inspection Planning and Identification of Instrumentation

#### a. Inspection Scope

The inspectors reviewed the licensee's UFSAR to identify applicable radiation monitors associated with measuring transient high and very high radiation areas, including those intended for remote emergency assessment. The inspectors identified the types of portable radiation detection instrumentation that were used for job coverage of high radiation area work, including instruments for underwater surveys, portable and fixed area radiation monitors that were used to provide radiological information in various plant areas, and continuous air monitors that were used to assess airborne radiological conditions and work areas with the potential for workers to receive a 50 millirem or greater committed effective dose equivalent (CEDE). Whole body counters that were used to monitor for internal exposure and those radiation detection instruments that were used to conduct surveys for the release of personnel and equipment from the

radiologically controlled area (RCA), including contamination monitors and portal monitors, were also identified.

This inspection constituted two samples as defined in IP 71121.03-5.

b. Findings

No findings of significance were identified.

.2 Calibration and Testing of Radiation Monitoring Instrumentation

a. Inspection Scope

The inspectors reviewed radiological instrumentation to determine if it had been calibrated as required by the licensee's procedures, consistent with industry and regulatory standards. The inspectors also reviewed alarm setpoints for selected instruments to determine whether they were established consistent with the UFSAR or Technical Specifications, as applicable, and with industry practices and regulatory guidance. Specifically, the inspectors reviewed calibration procedures and the most recent calibration records for the following radiation monitoring instrumentation and calibration equipment:

- Unit 1 and 2 Drywell High-Range Radiation Monitors;
- Personnel Contamination Monitors at the RCA egress;
- Portal Monitors at the RCA and Protected Area egresses;
- Portable Instrument Calibrator (and the associated instruments used to measure calibrator output);
- Unit 1 and 2 Refuel Floor High Range Area Radiation Monitors;
- Unit 1 Drywell Atmosphere Continuous Air Monitor;
- Unit 1 Fuel Pool Pump/Heat Exchanger Area Radiation Monitor;
- Radwaste Basement/Pump Room Area Radiation Monitor;
- Unit 2 RCIC Cubicle Area Radiation Monitor;
- Unit 2 Filter Building Charcoal Bed Vault Area Radiation Monitor;
- Several Portable Survey Instruments; and
- Whole Body Counter.

The inspectors determined what actions were taken when, during calibration or source checks, an instrument was found significantly out of calibration or exceeded as-found acceptance criteria. Should that occur, the inspectors determined whether the licensee's actions would include a determination of the instrument's previous uses and the possible consequences of that use since the prior successful calibration. The inspectors also reviewed the results of the licensee's most recent 10 CFR Part 61 source term (radionuclide mix) evaluations to determine if the radiation sources that were used for instrument calibration and for instrument checks were representative of the plant source term.

The inspectors observed the licensee's use of its portable survey instrument calibration unit, discussed calibrator output validation methods, and compared calibrator exposed readings with calculated/expected values. The inspectors evaluated compliance with licensee procedures while radiation protection (RP) personnel demonstrated the

methods for performing source checks of portable survey instruments and source checks of personnel contamination and portal monitors, and during the calibration of a drywell high-range radiation monitor.

This inspection constituted one sample as defined in IP 71121.03-5.

b. Findings

No findings of significance were identified.

.3 Problem Identification and Resolution

a. Inspection Scope

The inspectors reviewed licensee corrective action program documents and any licensee event reports or special reports that involved personnel contamination monitor alarms due to personnel internal exposures to determine whether identified problems were entered into the corrective action program for resolution.

While no internal exposure with a CEDE greater than 50 millirem occurred since the last inspection in this area, the inspectors reviewed the licensee's methods for internal dose assessment to determine if affected personnel would be properly monitored using calibrated equipment and if the data would be analyzed and exposures properly assessed.

This inspection constituted one sample as defined in IP 71121.03-5.

The inspectors reviewed corrective action program reports related to exposure significant radiological incidents that involved radiation monitoring instrument deficiencies since the last inspection in this area, as applicable. Members of the RP staff were interviewed, and corrective action documents were reviewed to determine whether followup activities were being conducted in an effective and timely manner commensurate with their importance to safety and risk based on the following:

- Initial problem identification, characterization, and tracking;
- Disposition of operability/reportability issues;
- Evaluation of safety significance/risk and priority for resolution;
- Identification of repetitive problems;
- Identification of contributing causes;
- Resolution of NCVs tracked in the corrective action system; and
- Identification and implementation of effective corrective actions.

This inspection constituted one sample as defined in IP 71121.03-5.

The inspectors determined if the licensee's self-assessment and audit activities completed for the approximate 2-year period that preceded the inspection were identifying and addressing repetitive deficiencies or significant individual deficiencies in problem identification and resolution, as applicable.

This inspection constituted one sample as defined in IP 71121.03-5.

b. Findings

No findings of significance were identified.

.4 Radiation Protection Technician Instrument Use

a. Inspection Scope

The inspectors verified that calibrations for those survey instruments used to perform job coverage surveys and for those currently designated for use had not lapsed. The inspectors determined if response checks of portable survey instruments and checks of instruments used for the unconditional release of materials and workers from the RCA were completed prior to instrument use, as required by the licensee's procedure. The inspectors also discussed instrument calibration methods and source response check practices with RP staff, and observed licensee staff perform instrument source checks and the calibration of an area radiation monitor.

This inspection constituted one sample as defined in IP 71121.03-5.

b. Findings

No findings of significance were identified.

.5 Self-Contained Breathing Apparatus Maintenance/Inspection and Emergency Response Staff Qualifications

a. Inspection Scope

The inspectors reviewed the status and surveillance records of self-contained breathing apparatus (SCBAs) that were staged in the plant and ready-for-use and evaluated the licensee's capabilities for refilling and transporting SCBA air bottles to-and-from the control room and operations support center during emergency conditions. The inspectors determined if control room staff and other emergency response and RP personnel were trained, respirator fit tested, and medically certified to use SCBAs, including personal bottle change-out. Additionally, the inspectors reviewed respiratory protection qualification records, including those for SCBA qualification, for numerous members of the licensee's radiological emergency teams to determine if a sufficient number of staff were qualified to fulfill emergency response positions, consistent with the licensee's emergency plan and the requirements of 10 CFR 50.47.

This inspection constituted one sample as defined in IP 71121.03-5.

The inspectors reviewed the qualification documentation for the contractor personnel that performed maintenance on manufacturer designated vital SCBA components. The inspectors also reviewed vital component test and, as applicable, maintenance records for several SCBA units that were designated as ready-for-use. The inspectors also evaluated, through record review and observations, if the required air cylinder hydrostatic testing was documented and current and if the Department of Transportation required retest air cylinder markings were in place for numerous randomly selected SCBA units and spare air bottles. The inspectors reviewed the onsite maintenance procedures governing vital component work, as applicable, including those for the

low-pressure alarm and pressure-demand air regulator. The inspectors reviewed the licensee's SCBA functional test and, if applicable, maintenance procedures and the manufacturer's recommended practices to determine if there were any inconsistencies between them.

This inspection constituted one sample as defined in IP 71121.03-5.

b. Findings

No findings of significance were identified.

2PS1 Radioactive Gaseous And Liquid Effluent Treatment And Monitoring Systems (71122.01)

.1 Inspection Planning

a. Inspection Scope

The inspectors reviewed the configuration of the licensee's gaseous and liquid effluent processing systems to confirm that radiological discharges were properly mitigated, monitored, and evaluated with respect to public exposure. The inspectors reviewed the performance requirements contained in General Design Criteria 60 and 64 of Appendix A to 10 CFR Part 50 and in the licensee's Radiological Effluent Technical Specifications (RETS) and Offsite Dose Calculation Manual (ODCM). The inspectors also reviewed any abnormal radioactive gaseous or liquid discharges and any conditions since the last inspection when effluent radiation monitors were out-of-service to verify that the required compensatory measures were implemented. Additionally, the inspectors reviewed the licensee's quality control program to verify that the radioactive effluent sampling and analysis requirements were satisfied and that discharges of radioactive materials were adequately quantified and evaluated.

The inspectors reviewed each of the radiological effluent controls program requirements to verify that the requirements were implemented as described in the licensee's RETS. For selected system modification (since the last inspection), the inspectors reviewed changes to the liquid or gaseous radioactive waste system design, procedures, or operation, as described in the UFSAR and plant procedures.

The inspectors reviewed changes to the ODCM made by the licensee since the last inspection to ensure consistency was maintained with respect to guidance in NUREG-1301, 1302 and 0133 and Regulatory Guides 1.109, 1.21 and 4.1. If differences were identified, the inspectors reviewed the licensee's technical basis or evaluations to verify that the changes were technically justified and documented.

The inspectors reviewed the radiological effluent release reports for 2006 and 2007 in order to determine if anomalous or unexpected results were identified by the licensee, entered in the CAP, and adequately resolved.

The inspectors reviewed any significant changes in reported dose values from the previous radiological effluent release report, and the inspectors evaluated the factors which may have resulted in the change. If the change was not explained as being influenced by an operational issue (e.g., fuel integrity, extended outage, or major decontamination efforts), the inspectors independently assessed the licensee's offsite

dose calculations to verify that the licensee's calculations were adequately performed and were consistent with regulatory requirements.

The inspectors reviewed the licensee's correlation between the effluent release reports and the environmental monitoring results, as provided in Section IV.B.2 of Appendix I to 10 CFR Part 50.

This inspection constitutes one sample as defined in IP 71122.01-5.

b. Findings

No findings of significance were identified.

.2 Onsite Inspection

a. Inspection Scope

The inspectors performed a walkdown of selected components of the gaseous and liquid discharge systems (e.g., gas compressors, demineralizers and filters, tanks, and vessels) and reviewed current system configuration with respect to the description in the UFSAR. The inspectors evaluated temporary waste processing activities, system modifications, and the equipment material condition. For radwaste equipment areas that were not readily accessible, the inspectors reviewed the licensee's material condition surveillance records, as applicable. The inspectors reviewed any changes that were made to the liquid or gaseous waste systems to verify that the licensee adequately evaluated the changes and maintained effluent releases ALARA.

During system walkdowns, the inspectors assessed the operability of selected point of discharge effluent radiation monitoring instruments and flow measurement devices. The effluent radiation monitor alarm set point values were reviewed to verify that the set points were consistent with RETS/ODCM requirements.

For effluent monitoring instrumentation, the inspectors reviewed documentation to verify the adequacy of methods and monitoring of effluents, including any changes to effluent radiation monitor set-points. The inspectors evaluated the calculation methodology and the basis for the changes to verify the adequacy of the licensee's justification.

The inspectors observed the licensee's sampling of gaseous radioactive waste (e.g., sampling of waste steams). Additionally, the inspectors reviewed several radioactive liquid and gaseous waste effluent discharge permits, assessed whether the appropriate treatment equipment was used and whether the radioactive effluent was processed and discharged in accordance with RETS/ODCM requirements, including the projected doses to members of the public.

The inspectors interviewed staff concerning effluent discharges made with inoperable (declared out-of-service) effluent radiation monitors to determine if appropriate compensatory sampling and radiological analyses were conducted at the frequency specified in the RETS/ODCM. For compensatory sampling methods, the inspectors reviewed the licensee's practices to determine if representative samples were obtained and if the licensee routinely relied on the use of compensatory sampling in lieu of adequate system maintenance or calibration of effluent monitors.

The inspectors reviewed surveillance test results for effluent-related ventilation and gaseous discharge systems (high efficiency particulate air (HEPA) and charcoal filtration) to verify that the systems were operating within the specified acceptance criteria. In addition, the inspectors assessed the methodology the licensee used to determine the stack/vent flow rates to verify that the flow rates were consistent with the RETS/ODCM.

The inspectors reviewed the licensee's program for identifying any normally non-radioactive systems that may have become radioactively contaminated to determine if evaluations (e.g., 10 CFR 50.59 evaluations) were performed per IE Bulletin 80-10.

The inspectors reviewed instrument maintenance and calibration records (i.e., both installed and counting room equipment) associated with effluent monitoring and reviewed quality control records for the radiation measurement instruments. The inspectors performed this review to identify any degraded equipment performance and to assess corrective actions, as applicable.

The inspectors reviewed the radionuclides that were included by the licensee in its effluent source term to determine if all applicable radionuclides were included (within detectability standards) in the licensee's evaluation of effluents. The inspectors reviewed waste stream analyses (10 CFR Part 61 analyses) to determine if hard-to-detect radionuclides were also included in the source term analysis.

The inspectors reviewed a selection of monthly, quarterly and annual dose calculations to ensure that the licensee had properly demonstrated compliance with 10 CFR Part 50, Appendix I, and RETS dose criteria.

The inspectors reviewed licensee records to identify any abnormal gaseous or liquid tank discharges (e.g., discharges resulting from misaligned valves, valve leak-by, etc.) to determine if the licensee had implemented the required actions. That review included an abnormal release in October 2008, resulting from an explosion in the floor drain surge tank vestibule building, which was caused by a buildup of methane gas. For that abnormal release, the inspectors reviewed the methods used by the licensee to assess the discharge along with the associated air sample results and effluent dose calculations. The inspectors also reviewed the licensee's Root Cause Investigation Report of that incident to determine if corrective actions were developed to address each cause. The inspectors determined if abnormal discharges were assessed and reported as part of the Annual Radioactive Effluent Release Report consistent with Regulatory Guide 1.21.

The inspectors reviewed the licensee's effluent sampling records (sampling locations, sample analyses results, flow rates, and source term) for radioactive liquid and gaseous effluents to verify that the licensee's information satisfied the requirements of 10 CFR 20.1501.

This inspection constitutes one sample as defined in IP 71122.01-5.

b. Findings

No findings of significance were identified.

.3 Identification and Resolution of Problems

a. Inspection Scope

The inspectors reviewed the licensee's self-assessments, audits, licensee event reports, and special reports related to the radioactive effluent treatment and monitoring program since the last inspection to determine if identified problems were entered into the CAP for resolution. The inspectors also assessed whether the licensee's self-assessment program was capable of identifying repetitive deficiencies or significant individual deficiencies in problem identification and resolution.

The inspectors reviewed corrective action reports from the radioactive effluent treatment and monitoring program since the previous inspection, interviewed staff, and reviewed documents to determine if the following activities were conducted in an effective and timely manner commensurate with their importance to safety and risk:

- initial problem identification, characterization, and tracking;
- disposition of operability/reportability issues;
- evaluation of safety significance/risk and priority for resolution;
- identification of repetitive problems;
- identification of contributing causes;
- identification and implementation of effective corrective actions;
- resolution of NCVs tracked in the corrective action system;
- implementation/consideration of risk-significant operational experience feedback; and
- ensuring problems were identified, characterized, prioritized, entered into a corrective action, and resolved.

This inspection constitutes one sample as defined in IP 71122.01-5.

b. Findings

No findings of significance were identified.

**4. OTHER ACTIVITIES**

4OA1 Performance Indicator (PI) Verification (71151)

.1 Unplanned Scrams per 7000 Critical Hours

a. Inspection Scope

The inspectors sampled licensee submittals for the Unplanned Scrams per 7000 Critical Hours PI for Units 1 and 2 for the period from the 1<sup>st</sup> quarter 2008 through the 4<sup>th</sup> quarter 2008. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in the Nuclear Energy Institute (NEI) Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 5, were used. The inspectors reviewed the licensee's operator narrative logs, issue reports, event reports and NRC Inspection Reports for the period of 1<sup>st</sup> quarter 2008 through the 4<sup>th</sup> quarter 2008 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 PI data collected or transmitted for this indicator and none were identified.

This inspection constituted two Unplanned Scrams per 7000 Critical Hours samples as defined in IP 71151-05.

b. Findings

No findings of significance were identified.

.2 Unplanned Scrams with Complications

a. Inspection Scope

The inspectors sampled licensee submittals for the Unplanned Scrams with Complications performance indicator for Units 1 and 2 for the period from the 1<sup>st</sup> quarter 2008 through the 4<sup>th</sup> quarter 2008. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in the NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 5, were used. The inspectors reviewed the licensee's operator narrative logs, issue reports, event reports and NRC Integrated Inspection Reports for the period of 1<sup>st</sup> quarter 2008 through the 4<sup>th</sup> quarter 2008 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 PI data collected or transmitted for this indicator and none were identified.

This inspection constituted two Unplanned Scrams with Complications samples as defined in IP 71151-05.

b. Findings

No findings of significance were identified.

.3 Unplanned Transients per 7000 Critical Hours

a. Inspection Scope

The inspectors sampled licensee submittals for the Unplanned Transients per 7000 Critical Hours performance indicator for Units 1 and 2 for the period from the 1<sup>st</sup> quarter 2008 through the 4<sup>th</sup> quarter 2008. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in the NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 5, were used. The inspectors reviewed the licensee's operator narrative logs, issue reports, maintenance rule records, event reports and NRC Integrated Inspection Reports for the period of 1<sup>st</sup> quarter 2008 through the 4<sup>th</sup> quarter 2008 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 PI data collected or transmitted for this indicator and none were identified.

This inspection constituted two Unplanned Transients per 7000 Critical Hours samples as defined in IP 71151-05.

b. Findings

No findings of significance were identified.

.4 Drill/Exercise Performance

a. Inspection Scope

The inspectors sampled licensee submittals for the Drill/Exercise Performance (DEP) PI for the period from the third quarter 2008 through fourth quarter 2008. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in the NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 5, were used. The inspectors reviewed the licensee's records associated with the PI to verify that the licensee accurately reported the DEP indicator in accordance with relevant procedures and the NEI guidance. Specifically, the inspectors reviewed licensee records and processes including procedural guidance on assessing opportunities for the PI; assessments of PI opportunities during pre-designated control room simulator training sessions, performance during the 2008 biennial exercise, and performance during other drills. Specific documents reviewed are described in the Attachment to this report.

This inspection constituted one drill/exercise performance sample as defined in IP 71151-05.

b. Findings

No findings of significance were identified.

.5 Emergency Response Organization Drill Participation

a. Inspection Scope

The inspectors sampled licensee submittals for the Emergency Response Organization (ERO) Drill Participation PI for the period from the third quarter 2008 through fourth quarter 2008. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in the NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 5, were used. The inspectors reviewed the licensee's records associated with the PI to verify that the licensee accurately reported the indicator in accordance with relevant procedures and the NEI guidance. Specifically, the inspectors reviewed licensee records and processes including procedural guidance on assessing opportunities for the PI; performance during the 2008 biennial exercise and other drills; and revisions of the roster of personnel assigned to key emergency response organization positions. Specific documents reviewed are described in the Attachment to this report.

This inspection constituted one ERO drill participation sample as defined in IP 71151-05.

b. Findings

No findings of significance were identified.

.6 Alert and Notification System

a. Inspection Scope

The inspectors sampled licensee submittals for the Alert and Notification System PI for the period from the third quarter 2008 through fourth quarter 2008. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in the NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 5, were used. The inspectors reviewed the licensee's records associated with the PI to verify that the licensee accurately reported the indicator in accordance with relevant procedures and the NEI guidance. Specifically, the inspectors reviewed licensee records and processes including procedural guidance on assessing opportunities for the PI and results of periodic ANS operability tests. Specific documents reviewed are described in the Attachment to this report.

This inspection constituted one alert and notification system sample as defined in IP 71151-05.

b. Findings

No findings of significance 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. 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: the complete and accurate identification of the problem; that timeliness was commensurate with the safety significance; that 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 attached List of Documents Reviewed.

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 of significance were identified.

.2 Daily Corrective Action Program Reviews

a. 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 of significance were identified.

.3 Annual Sample: Review of Operator Workarounds

a. Scope

The inspectors evaluated the licensee's implementation of their process used to identify, document, track, and resolve operational challenges. Inspection activities included, but were not limited to, a review of the cumulative effects of the operator workarounds (OWAs) on system availability and the potential for improper operation of the system, for potential impacts on multiple systems, and on the ability of operators to respond to plant transients or accidents.

The inspectors performed a review of the cumulative effects of OWAs. The documents listed in the Attachment were reviewed to accomplish the objectives of the inspection procedure. The inspectors reviewed both current and historical operational challenge records to determine whether the licensee was identifying operator challenges at an appropriate threshold, had entered them into their CAP and proposed or implemented appropriate and timely corrective actions which addressed each issue. Reviews were conducted to determine if any operator challenge could increase the possibility of an Initiating Event, if the challenge was contrary to training, required a change from long-standing operational practices, or created the potential for inappropriate compensatory actions. Additionally, all temporary modifications were reviewed to identify any potential effect on the functionality of Mitigating Systems, impaired access to equipment, or required equipment uses for which the equipment was not designed. Daily plant and equipment status logs, active adverse condition monitoring plans, open troubleshooting plans, active operational and technical decision making (OTDM) documents, degraded instrument logs, and operator aids or tools being used to compensate for material deficiencies were also assessed to identify any potential sources of unidentified operator workarounds.

This review constituted one OWA annual inspection sample as defined in IP 71152-05.

b. Findings

No findings of significance were identified.

.4 Selected Issue Followup Inspection: Human Performance Improvement Initiatives

a. Scope

The corrective action plan associated with IR 698843, "Receipt of NRC Substantive Crosscutting Issue in the Area of Documentation" was reviewed as followup to the previous substantive cross-cutting issue. The quality of the action closures was reviewed as well as the thoroughness of the on-going actions. During the review, inspectors monitored implementation of programs put in place to reinforce human performance improvement initiatives both in the office and in the power plant. The inspectors monitored training provided to licensee employees and contractor personnel working on-site and incorporated those observations into the overall trend evaluation as well as the individual human performance issues that impacted plant equipment during the previous quarter.

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

b. Findings

No findings of significance were identified.

4OA3 Followup of Events and Notices of Enforcement Discretion (71153)

.1 Failure of the Unit 2 Emergency Diesel Generator Cooling Water Pump (DGCWP)

a. Inspection Scope

The inspectors reviewed the plant's response to an unexpected failure of the Unit 2 DGCWP on November 12, 2008. The pump wear ring failed due to damage caused by intergranular stress corrosion cracking (IGSCC) and the breaker tripped open when the pump seized. The inspectors reviewed pump history, work documents, and failure reports from the offsite facilities to determine the cause of the failure. Inspectors reviewed the licensee's root cause report and corrective actions plan for the U2 DGCWP as well as the extent of condition evaluation and timeliness of planned actions. Since the pump materials had been identified as susceptible to this failure mechanism during investigation of the Unit 1 DGCWP in January of 2008, the inspectors reviewed the previous root cause evaluation and corrective action plan for applicability to this failure. Documents reviewed in this inspection are listed in the Attachment.

This event followup review constituted one sample as defined in IP 71153-05.

b. Findings

Introduction: A self-revealed finding of very low safety significance (Green) and NCV of 10 CFR 50, Appendix B, Criterion III, "Design Control," was identified after the Unit 2 DGCWP failed on November 12, 2008. Specifically, the licensee's failure to implement

measures with sufficient technical rigor during the design and procurement process for the pump resulted in installation of pump components that were not suited to the application and operating methodology for the emergency diesel generator cooling water system.

Discussion: The Unit 2 DGCWP was started in support of QCOS 5750-05, "Quarterly Testing of Service Water Supply HPCI Room Cooler Check Valves," on November 12, 2008. The pump breaker tripped 46 seconds after the start signal and the breaker long term time delay trip signal initiated the trip. The pump and the Unit 2 emergency diesel generator were declared inoperable and the licensee performed the required Technical Specification actions for the limiting condition of operation (LCO). Followup troubleshooting by electricians under Work Order (WO) 1185466 demonstrated the electrical supply system functioned as expected. Mechanical inspection conducted under WO 1185466 revealed that the pump stopped running as a result of the inboard impeller wear ring having broken and jammed against the casing effectively "acting as a brake" to seize the pump shaft. The rotating assembly was replaced with a refurbished assembly from the warehouse and the pump was restored to full service on November 13, 2008, following the post-maintenance and operability testing. Post-mortem evaluation of the failed wear ring indicated cracking due to IGSCC.

The Unit 1 DGCWP failed on January 9, 2008, under similar circumstances. External laboratory analysis identified that the wear rings were machined from Type 416 Stainless Steel (SS) and therefore susceptible to IGSCC. Evidence of IGSCC was present, but the accelerated failure of the Unit 1 pump was attributed to inadequate venting and additional stress due to operating for a short period with the pump air bound when the pump was placed in service on May 6, 2007. A recommendation from the organization performing the analysis was to replace the IGSCC susceptible components with components fabricated from non-susceptible materials. The design changes needed to support this action had not been completed when the Unit 2 pump failed.

The licensee's root cause evaluation performed a historical review of the pump design and installation. In 2003, due to performance challenges to the carbon steel pumps installed in the system, a decision was made to pursue the change in pump internals to a stainless steel design using the parts equivalency evaluation under SM-AA-300, "Procurement Engineering and Support Activities," rather than as a modification using CC-AA-103, "Configuration Change Control for Permanent Plant Changes." On January 6, 2004, the Component Maintenance Optimization (CMO) group sent the vendor quote for Type 316 SS pumps. While design and performance characteristics including seal type and seismic requirements were specifically communicated to the vendor, none of the communication or procurement information was related to pump internals beyond the pump material. The chemistry of the process fluid (i.e., raw water) and the intermittent operation of the pump (which allowed stagnant water to sit in the pump for an extended period) were not communicated to the vendor. Even though the licensee asked that all changes the vendor made to the original pump design be communicated to the licensee for evaluation prior to installation, the vendor changed the wear ring material to Type 416 SS as a matter of practice for stainless steel installations and this information was not communicated to the licensee. An item equivalency evaluation was performed as allowed using SM-AA-300 to evaluate items in the procurement process that were not identical to the original part. SM-AA-300 did not require the application suitability reviews (and none were performed) for the wear rings because the parts were not specifically identified by the vendor as changed and the

parts classification manual invoked by SM-AA-300 identified the wear rings as non-critical. As non-critical components, the wear rings were not expected to cause the pump to fail and were deemed to be easily replaceable.

The individuals performing the parts equivalency evaluation analyzed the changes identified by the vendor, but since the complete list of materials and components was not provided and analyzed, the use of Type 416 SS for the wear rings was not apparent. In fact, the presence of Type 416 SS material in the pump internals first became apparent to the licensee engineering organization during the post-mortem of the Unit 1 pump in January 2007.

Analysis: The inspectors determined that the failure to implement design control measures of appropriate rigor to ensure the replacement pump internals were suitably screened to ensure suitability to support the safety-related functions of the DGCWP was a performance deficiency. The inspectors determined the finding was more than minor because it impacted the mitigating systems cornerstone attribute of equipment performance to ensure the reliability and capability of the DGCWP and supported emergency diesel generators to start and run when needed. The inspectors performed a Phase 1 SDP evaluation and determined that the issue is Green because only one pump of three subsystems was degraded to the point where operability and function was affected. In addition, the pump was promptly repaired within the TS allowed out-of-service time and common mode failure of the other pumps was adequately addressed by running the other pumps and performing timely overhauls to ensure reliability as the root cause evaluation of the failure continued. As a result, the inspectors answered all of the questions of Manual Chapter 0609, Attachment 4, Table 4a, Mitigating Systems Cornerstone, "no" and screened the issue as Green.

The inspectors also identified organizational behaviors that indicate weaknesses in the operational decision making process. For example, inspectors determined that a significant contributing factor to the finding was the incomplete communications with the vendor regarding operating methods and environment of the pump, coupled with the assumptions the station engineering staff made based on those communications. Reliance on the pump vendor without establishing an effective means of assuring compliance is a non-conservative organizational behavior.

Even though the behavior leading to this event occurred almost 5 years before the Unit 2 DGCWP failed, the inspectors determined that this event is indicative of current performance because at the time of the failure the M-94-0300-01, "Material Engineering Parts Classification Manual," still classified the wear rings as non-critical/non-safety-related and thus would not be considered critical to the limiting design criteria. Inspectors have determined that this non-conservative behavior is cross-cutting in Human Performance, Decision making, for failure to use conservative assumptions in communications with the vendor and ensuring all of the vendor supplied parts were appropriate to support the pump function (H.1(b)).

Enforcement: Title 10 CFR 50, Appendix B, Criterion III states in part that measures shall also be established for the selection and review for suitability of application of the materials, parts, equipment, and processes that are essential to the safety-related functions of the structures, systems, and components.

Contrary to the above, the procedure implementing these measures at the station, SM-AA-300, "Procurement Engineering and Support Activities," did not require the application suitability reviews because the parts were incorrectly classified in the parts manual as non-critical. Because this violation is of very low safety significance, and because the issue was entered into the corrective action program as IR 843846, this issue is being treated as a NCV consistent with Section VI.A.1 of the NRC Enforcement Policy (**NCV 05000265/2009002-05**). Corrective actions for this event included immediate replacement of the Unit 2 rotating assembly with a refurbished assembly, assessing immediate operability and potential common mode failure of the remaining two pumps, replacement of the Unit 1/2 and Unit 1 DGCWPs with refurbished rotating assemblies containing wear rings constructed of materials suitable for the operating environment, and initiation of a plant modification to replace the pump internals with a design that is optimum for the operating environment.

.2 (Closed) Unresolved Item (URI) 05000254/2008003-01; 05000265/2008003-01: Units 1 and 2 Response to Earthquake in April 2008

At 04:37 a.m. on April 18, 2008, a seismic event occurred in southeastern Illinois and large aftershocks occurred at 05:36 a.m. and 10:15 a.m. Although the epicenter was located approximately 300 miles away from the plant, some plant personnel felt the earth tremors associated with the event. The site considered, but did not declare, an Unusual Event emergency plan classification during the event. The shift manager reviewed the emergency action levels (EALs) and associated thresholds for an earthquake (Natural and destructive phenomena affecting the PROTECTED AREA) and determined that the EAL for the event was not met and that the event was therefore not reportable. The EAL threshold for an Unusual Event at Quad Cities is established to coincide with NEI 99-01 Revision 5, "Methodology for Development of Emergency Action Levels," and states, "Seismic event as indicated by any TWO of the following: Earthquake felt in-plant, Seismic event confirmed by station seismic monitor procedure, or National Earthquake Center." The shift manager determined that the earthquake was not felt in the plant because no one within the power block or the main control room felt the tremors (the residents confirmed that this is how the site trains the emergency response organization to classify this event.) Technicians determined the quake and subsequent after shocks did not reach the seismic event actuation set point. The shift could not contact the National Earthquake Center but did get confirmation of the southern Illinois earthquake via a web page. Thus, in the shift manager's evaluation, only one of the criteria was met and the site did not declare an Unusual Event.

The bases discussion in NEI 99-01 states, "As defined in the EPRI-sponsored Guidelines for Nuclear Plant Response to an Earthquake, dated October 1989, a 'felt earthquake' is: An earthquake of sufficient intensity such that: (a) the vibratory ground motion is felt at the nuclear plant site and recognized as an earthquake based on a consensus of control room operators on duty at the time, and (b) for plants with operable seismic instrumentation, the seismic switches of the plant are activated." The specific concerns identified by the inspectors included:

- Concerns that the condition should have resulted in an Unusual Event classification and should have been reported. The licensee initially communicated to the resident inspectors that the phrase "Earthquake felt in plant" is limited to the control room and power block. This interpretation did not seem to support the EAL for issues "affecting the protected area" or the

NEI bases discussion in NEI 99-01 for this event. As Quad Cities had transferred this statement to their own bases document, they changed “felt at the nuclear plant site” to “felt in plant” and therefore further restricted the application of the criteria.

- Concerns that the potential for the earthquake to impact important safety functions that might not be evaluated or reported under this interpretation of the EAL. Risk significant or safety equipment located outside the power block such as underground piping supplying cooling water to the residual heat removal system and the emergency diesel generators were of particular concern and there was no clear connection between the criteria applied and the procure as implemented that provided assurance that all operators would execute the guidance consistently.

The licensee provided additional justification supporting the current position while responding to the Issue reports associated with the initial event and concerns expressed by the inspectors. Additional review and discussion with the regional and NRC headquarters emergency preparedness inspection staff determined that the licensee had communicated the more limiting interpretation of the guidelines during revision of the emergency action levels and bases documents. This more limiting interpretation was determined to be acceptable at that time. Further, the inspectors’ review of the EAL threshold for the ALERT classification determined that the same potential confusion does not exist because this EAL addresses VITAL AREAS and Table H2 of the matrix provided in EP-AA-1006, “Radiological Emergency Plan Annex for Quad Cities Station” (EAL Manual), provides additional information that includes service water pumps as vital areas to be monitored.

Additionally, the inspectors' concerns that an Unusual Event may not be initially declared are bound by the structure of the emergency action levels that assure as equipment issues occur that impact safe shutdown capabilities or principal barriers, other EALs will be satisfied requiring emergency plan implementation by the licensee.

Given that regional and NRC headquarters emergency preparedness inspection staff have assessed the original concerns of the resident inspectors and determined that the implementation of the emergency action levels was in accordance with the station procedure and regulatory guidelines, this URI is closed with no findings. Documents reviewed as part of this inspection are listed in the Attachment.

#### 40A5 Other Activities

- .1 (Closed) NRC Temporary Instruction 2515/175 “Emergency Response Organization, Drill/Exercise Performance Indicator, Program Review”

The inspectors performed Temporary Instruction (TI) 2515/175, ensured the completeness of the TI’s Attachment 1 and then forwarded the data to NRC, Headquarters.

.2 Quarterly Resident Inspector Observations of Security Personnel and Activities

a. Inspection Scope

During the inspection period, the inspectors conducted observations of security force personnel and activities to ensure that the activities were consistent with licensee security procedures and regulatory requirements relating to nuclear plant security. These observations took place during both normal and off-normal plant working hours.

These quarterly resident inspector observations of security force personnel and activities did not constitute any additional inspection samples. Rather, they were considered an integral part of the inspectors' normal plant status review and inspection activities.

b. Findings

No findings of significance were identified.

4OA6 Management Meetings

.1 Exit Meeting Summary

On April 7, 2009, the inspectors presented the inspection results to Mr. T. Tulon, Site Vice President, 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:

- Public Radiation Safety effluent monitoring and control inspection with Mr. T. Tulon and others on January 30, 2009.
- The results of the triennial heat sink inspection with Mr. T. Tulon, Site Vice President; R. Gideon, Plant Manager; and other members of the licensee's staff.
- Emergency Preparedness inspection interim exit with Mr. R. Gideon on March 6, 2009. A final Emergency Preparedness inspection exit was conducted by telephone with Mr. C. Tzomes on April 1, 2009.
- Occupational radiation safety radiation monitoring instrumentation program inspection with Mr. T. Tulon and others on March 13, 2009.

The inspectors confirmed that none of the potential report input discussed was considered proprietary.

#### 4OA7 Licensee-Identified Violations

The following violation of very low safety significance (Green) or Severity Level IV was identified by the licensee and is a violation of NRC requirements which meets the criteria of the NRC Enforcement Policy for being dispositioned as a Non-Cited Violation.

- Title 10 CFR 50, Appendix B, Criterion III, "Design Control," requires in part that "measures be established to assure that applicable regulatory requirements and design basis...are correctly translated into specifications, drawing, procedures and instructions." Contrary to the above, on January 26, 2009, the licensee identified that the operating duty cycle for the containment atmospheric monitor (CAM) system had been changed without appropriate consideration of equipment qualified life limitations in the current design basis calculations. The duty cycle had been changed from approximately 24 hours per month as assumed in the qualified equipment life calculations performed in accordance with 10 CFR 50.49, "Environmental qualification of electric equipment important to the safety of nuclear power plants," to full time operation. Neither the system operating procedure nor the engineering change review performed in support of the operating duty cycle change identified the operating limitations contained in the equipment qualification program requirement and therefore measures to assure that the design basis requirements were appropriately incorporated into the operating practices were not adequate. This nonconforming condition was incorporated into the licensee's corrective action program as IR 872127. This finding was of very low safety significance because only one of the four CAM subsystems (configuration is two for each unit) was inoperable as a result of exceeding the equipment qualified lifetime and therefore, the functional capability was not lost for either unit. Licensee corrective actions included replacement of the affected electrical components, conducting training for engineers performing review functions, and revision to preventative maintenance program schedules and operating procedures to incorporate the design basis operating limitations.

ATTACHMENT: SUPPLEMENTAL INFORMATION

## SUPPLEMENTAL INFORMATION

### KEY POINTS OF CONTACT

#### Licensee

T. Tulon, Site Vice President  
R. Gideon, Plant Manager  
K. Donovan, Assistant Maintenance Manager  
J. Hansen, Exelon Corporate Licensing Managing  
R. Svaleson, Operations Manager  
H. Madronero, Engineering Manager  
W. Beck, Regulatory Assurance Manager  
J. Burkhead, Nuclear Oversight Manager  
K. Moser, Training Manager  
V. Neels, Chemistry/Environ/Radwaste Manager  
D. Collins, Radiation Protection Manager  
D. Thompson, Security Manager  
D. Tubbs, MidAmerican Energy, Manager Nuclear  
P. Tzomes, EP Manager

#### Nuclear Regulatory Commission

M. Ring, Chief, Reactor Projects Branch 1

#### Illinois Emergency Management Agency

C. Mathews, Resident Inspector

### LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

#### Opened

05000254/2009002-01; 05000265/2009002-01	NCV	Broken Latch on Fire Door 145
05000265/2009002-02	NCV	Failure to Follow Work Instructions for 2A Core Spray Check Valve
05000254/2009002-03	FIN	Unit 1F Drywell Cooler Improper Restoration From Maintenance
05000254/2009002-04; 05000265/2009002-04	NCV	Failure To Comply With Technical Specification And Radiation Work Permit Requirements During Work In A Locked High Radiation Area
05000265/2009002-05	NCV	Failure of the Unit 2 Emergency Diesel Generator Cooling Water Pump

Closed

05000254/2009002-01; 05000265/2009002-01	NCV	Broken Latch on Fire Door 145
05000265/2009002-02	NCV	Failure to Follow Work Instructions for 2A Core Spray Check Valve
05000254/2009002-03	FIN	Unit 1F Drywell Cooler Improper Restoration From Maintenance
05000254/2009002-04; 05000265/2009002-04	NCV	Failure To Comply With Technical Specification And Radiation Work Permit Requirements During Work In A Locked High Radiation Area
05000265/2009002-05	NCV	Failure of the Unit 2 Emergency Diesel Generator Cooling Water Pump
05000254/2008003-01; 05000265/2008003-01	URI	Units 1 and 2 Response to Earthquake in April 2008
Temporary Instruction 2525/175	TI	Emergency Response Organization Drill/Exercises Performance Indicator, Program Review

## LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors 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 1R01

- QCOP 0010-02; Required Cold Weather Routine; Revision 27
- QOP 2010-33; Sparging and Recirculating the Floor Drain Surge Tank; Revision 9
- OP-AA-108-111-1001; Severe Weather and Natural Disaster Guidelines; Revision 3; 5/7/2008

### Section 1R04

- QCOP 6600-01; Diesel Generator 1(2) Preparation for Standby Operation; Revision 36
- QCAP 1500-01; Administrative Requirements for Fire Protection; Revision 23
- IR 864090, Door Latch Broken Rendering Fire Door Inoperable; 01/08/2009
- Fire Protection Report (UFSAR), Revision 18; 10/03/2007
- Quad Cities Nuclear Power Station Updated Final Safety Analysis Report (UFSAR); Revision 9; dated October 2007
- Quad Cities Units 1 and 2 Fire Protection Report; Revision 17; dated October 2005
- NFPA-80: "Fire Doors and Windows"; Edition 1975
- QCMMS 4100-16, Revision 13; Fire Door Inspection; 11/30/2007
- QOM 1-4000-10, Revision 5; Unit 1B Core Spray Valve Checklist; 05/27/2008
- QOM 2-1300-02, Revision 11; Unit 2 RCIC Valve Checklist
- QOM 2-1300-04, Revision 5; RCIC Fuse Checklist
- QCOP 1300-01, Revision 32; RCIC System Preparation for Standby Operation
- QOM 2-1000-05, Revision 17; Unit 2 RHR Service Water Valve Checklist

### Section 1R05

- QCMMS 4100-01; Fire Extinguisher Inspection, Revision 29
- Pre-plan RB-10; Fire Zone 1.1.1.5, Unit 1 Reactor Bldg. EI 666'-6", Stand-by Gas Treatment 4th Floor East; Revision 24
- Pre-plan RB-24; Fire Zone 1.1.2.5, Unit 2 Reactor Bldg. EI 666'-6", Stand-by Gas Treatment 4th Floor East; Revision 24
- Pre-plan TB-85; Fire Zone 8.2.8.E, Unit 1 Turbine Bldg. EI 639'-0", Main Turbine Floor (Outside Shield Wall)

### Section 1R06

- QCGP 3-1; Reactor Power Operations; Revision 057
- QCOP 6900-19; Documenting 125-250 VDC Grounds; Revision 09
- IR 883737; Required to Reduce Unit 2 Power Due to Valve Packing Leak; 02/22/2009
- IR 884287; Received Unit 2 125VDC Ground Alarm During 2B FRV Packing Failure; 02/24/2009

## Section 1R07

- AR 726161; 2D RHRSW Cubicle Cooler Flow Rate Lower Than Normal; dated January 23, 2008
- AR 736814; 1A RHR Room Cooler Flow Rate Meter; dated February 15, 2008
- AR 735820; 1B RHR Room Cooler Flow Rate Meter; dated February 15, 2008
- AR 746047; 1B RHR Room Cooler Low Flow; dated March 7, 2008
- AR 760672; Small Deformation in RHRSW Separation Screen; dated April 8, 2008
- AR 815744; U1 HPCI Room Cooler Is Fouled; dated September 9, 2008
- AR 819424; U1 HPCI Room Cooler Inspection Results; dated September 18, 2008
- AR 820077; Emergent Clearance Request for U1 HPCI Room Cooler; dated September 19, 2008
- AR 822022; 1B CS Room Cooler Needed Filters Replaced; dated September 24, 2008
- AR 822446; Bolting Missing On Louvers And End Dust Cover; dated September 25, 2008
- AR 824889; 2B RHR Room Cooler Dust Cover Missing Screws; dated October 1, 2008
- FASA 498448; QC GL 89-13 Safety-Related SW Program; dated November 7, 2006
- EC 333328; Determine Tube Plugging Limit, Plugging Criteria and Retubing; dated October 22, 2001
- EC 362215; Determine Tube Debris Fouling Limit for DGHX; September 22, 2006
- QDC 5700-M-806; ECCS Room Cooler Design Basis Calculation; Revisions 1, 1A and 1B
- SA-768; QC 2005A HX Risk Ranking; dated September 7, 2007
- QCOS 5750-09; ECCS Room Cooler Flow Surveillance; performed on August 27, 2008
- CY-QC-110-612; SW and RHRSW/DGCV Corrosion Inhibitor Operation, Revision 4
- CY-QC-110-613; SW and RHRSW/DGCV Biocide Operation, Revision 4
- CY-AA-120-4110; Raw Water Chemistry Strategic Plan, Revision 2
- ER-AA-5400; Buried Piping and Raw Water Corrosion Program Guide, Revision 1
- ER-AA-5400-1001; Water Corrosion Program Guide, Revision 0
- ER-AA-5400-1002; Buried Piping Examination Guide, Revision 1
- NES-MS-03.2; Evaluation of Discrepant Piping and Support Systems, Revision 6
- WO 737930; Open/Inspect and ECT of U2 DGHX; dated April 3, 2006
- WO 936617; U2 EDG Monthly Load Test (IST) –QCOS 6600-42; dated August 2, 2006
- WO 954332; Open/Inspect and ECT of U2 DGHX 2A and 2B; dated March 14, 2008
- WO 1030706; Inspected/Cleaned U1 HPCI Room Cooler; dated February 5, 2008
- WO 1166867; Inspected/Cleaned the fouled U1 HPCI Room Cooler; dated September 19, 2008
- WO 1130550; RHRSW Bay Semi-annual Inspection and Cleaning; dated October 17, 2008
- Quad Cities Generic Letter 89-13 Program Basis Document, Revision 2
- ATD-0400 Attachment 2; EDG HX Spec Sheet And Performance Data; Revision 0
- ECCS Room Cooler Performance Data Sheets; dated October 19, 1998

## Section 1R11

- LOCT-1091-ECORE; Recirculation Controller Failure/ Turbine Building Steam Leak/ QGA 400 Blowdown; Revision 7
- EP-AA-1006; Radiological Emergency Plan Annex for Quad Cities Station; Revision 26

## Section 1R12

- QCOP 0300-04, Revision 18; Control Rod Drive and CRD System Venting; 09/13/2004
- QCOP 0300-05, Revision 23; CRD Insert and Withdrawal Timing; 01/17/2007
- QCOP 0300-11, Revision 11; CRD System Accumulator Water Removal; 01/17/2007

- QCOP 0300-16, Revision 07; Addition of Water to the Reactor Vessel Using CRD Hydraulic System; 06/27/2008
- QCOP 0300-21, Revision 08; CRD Hydraulic Control Unit Accumulator Piston Seal Exercising; 08/30/2006
- QCOP 0300-27, Revision 04; Control Rod Drive Maintenance with Fuel Loaded; 07/09/2008
- QCOP 0300-30, Revision 08; Control Rod Drive Abnormality Record; 11/15/2006
- QCOS 0300-23, Revision 05; CRD Temperature Surveillance; 12/19/2007
- QCOS 0300-24, Revision 0; Control Rod Scram Timing in the Hot Condition; 01/09/2009
- QCOS 0300-14, Revision 011; Control rod Drive Inoperable Outage Report; 06/25/2004
- QCOS 0300-19, Revision 004; CRD Accumulator Alarm Inoperable Outage Report; 06/23/2006
- QCAN 901(2)-5 G-2, Revision 009; CRD ACCUM Press Lo-Level Hi; 06/05/2008
- Enterprise Maintenance Rule Production Database for Z0300: Control Rod Drive Hydraulics
- System Engineer Notebook and Accountability Logs for Z0300: Control Rod Drive Hydraulics
- EC 372992; 100% Duty of CAM System Beyond Existing Design Basis; Revision 00
- EC 370637; Evaluate Continuous Operation of CAM System VS Standby Operation; 06/20/2008
- EC 373861; 100% Duty of CAM System Beyond Existing Design Basis; Revision 000
- IR 872127; Assumptions Regarding Environmental Qualification Requirements Results in System Operation Outside of Qualified Conditions; 01/26/2009
- IR 850973; 1A CAM H2/O2 (2400-01) MRULE PC Exceeded; 12/01/2008
- IR 797750; CAM MRULE (A)(1) Action Plan Extension Due to EC 370637; 07/17/2008

#### Section 1R13

- OP-PB-108-101-1002, Revision 006; Guidelines for Control of Protected Equipment; 07/29/2008
- WC-AA-101, Revision 14; On-line Work Control Process; 11/05/2007
- QCOS 1100-07, Revision 30; SBLC Pump Flow Rate Test; 01/09/2009
- QCOS 1100-09, Revision 001; SBLC Pump Post Maintenance Packing Test; 02/27/09
- EC 374553, Revision 0; SBLC/SLCS Configuration Change for Pressure Boundary Extension Past Valve 1-1101-22; 03/05/09

#### Section 1R15

- IR 863466, Unit 1/2 EDG Silencer Inner Baffle Pip Support Welds Broken; 01/06/2009
- EC 373602; Evaluate Effect of Broken Emergency Diesel Generator (EDG) Silencer Support Welds on EDG' Revision 00
- UFSAR Section 9.58; Diesel Generator Combustion Air Intake and Exhaust System; Revision 9
- WO 602538; One-time Inspect 1/2 EDG Exhaust Silencer (License Renewal); 01/23/2009
- EC 373861; 100% Duty of CAM System Beyond Existing Design Analysis; Revision 000
- IR 872127; 100% Duty of CAM System Beyond Existing Design Analysis; 1/26/2009
- EC 372992, 100% Duty of CAM System Beyond Existing Design Analysis; Revision 000
- EC 370637; Evaluate Continuous Operation of CAM System Versus Standby; 06/20/2008
- IR 881609; HPCI Turbine Inlet drain Pot High Level Alarm Will Not Clear; 02/17/2009
- EC 374553; SLC Configuration Change for Pressure Boundary Extension Past Valve 1-1101-22; Revision 0
- IR 888341; U1 SBLC Test Aborted – Pump Recirculation Valve Binding; 03/05/2009
- IR 892866; Quad: Channel Distortion Operability Questions; 3/14/2009

- EC 374673; Operability Evaluation supporting Fuel and Control Rod Drive System potential non-conforming condition identified in IR 892866; 3/18/2009
- GE Nuclear Energy 10 CFR Part 21 Communication SC08-05, Revision 1; Updated Surveillance Program for Channel-Control Blade Interference Monitoring; 12/17/2008
- IR 874398; Indications of Channel Distortion – Peach Bottom 3; 1/30/2009
- IR 894200; Upper Compartment Doors Unlatched on 14 Safety-Related 4Kv Cubicles; 3/17/2009

#### Section 1R19

- TIC-2261 for QCOP 6600-05, Revision 32; Diesel Generator 0 Startup; 02/12/2008
- QCOS 6600-20, Revision 54; Diesel Generator Endurance and Margin Full Load Reject Hot Restart Test; 07/21/2008
- EC 360510; U0 EDG Voltage Regulator (Place the EDG in Droop Mode Prior to Synchronizing to the Grid); 1/7/2009
- QCOS 1100-07, Revision 30; SBLC Pump Flow Rate Test; 01/09/2009
- QCOS 1100-09, Revision 001; SBLC Pump Post Maintenance Packing Test; 02/27/2009
- WO 952467, MCC 18-1B CUB E2 Drywell Cooler 1F
- IR 880644; 1F DW Cooler Operations Leads to Improper Cooling Flows; 02/13/2009
- IR 881225; 1F Drywell Cooler Wired Incorrectly; 02/16/2009
- MA-AA-716-100, Revision 8; Maintenance Alteration Process
- MA-AA-716-0121, Revision 11; Post Maintenance Testing
- EP-AA-400-1001, Revision 8; Check Valve Monitoring and Preventative Maintenance Program
- ER-AA-321-1005, Revision 4; Condition Monitoring For Inservice Testing of Check Valves
- QCOS 1400-01, Revision 36; Quarterly Core Spray System Flow Rate Test
- WO 688962; Inspect/Repair Guides and Seat
- WO 1118831; Unable to Maintain 2A Core Spray Fill Following Pump Run
- IR 754428; Unable to Maintain 2A Core Spray Fill Following Pump Run; 03/25/2008
- IR 755926; Question on Disposition of Failed Check Valve by Operations; 03/28/2008
- IR 809575; Document Rework of 2-1402-8A Valve; 08/12/2008
- IR 884510; Adequacy of 2A CS Pump PMT Questioned (by NRC); 02/24/2009
- IR 867904, As Found Clearance Readings Out-of-Tolerance; 01/16/2009
- EC 373725; Evaluation of Weld Build Up on 2-1402-8A Plug Guides; 01/20/2009

#### Section 1R22

- QCOS 6600-43, Revision 30; Unit 1/2 Emergency Diesel Generator Load Test; 10/21/2008
- QCOS 1600-07, Revision 027; Reactor Coolant Leakage in the Drywell
- QCOS 2300-06, Revision 033; HPCI System Power Operated Valve Test
- QCOS 2300-15, Revision 023; HPCI Drain Pot Steam Line Drain Level Switch, Valve and Alarm Function Verification
- QCIS 2300-02, Revision 009; HPCI Reactor Low Pressure Analog Trip System Calibration and Functional Test
- QCIS 2300-04, Revision 016; HPCI Steam Line High Flow Analog Trip System Calibration and Functional Test
- QCOS 7500-04, Revision 025; Unit 1 Standby Gas Treatment Initiation and Reactor Building Isolation Test; 01/30/2009
- QCOS 1600-44, Revision 014; Unit 2 PCI Group 2 Partial Isolation Test at Power; 01/09/2009
- QCOS 1600-07, Revision 027; Reactor Coolant Leakage in the Drywell
- QCOS 0300-22, Revision 0; Fuel Channel Distortion Monitoring
- IR 893124; Plant Process Computer Interface Problem; 3/15/2009

- IR 893152; CRD Double Notched: U1 D-3; 3/15/2009
- IR 893175; RPIS Missing Indication for H-5 (Unit 1); 3/15/2009
- IR 893184; CRD Double Notched; 3/15/2009

#### Section 1EP2

- State of Illinois and State of Iowa's Offsite Emergency Plan Prompt Alert and Notification System Addendums for the Quad Cities Nuclear Power Station; dated January 1994
- Exelon Nuclear Siren Operations Manual; dated February 28, 2003
- Quad Cities Off-Site Siren Test Plan; dated December 2007
- Quad Cities Plant Warning System Maintenance and Operational Report; dated January 12, 2009
- Quad Cities Plant Warning System Maintenance and Operational Report; dated October 3, 2007
- AR 00804562; Storm-Related Loss of Power Inoperable Siren EI-5; dated August 6, 2008
- AR 00595621; Major Loss of Emergency Planning Zone Sirens >25 Percent; dated February 24, 2007

#### Section 1EP3

- Exelon Nuclear Standardized Radiological Emergency Plan; Section B; Revision 19
- EP-AA-122-1001; Attachment 2; Conduct of Call-In Augmentation Drills; Revision 10
- ERO Augmentation Drill Reports; dated March 2007 - December 2008
- Quad Cities Station ERO Team List; dated February 25, 2009
- AR 00870082; Maintenance Group Lead Response Time Excessive; dated January 22, 2009
- AR 00856081; On-Call ERO Member Failed to Respond during Augmentation Drill; dated December 14, 2008
- AR 0081988; Pager Issues with 4 On-Call ERO Members During Call-In Drill; dated September 17, 2008

#### Section 1EP5

- Exelon Nuclear Radiological Emergency Plan Annex for Quad Cities Station, Section 3; Classification of Emergencies; Revision 27
- EP-AA-122; Drills and Exercises; Revision 8
- EP-AA-122-1001; Drill and Exercise Scheduling, Development, and Conduct; Revision 10
- Quad Cities Generating Station Emergency Preparedness December 11, 2008, Full Scale Performance Indicator Drill Report; dated December 10, 2008
- NOSA-QDC-08-03; Quad Cities Station Emergency Preparedness Audit; dated April 30, 2008
- NOSA-QDC-08-03; Quad Cities Station Objective Evidence Report, P2I-1; dated April 25, 2008
- NOSA-QDC-07-04; Quad Cities Station Emergency Preparedness Audit; dated May 2, 2007
- QC-EP-09-02; Quad Cities December 11, 2008, Performance Indicator Drill Findings and Observation Report; dated January 9, 2009
- QC-EP-08-12; Quad Cities Station October 27, 2008 Unusual Event Report; dated November 24, 2008
- Quad Cities Station 18, 2008, April Seismic Disturbance Response White Paper; dated August 13, 2008
- Check-In Self-Assessment Report; 2009 NRC Baseline Emergency Preparedness Program Inspection Readiness; dated December 7, 2008
- EP Information Newsletter; dated March 2, 2009

- Appendix E, Manual Chapter 0612; Examples of Minor Issues, Example 4.j; dated September 20, 2007
- P2I-1; Offsite Agency Interface Interview Questions for Clinton, Whiteside, Rock Island, and Scott Counties; dated March 5 and 6, 2009
- AR 00889346; Local Governments Were Not Contacted For Annual 10 CFR 50.54(t) Evaluation of Adequacy Interfaces; dated March 5, 2009
- AR 00877583; Plant Address System Degradation Requires Attention and Compensatory Measures; dated February 6, 2009
- AR 00847731; Offsite Communications Delays during October 27, 2008, Unusual Event; dated November 20, 2008
- AR 00846598; Lack of Emergency Response Facility Activation for October 27, 2008, Unusual Event; dated November 18, 2008
- AR 0846577; EP Procedure Adherence Shortcomings during October 27, 2008, Unusual Event; dated November 18, 2008
- AR 00836178; October 27, 2008, Explosion at Floor Drain Surge Tank Building; dated October 27, 2008
- AR 00826462; URI 08-003-002-Response to April 18, 2008, Earthquake; dated October 3, 2008
- AR 00826404; 2008 Exercise-Release and Dose Assessment Demonstration Criteria Failure in the TSC; dated October 3, 2008
- AR 00826401; 2008 Exercise-Control Room Team Dispatched without Dose/KI Briefing; dated October 3, 2008
- AR 00814351; NRC Operations Center Inquired About the August 27, 2008, Exercise; dated September 5, 2008
- AR 00811932; NOS Identified Improvements for OSC during August 27, 2008, Exercise; dated August 28, 2008
- AR 00811600; Inadvertent Emergency Broadcast Results in ENS Notification, dated August 27, 2008
- AR 00769725; NRC Question Regarding April 18, 2008, EAL Entry; dated April 30, 2008
- AR 00765023; EP Review of Exelon Response to April 18, 2008 Seismic Activity; dated April 18, 2008
- AR 00695962; Apparent Cause Report of Maintenance Department Respiratory Qualifications Below 50 Percent; dated November 7, 2007

### Section 2OS1

- RWP 10010478 Revision 1, Radwaste Operations Activities (and associated radiation survey data for the radwaste basement); dated January 13, 14 and 28, 2009
- AR 00866242; Worker Received ED Alarm; dated January 13, 2009
- Human Performance Issue Report; Equipment Operator Receives a High Radiation Area Violation; discovered January 13, 2009
- QCOP 2099-02; Transfer and Dewatering of Waste Demineralizer Spent Resin Tank via "B" Transfer Header; Revision 19

### Section 2OS3

- RP-AA-700; Controls for Radiation Protection Instrumentation; Revision 2
- RP-QC-801; Shepherd Model 89 Shielded Calibrator; Revision 9
- RP-QC-703; Operation and Calibration of the AMP-100/200; Revision 5
- RP-QC-701; Operation and Calibration of the Ram GAM 1; Revision 2
- RP-QC-716; Operation of the Thermo Eberline Teleprobe; Revision 3

- RP-QC-719; Operation of the Merlin Gerin Wide-Range Telepole; Revision 0
- RP-QC-753; NMC Multi-Channel Continuous Air Monitor; Revision 6
- RP-QC-754; Operation and Calibration of Portable Neutron Monitors; Revision 4
- Calibration Data for Eberline RO-20 (Serial No. 005240) Portable Survey Instrument; dated May 20, 2008
- Calibration Data for Eberline ASP-1/NRD (Serial No. 3474) Portable Survey Instrument; dated June 10, 2008
- Calibration Data for MGP AMP 200 (Serial No. 7700-038) Portable Survey Instrument; dated May 27, 2008
- Calibration Data for Thermo Electron Model FHZ-612 (Serial No. 0501) Portable Survey Instrument; dated April 23, 2008
- QIP 1800-01; Calibration Data for Units 1 and 2 Refuel Floor High Range Area Radiation Monitor; dated July 15, 2008 (Unit 1) and February 20, 2008 (Unit 2)
- QCIMP 1800-04; Calibration Data for Unit 1 Fuel Pool Pump/Heat Exchanger Area Radiation Monitor; dated December 5, 2008
- QIP 1800-01; Calibration Data for Radwaste Basement/Pump Room Area Radiation Monitor; dated September 2, 2008
- QIP 1800-01; Calibration Data for Unit 2 RCIC Room Area Radiation Monitor; dated July 22, 2008
- QIP 1800-01; Calibration Data for Unit 2 Offgas Charcoal Bed Vault Area Radiation Monitor; dated July 10, 2008
- QCIS 2400-05; Calibration Data for Units 1 and 2 (Division I and II) Drywell High-Range Radiation Monitors; dated May 14, 2008 (Unit 2 – Division II), April 22, 2008 (Unit 2 – Division I), March 9, 2008 (Unit 1 – Division I) and April 5, 2007 (Unit 1 – Division II)
- CY-QC-130-407; Calibration Record for Drywell CAM (Serial No. 83-122-21); dated October 23, 2008 and (Serial No. 83-122-20); dated October 27, 2008
- RP-QC-729; Operation and Calibration of the IPM Whole Body Monitors; Revision 4
- RP-QC-731; Eberline PM-7 Portal Monitor; Revision 8
- Calibration Report for PM-7 Portal Monitors (Serial Nos. 1, 2, 3, 6, 10, 11, 15); dated various periods between November 2008 and February 2009
- IPM Personnel Contamination Monitor Calibration Record (Serial Nos. 342, 343, 347, 348, 349, 350, 351 and 353); dated various periods between December 2008 and February 2009
- Report of Calibration for the Canberra Fastscan Whole body Count System at the Quad Cities Nuclear Station; dated February 19, 2009
- RP-QC-831; Maintenance and Inspection of MSA Firehawk; Revision 6
- Records of Monthly SCBA Inspections; dated January 2008 – February 2009
- MSA Training Certification for Sandry Fire Supply Technicians; dated February 6, 2008
- MSA Firehawk Pressure Regulator Test Results (for 93 SCBA units); dated December 1-4, 2008
- Respirator Qualification/Training Report for Quad Cities Operations, Maintenance, Radiation Protection and Chemistry Departments
- Lesson Plan; MSA 2216 Firehawk Use - Respiratory Level II; Revision 00
- Radcal Corporation Calibration of Electrometer/Ion Chamber Model 20X5-3 (Serial No. 4937) and Model 20X5-180 (Serial No. 6917); dated March 3, 2008
- Calibration/Verification Data for J. L. Shepherd Model 89-400 Calibrator; dated September 3, 2008
- Report of Self-Assessment; RP Instrumentation; dated January 16, 2009
- Report of Nuclear Oversight Audit; Instrument Control; dated August 15, 2007
- AR 00662181; Repetitive Equipment Issues; dated August 19, 2007
- AR 00865783; ARM 23 Alarmed Downscale; dated January 12, 2009
- AR 00864591; Potential Mask Spectacle Kit Discrepancy; dated January 9, 2009

- AR 00670459; Firehawk SCBA Change Management Plan Overlooked; dated September 12, 2007
- AR 00884666; Procedure Revision to RP-QC-831; dated February 24, 2009
- AR 00657571; NRC Inspection - Area Radiation Monitor Calibration Concern (dated August 8, 2007); and associated assessment of monitoring system linearity (dated July 1, 2008)
- AR 00892620; SCBA Bottles Low in Pressure; dated March 24, 2009

### Section 2PS1

- Quad Cities Nuclear Power Station Radioactive Effluent Reports for January - December 2006 (issued April 30, 2007) and for January - December 2007 (issued April 25, 2008)
- CY-QC-170-301; Quad Cities Station Offsite Dose Calculation Manual; Revision 8
- CY-QC-120-735; Main Chimney and Reactor Vent Noble Gas Release Rate Action Levels; Revision 4
- CY-QC-120-729; Liquid Effluent Monitor Alarm Setpoints; Revision 2
- CY-QC-130-650; Inoperable Chemistry Instrument LCO Requirements; Revision 6
- CY-QC-120-737; Radioactive Liquid Discharge Batch Analysis; Revision 8
- CY-QC-110-606; Main Chimney Gaseous and Particulate Sampling; Revision 13
- CY-QC-110-605; Reactor Building Vent Gaseous and Particulate Sampling; Revision 11
- QCIS 1700-19; Unit 2 Reactor Building Vent Sampler Flow Rate Indication Calibration and Functional Test; dated September 11, 2008
- QCIS 1700-19; Unit 1 Reactor Building Vent Sampler Flow Rate Indication Calibration and Functional Test; dated September 10, 2008
- QCIS 1700-07; Unit 1 Reactor Building Ventilation Radiation Monitor Calibration and Functional Test; dated September 11, 2008
- QCIS 1700-07; Unit 2 Reactor Building Ventilation Radiation Monitor Calibration and Functional Test; dated September 11, 2008
- CY-QC-130-402; SPING High Range Noble Gas Calibration; dated June 20, 2008
- CY-QC-130-402; SPING Mid Range Noble Gas Calibration; dated June 20, 2008
- CY-QC-130-402; SPING Low Range Noble Gas Calibration; dated June 19, 2008
- CY-QC-130-601; Main Chimney Noble Gas Monitor Calibration; dated May 31, 2007
- QCIS 1700-17; Main Chimney Sampler Flow Rate Indication Calibration and Functional Test; dated November 24, 2008
- QCCP 0300-07; Unit 1 Service Water Monitor Calibration; dated January 11, 2007
- QCCP 0300-07; Unit 1 Service Water Monitor Calibration; dated January 11, 2007
- QCCP 0300-07; Unit 2 Service Water Monitor Calibration; dated August 16, 2007
- QCCP 0300-07; Radwaste Effluent Monitor Calibration; dated March 5, 2007
- Results of Radiochemistry Cross Check Program; Quad Cities Nuclear Power Station; 1st – 4th Quarters of 2007 and 1st and 2nd Quarters 2008
- Liquid and Gaseous Sample LLD Determinations; Various Geometries for Detectors 1, 2, 3, and 4; dated various periods in 2006/2007
- Efficiency Calibrations for Gamma Spectroscopy Detectors 1, 2, 3 and 4; Various Geometries; dated November 27, 2007
- AR 00795268; Discrepancy between Calculated and Measured Unit 1 Offgas Flow; dated July 10, 2008
- AR 00804501; Historical Perspective on Unit 1 Offgas Flow Discrepancy; dated August 6, 2008
- AR 00841098; Floor Drain Surge Tank Room Roof Vent Open to Atmosphere; dated November 6, 2008
- AR 00564118; Chemistry Used Incorrect Holdup Flow Rate for Unit 2 Offgas Sample; dated December 21, 2006

- AR 00662274; Liquid Process Radiation Monitor Failure; dated August 20, 2007
- AR 00678981; Unit 2 Service Water Radiation Monitor Relay Failure; dated October 2, 2007
- AR 00681692; Unit 2 Service Water Radiation Monitor Inoperable; dated October 8, 2007
- AR 00714680; Unit 1 Offgas Adsorber Has Elevated Discharge Activity; dated December 21, 2007
- AR 00796247; Abnormal Gaseous Effluent Release Identified; dated July 14, 2008
- AR 00812082; Increase in Activity Levels Noted in Unit 2 Reactor Building Closed Cooling Water; dated August 28, 2008
- AR 00845931; Methodology to Account for Abnormal Release via RHR Leak; dated November 17, 2008
- AR 00841251; Insignificant Abnormal Radiological Effluent Release; dated November 6, 2008
- Focused Area Self-Assessment Report; Radiological Effluents and Radiological Environmental Monitoring; dated March 31, 2008
- QCTS 0430-02/03; Standby Gas Treatment System In-Place DOP Leak Test of HEPA Filters/Charcoal Adsorber Freon 11 Leak Test; Train 'A'; both dated September 4, 2008
- Nucon International, Inc. Radioiodine Test Report for Standby Gas Treatment System Train 'A' Test Canister; dated September 24, 2008
- QCTS 0430-02/03; Standby Gas Treatment System In-Place DOP Leak Test of HEPA Filters/Charcoal Adsorber Freon 11 Leak Test; Train 'B'; both dated July 17, 2007
- Nucon International, Inc. Radioiodine Test Report for Standby Gas Treatment System Train 'B' Test Canister; dated July 24, 2007
- Conestoga-Rovers & Associates Hydrogeologic Investigation Report for Quad Cities Generating Station; dated September 2006
- Migration Control Plan for Unit 1 RHR Suction Line Release Quad Cities Generation Station; dated July 2008
- Special Test – Reactor Building Vent Stack Computer Point; Performed December 14, 1992
- RP-QC-300-1001; Radiological Survey Surveillance Program; Revision 4 (and associated Surveillance Inspection Results for 2007–2008)
- Root Cause Investigation Report – Explosion in Floor Drain Surge Tank Vestibule Building from the Buildup of Methane Gas; dated December 1, 2008 (Revision 2)

#### Section 40A1

- EP-AA-125-1002; ERO Performance - Drill and Exercise Performance Indicator Guidance; Revision 4
- EP-AA-125-1003; ERO Readiness - Drill Participation Performance Indicator Guidance; Revision 6
- EP-AA-125-1004; Emergency Response Facilities and Equipment - Siren Performance Indicator Guidance; Revision 4
- LS-AA-2120; Monthly Data Elements for NRC Drill/Exercise Performance; dated July - December 2008
- LS-AA-2110; Monthly Data Elements for NRC ERO Drill Participation; dated September - December 2008
- LS-AA-2130; Monthly Data Elements for NRC ANS Reliability; dated July - December 2008
- Quad Cities Monthly Siren Availability Report; dated July - December 2008
- EP Respiratory Qualifications Report; dated March 3, 2009
- AR 00855278; Missed Performance Indicator Opportunity during PI Drill; dated December 11, 2008
- AR 00844706; Missed Performance Indicator Opportunity during Operator Requal Exam; dated November 13, 2008

- AR 00826410; 2008 Exercise-OSC Activation Demonstration Criteria Failure; dated October 3, 2008

#### Section 4OA2

- OP-AA-102-103, Revision 2; Operator Work-around Program
- OP-AA-102-103-1001, Revision 000; Operator Burden Impact Assessment Program
- IR 850079; Review Manual Operation of CS Discharge Valve; 11/26/2008
- Operator Work-around Board Minutes dated February 26, 2009
- Operator Work-around Board Minutes dated January 23, 2009

#### Section 4OA3

- WO 1185466; U2 EDGCWP Trip; 11/12/2008
- IR 843846; U2 EDGCWP Trip; 11/12/2008
- IR 848636; 1/2 DG CWP Wear Ring Cross Section Crack; 11/22/2008
- IR 845247; NOS ID Lack of Aggressive Response to Power Lab Report; 11/14/2008
- SM-AA-300, Revision 0; Procurement Engineering and Support Activities

## LIST OF ACRONYMS USED

AF	Adjustment Factor
ALARA	As-Low-As-Is-Reasonably-Achievable
ANS	Alert and Notification System
AR	Assignment Report
CAM	Containment Atmospheric Monitoring
CAP	Corrective Action Program
CCDP	Conditional Core Damage Probability
CEDE	Committed Effective Dose Equivalent
CFR	Code of Federal Regulations
CMO	Component Maintenance Optimization
DEP	Drill/Exercise Performance
DF	Duration Factor
DGCW	Diesel Generator Cooling Water
DGCWP	Diesel Generator Cooling Water Pump
EAL	Emergency Action Level
ED	Electronic Dosimeter
EDG	Emergency Diesel Generator
EO	Equipment Operator
EP	Emergency Preparedness
ERO	Emergency Response Organization
FRV	Feedwater Regulating Valve
HEPA	High Efficiency Particulate Air
HPCI	High Pressure Coolant Injection
IGSCC	Inter-granular Stress Corrosion Cracking
IMD	Instrument Maintenance Department
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Issue Report
IST	Inservice Test
kV	Kilovolt
LCO	Limiting Condition for Operation
LHRA	Locked High Radiation Area
MMD	Mechanical Maintenance Department
MSIV	Main Steam Isolation Valve
NCV	Non-Cited Violation
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NRC	U.S. Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
OTDM	Operational and Technical Decision Making
OWA	Operator Workaround
PI	Performance Indicator
PMT	Post-Maintenance Testing
PNS	Probability of Non-Suppression
RBCCW	Reactor Building Closed Cooling Water
RCA	Radiologically Controlled Area
RCIC	Reactor Core Isolation Cooling
RCS	Reactor Coolant System
RETS	Radiological Effluent Technical Specification

RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RP	Radiation Protection
RPT	Radiation Protection Technician
RWP	Radiation Work Permit
SBLC	Standby Liquid Control
SCBA	Self-Contained Breathing Apparatus
SDP	Significance Determination Process
SS	Stainless Steel
SSC	Systems, Structures, and Components
TI	Temporary Instruction
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
UHS	Ultimate Heat Sink
URI	Unresolved Item
Vdc	Volts Direct Current
WO	Work Order