



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION III  
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May 3, 2017

Mr. Bryan C. Hanson  
Senior VP, Exelon Generation Company, LLC  
President and CNO, Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2—NRC  
INTEGRATED INSPECTION REPORT 05000254/2017001 AND  
05000265/2017001

Dear Mr. Hanson:

On March 31, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Quad Cities Nuclear Power Station, Units 1 and 2. On April 11, 2017, the NRC inspectors discussed the results of this inspection with Mr. S. Darin and other members of your staff. The results of this inspection are documented in the enclosed report.

Based on the results of this inspection, the NRC has identified one issue that was evaluated under the risk significance determination process as having very low safety significance (Green). The NRC has also determined that one violation is associated with this issue. Because the licensee initiated condition reports to address this issue, this violation is being treated as a Non-Cited Violation (NCV), consistent with Section 2.3.2a of the Enforcement Policy. The NCV is described in the subject inspection report.

If you contest the violation or significance of the 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; and the NRC Resident Inspector at the Quad Cities Nuclear Power Station.

If you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement 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 U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region III; and the NRC Resident Inspector at the Quad Cities Nuclear Power Station.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, and Requests for Withholding."

Sincerely,

*/RA/*

Karla Stoedter, Chief  
Branch 1  
Division of Reactor Projects

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

Enclosure:  
IR 05000254/2017001; 05000265/2017001

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Letter to Bryan C. Hanson from Karla Stoedter dated May 3, 2017

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2—NRC  
INTEGRATED INSPECTION REPORT 05000254/2017001 AND  
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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: 05000254/2017001; 05000265/2017001

Licensee: Exelon Generation Company, LLC

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

Location: Cordova, IL

Dates: January 1 through March 31, 2017

Inspectors: R. Murray, Senior Resident Inspector  
K. Carrington, Resident Inspector  
M. Garza, Emergency Preparedness Inspector  
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J. Neurauter, Reactor Engineer  
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Approved by: K. Stoedter, Chief  
Branch 1  
Division of Reactor Projects

Enclosure

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## SUMMARY

Inspection Report 05000254/2017001, 05000265/2017001; 01/01/2017–03/31/2017;  
Quad Cities Nuclear Power Station, Units 1 and 2; Identification and Resolution of Problems.

This report covers a 3-month period of inspection by resident inspectors and announced baseline inspections by regional inspectors. One Green finding was identified by the inspectors. The finding involved a Non-Cited Violation (NCV) of the U.S. Nuclear Regulatory Commission (NRC) requirements. The significance of inspection findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects within the Cross-Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated November 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

### **Cornerstone: Mitigating Systems**

Green. A finding of very low safety significance and an associated NCV of 10 CFR 50, Appendix B, Criterion V was self-revealed on January 27, 2017, when the Unit 1C residual heat removal service water (RHRSW) pump was started for a routine surveillance evolution and all expected annunciators and equipment failed to operate properly, which led to the licensee declaring the Unit 1C RHRSW pump inoperable. Specifically, the licensee failed to establish a procedure for the mechanism operated contact (MOC) switch linkage arm that was appropriate to the circumstances to ensure the component would continue to perform its function. Immediate corrective actions included reconnecting the MOC switch linkage arm assembly and testing it by starting the 1C RHRSW pump prior to declaring the pump operable. In addition, the licensee planned procedure revisions to QCEPM 0200-11 that would specify a torque value to ensure the MOC switch linkage arm was adequately secured and could perform its function. This issue was entered into the licensee's corrective action program as Issue Report 3967424.

The finding was determined to be more than minor because the finding was associated with the Mitigating Systems cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to ensure the MOC switch linkage arm was adequately fastened led to the failure of the component and its associated Unit 1C RHRSW pump during breaker operation on January 27, 2017. The finding was determined to be of very low safety significance (Green), because the inspectors answered "No" to all of the questions in IMC 0609, Appendix A, "The Significance Determination Process for Findings at Power," Exhibit 2, "Mitigating Systems Screening Questions," Section A, "Mitigating SSCs and Functionality." The inspectors determined this finding affected the cross-cutting area of human performance, in the aspect of avoid complacency, which states, "Individuals recognize and plan for the possibility of mistakes, latent issues, and inherent risk, even while expecting successful outcomes." Specifically, the licensee failed to recognize a potential risk and inherent latent issue for a condition identified in 2015 at Quad Cities, when a MOC switch failed to perform its function due to a missing nut in a different breaker's linkage assembly. The licensee identified and corrected the

condition but failed to evaluate the cause of the missing nut because it did not impact the operability of the component. In the 2015 instance, the MOC switch issue only affected indications for the component and had no adverse impact on the ability of the component to perform its function [H.12]. (Section 4OA2)

## REPORT DETAILS

### Summary of Plant Status

#### **Unit 1**

With the exception of planned power reductions for turbine testing, control rod pattern adjustments, and power changes as requested by the transmission system operator, the unit remained at or near full power from January 1 to January 18, 2017. On January 18, the unit began coasting down for Refueling Outage Q1R24. On March 27, 2017, the unit shut down for Q1R24 and remained shut down through the end of the inspection period.

#### **Unit 2**

The unit operated at or near full power for the entire inspection period with the exception of planned power reductions for turbine testing, control rod pattern adjustments, control rod drive maintenance, and power changes as requested by the transmission system operator.

### **1. REACTOR SAFETY**

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

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

##### .1 Winter Seasonal Readiness Preparations

##### a. Inspection Scope

The inspectors conducted a review of the licensee's preparations for winter conditions to verify that the plant's design features and implementation of procedures were sufficient to protect mitigating systems from the effects of adverse weather. Documentation for selected risk-significant systems was reviewed to ensure that these systems would remain functional when challenged by inclement weather. During the inspection, the inspectors focused on plant specific design features and the licensee's procedures used to mitigate or respond to adverse weather 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. Cold weather protection, such as heat tracing and area heaters, was verified to be in operation where applicable. The inspectors also reviewed corrective action program (CAP) items to verify that the licensee was identifying adverse weather issues at an appropriate threshold and entering them into their CAP in accordance with station corrective action procedures. Documents reviewed are listed in the Attachment to this report. The inspectors' reviews focused specifically on the following plant systems due to their risk significance or susceptibility to cold weather issues:

- 345 kilo-volt system; and
- Units 1 and 2 standby liquid control systems.

This inspection constituted one winter seasonal readiness preparation sample as defined in Inspection Procedure (IP) 71111.01–05.



b. Findings

No findings 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 and Unit 2 emergency diesel generator (EDG) systems during Unit 1/2 EDG surveillance testing;
- Unit 2 reactor core isolation cooling (RCIC) system during Unit 2 high pressure coolant injection system planned maintenance;
- Unit 2 'C' and 'D' residual heat removal service water (RHRSW) pump systems during 'A' and 'B' RHRSW systems planned maintenance; and
- Unit 1 fuel pool cooling system during Unit 1 Q1R24 alternate decay heat removal operations.

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

These activities constituted four partial system walkdown samples as defined in IP 71111.04–05.

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05)

.1 Routine Resident Inspector Tours (71111.05Q)

a. Inspection Scope

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

- Fire zone (FZ) 11.2.1, Unit 1 reactor building, elevation 554'-0", southwest corner room, 1B core spray;
- FZ 8.2.6.B, Unit 1 turbine building, elevation 595'-0", low pressure heater bay;
- FZ 8.2.7.B, Unit 1 turbine building, elevation 615'-6", low Pressure and 'D' heater bay; and
- FZ 8.2.7.C, Unit 1/2 turbine building, elevation 611', mezzanine floor.

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

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

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

Documents reviewed are listed in the Attachment to this report.

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

b. Findings

No findings were identified.

1R06 Flooding (71111.06)

.1 Internal Flooding

a. Inspection Scope

The inspectors reviewed selected risk important plant design features and licensee procedures intended to protect the plant and its safety-related equipment from internal flooding events. The inspectors reviewed flood analyses and design documents, including the UFSAR, engineering calculations, and abnormal operating procedures to

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

- Units 1 and 2 RHRSW vaults.

Documents reviewed during this inspection are listed in the Attachment to this report. This inspection constituted one internal flooding sample as defined in IP 71111.06–05.

b. Findings

No findings were identified.

1R07 Annual Heat Sink Performance (71111.07)

.1 Heat Sink Performance

a. Inspection Scope

The inspectors reviewed the licensee's testing of the 'B' control room emergency ventilation system refrigeration condensing unit heat exchanger to verify that potential deficiencies did not mask the licensee's ability to detect degraded performance, to identify any common cause issues that had the potential to increase risk, and to ensure that the licensee was adequately addressing problems that could result in initiating events that would cause an increase in risk. The inspectors reviewed the licensee's observations as compared against acceptance criteria, the correlation of scheduled testing and the frequency of testing, and the impact of instrument inaccuracies on test results. Inspectors also verified that test acceptance criteria considered differences between test conditions, design conditions, and testing conditions. Documents reviewed for this inspection are listed in the Attachment to this document.

This annual heat sink performance inspection constituted one sample as defined in IP 71111.07–05.

b. Findings

No findings were identified.

1R08 Inservice Inspection Activities (71111.08)

From March 27–31, 2017, the inspectors conducted a review of the implementation of the licensee's Inservice Inspection (ISI) Program for monitoring degradation of the Unit 1 reactor coolant system, risk-significant piping and components, and containment systems.

The inspections described in Sections 1R08.1 and 1R08.5 below constituted one sample as defined in IP 71111.08–05.

.1 Piping Systems Inservice Inspection

a. Inspection Scope

The inspectors either observed or reviewed the following Non-Destructive Examinations (NDE) mandated by the American Society of Mechanical Engineers (ASME), Section XI Code to evaluate compliance with the ASME Code Section XI and Section V requirements, and if any indications and defects were detected to determine if these were dispositioned in accordance with the ASME Code or a NRC approved alternative requirement:

- Ultrasonic examination of elbow-to-pipe weld (component 30A–S11) in the main steam system (WO No. 01831310–01);
- Ultrasonic examination of elbow-to-pipe weld (component 30B–S10) in the main steam system (WO No. 01831310–01);
- Magnetic particle examination (MT) of collar-torus shell (component 1025–50) in emergency core cooling system (WO 01831310);
- MT of welds—variable spring can with four lugs welded to pipe (component 1401-W-201A) in core spray system (WO 01831310);
- MT of welds—eight guide lugs welded to pipe (component 2304–W–204A) in the high pressure coolant injection system (WO No. 01831310);
- General visual examination of a sample of metallic containment surface area examinations: Penetrations X–016A, X–020, X–025, X–042, X–08, and X–109; X-025 MC piping at elevations 647, 623, and 595 (WO No. 01831711–02);
- Visual examination (VT–1) of welds—four lugs welded to pipe (component 1005A–W–304.5A) in RHRSW system (WO 01831310);
- VT–3 of pipe restraint—box guide (component 1005A–W–304.5) in RHRSW system (WO 01831310);
- VT–3 of pipe support—two variable spring cans (component 1401–W–201 A&B) in core spray system (WO 01831310); and
- VT–3 of flued head anchor (component 1202–M–108.1) in the reactor water clean-up system (WO No. 01831310).

The inspectors reviewed one surface examination from the previous outage with a relevant indication that was evaluated and accepted by the licensee for continued service. The inspectors verified that the licensee’s removal of the piping flange indications without a weld repair did not impact compliance with ASME Standard B16.5 for flange design and Standard B31.1 for piping design.

- Reactor head vent line indications found during liquid penetrant examinations (WO 01636433–07).

The inspectors reviewed records for the following pressure boundary weld repairs completed for risk-significant systems during the last outage to determine whether the licensee applied the pre-service NDE and acceptance criteria required by the Construction Code, and/or the NRC-approved Code relief request. Additionally, the inspectors reviewed the welding procedure specifications and supporting weld procedure qualification records to determine whether the weld procedures were

qualified in accordance with the requirements of the Construction Code and the ASME Code, Section IX:

- installation of a 2-to-1 fillet weld at socket welds 1 through 23 on the Unit 1 reactor head vent line 1-0215-2"-B (WO No. 01636433-01); and
- high pressure coolant injection piping reroute—weld map #1 fillet welds at socket welds 2, 3, 8, 9, 16, and 17 on line 1-2318-2"-LX (WO No. 1877257-11).

b. Findings

No findings were identified.

.2 Reactor Pressure Vessel Upper Head Penetration Inspection Activities (Not Applicable)

.3 Boric Acid Corrosion Control (Not Applicable)

.4 Steam Generator Tube Inspection Activities (Not Applicable)

.5 Identification and Resolution of Problems

a. Inspection Scope

The inspectors performed a review of ISI-related problems entered into the licensee's CAP, and conducted interviews with licensee staff to determine if:

- the licensee had established an appropriate threshold for identifying ISI-related problems;
- the licensee had performed a root cause (if applicable), and taken appropriate corrective actions; and
- the licensee had evaluated operating experience, and industry generic issues related to ISI and pressure boundary integrity.

The inspectors performed these reviews to evaluate compliance with Title 10, *Code of Federal Regulations* (CFR), Part 50, Appendix B, Criterion XVI, "Corrective Action," requirements. The corrective action documents reviewed by the inspectors are listed in the Attachment to this report.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program (71111.11)

.1 Resident Inspector Quarterly Review of Licensed Operator Requalification (71111.11Q)

a. Inspection Scope

On February 7, 2017, the inspectors observed a crew of licensed operators in the plant's simulator during licensed operator requalification training. The inspectors verified that operator performance was adequate, evaluators were identifying and documenting crew performance problems, and that training was being conducted in accordance with licensee procedures. The inspectors evaluated the following areas:

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

The crew's performance in these areas was compared to pre-established operator action expectations and successful critical task completion requirements. Documents reviewed are listed in the Attachment to this report.

This inspection constituted one quarterly licensed operator requalification program simulator sample as defined in IP 71111.11-05.

b. Findings

No findings were identified.

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

a. Inspection Scope

On March 26, 2017, the inspectors observed control room operators on Unit 1 perform a planned shutdown for refueling outage Q1R24. This was an activity that required heightened awareness and was related to increased risk. The inspectors evaluated the following areas:

- licensed operator performance;
- crew's clarity and formality of communications;
- ability to take timely actions in the conservative direction;
- prioritization, interpretation, and verification of 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 performance in these areas was compared to pre-established operator action expectations, procedural compliance and task completion requirements. Documents reviewed are listed in the Attachment to this report.

This inspection constituted one quarterly licensed operator heightened activity/risk sample as defined in IP 71111.11-05.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

.1 Routine Quarterly Evaluations

a. Inspection Scope

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

- Z6600: emergency diesel generator systems; and
- Z8300: 125 volt direct current (VDC) battery systems.

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 two quarterly maintenance effectiveness samples as defined in IP 71111.12-05.

b. Findings

No findings were identified.

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

.1 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

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

- Work week 17–02–05: Unit 1 RCIC system planned maintenance and online risk change to yellow, 'B' train of control room emergency heating, ventilation, and air conditioning system heat exchanger planned maintenance, 1A core spray pump planned maintenance and Unit 1 online risk change to yellow;
- Emergent work on the Unit 2 3E automatic depressurization system electromatic relief valve light indication on February 3, 2017;
- Work week 17–09–12: Unit 2 125 VDC planned maintenance and both units unplanned online risk change to yellow due to tornado warnings in Rock Island County; and
- Work week 17–13–03: Unit 2 online risk change to yellow and Unit 1 shutdown safety risk yellow during refueling outage Q1R24—Week 1.

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.

Documents reviewed during this inspection are listed in the Attachment to this report. These maintenance risk assessments and emergent work control activities constituted four samples as defined in IP 71111.13–05.

b. Findings

No findings were identified.

1R15 Operability Determinations and Functional Assessments (71111.15)

.1 Operability Evaluations

a. Inspection Scope

The inspectors reviewed the following issues:

- Issue Report (IR) 2709786: DGCWP [diesel generator cooling water pump]/RHRSW Common Suction Piping Degradation;
- IR 3968961: Residual Heat Removal (RHR) Thermal Performance Testing Using Fluke Model 45;
- IR 3967424: Unit 1C RHRSW Pump Abnormal Indications; and
- IR 3971856: 1D RHRSW Trip Fuses Worked Out of Fuse Holder.

The inspectors selected these potential operability issues based on the risk significance of the associated components and systems. The inspectors evaluated the technical adequacy of the evaluations to ensure that TS operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the



appropriate sections of the TS and UFSAR to the licensee's evaluations to determine whether the components or systems were operable. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled. The inspectors determined, where appropriate, compliance with bounding limitations associated with the evaluations. Additionally, the inspectors reviewed a sampling of corrective action documents to verify that the licensee was identifying and correcting any deficiencies associated with operability evaluations. Documents reviewed are listed in the Attachment to this report.

This operability inspection constituted four samples as defined in IP 71111.15–05.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19)

.1 Post-Maintenance Testing

a. Inspection Scope

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

- WO 1961658 for the Unit 1 RCIC system following planned maintenance;
- WO 1846331 for the Unit 2 125 VDC battery system following battery terminal board and potentiometer installation under Engineering Change (EC) 402467; and
- WO 4612395 for the Unit 1 EDG cooling water pump following emergent work and unplanned maintenance.

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

This inspection constituted three PMT samples as defined in IP 71111.19–05.

b. Findings

No findings were identified.

1R20 Outage Activities (71111.20)

.1 Refueling Outage Activities

a. Inspection Scope

The inspectors reviewed the Outage Safety Plan (OSP) and contingency plans for the Unit 1 refueling outage (RFO), that began on March 27, 2017, and continued through the end of this inspection period, to confirm that the licensee had appropriately considered risk, industry experience, and previous site-specific problems in developing and implementing a plan that assured maintenance of defense-in-depth. During the RFO, the inspectors observed portions of the shutdown and cooldown processes and monitored licensee controls over the outage activities listed below:

- licensee configuration management, including maintenance of defense-in-depth commensurate with the OSP for key safety functions and compliance with the applicable TS when taking equipment out of service;
- installation and configuration of reactor coolant pressure, level, and temperature instruments to provide accurate indication, accounting for instrument error;
- controls over the status and configuration of electrical systems to ensure that TS and OSP requirements were met, and controls over switchyard activities;
- monitoring of decay heat removal processes, systems, and components;
- controls to ensure that outage work was not impacting the ability of the operators to operate the spent fuel pool cooling system;
- reactor water inventory controls including flow paths, configurations, and alternative means for inventory addition, and controls to prevent inventory loss;
- controls over activities that could affect reactivity;
- maintenance of secondary containment as required by TS;
- refueling activities; and
- licensee identification and resolution of problems related to RFO activities.

Documents reviewed are listed in the Attachment to this report.

This inspection constituted a partial RFO sample and continued into the next inspection period.

b. Findings

No findings were identified.

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:

- QCIS 1000–09: RHR Pump Discharge Pressure Calibration and Functional Test (Routine);
- QCOS 6600–37(39): Unit 1(2) EDG Largest Load Reject Surveillance (Routine);
- QCOS 6600–44: Unit 1 EDG Timed Start Test (Routine)
- QCOS 1000–43: Unit 2 ‘A’ Loop Low Pressure Coolant Injection (LPCI) and Containment Cooling Modes of RHRs Non-Outage Logic Test (Routine);
- QCOS 1400–16: Unit 1 Division II Core Spray Logic Functional Test (Routine); and
- QCOS 1400–09: Core Spray Pressure Isolation Valve Seat Leakage Test (In-service Test).

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

- did preconditioning occur;
- the effects of the testing were adequately addressed by control room personnel or engineers prior to the commencement of the testing;
- acceptance criteria were clearly stated, demonstrated operational readiness, and were consistent with the system design basis;
- plant equipment calibration was correct, accurate, and properly documented;
- as-left setpoints were within required ranges; and the calibration frequency was in accordance with TSs, the USAR, 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 five routine surveillance testing samples, and one in-service test sample as defined in IP 71111.22, Sections–02 and–05.

b. Findings

No findings were identified.

1EP2 Alert and Notification System Evaluation (71114.02)

.1 Alert and Notification System Evaluation

a. Inspection Scope

The inspectors reviewed documents and held discussions with Emergency Preparedness (EP) staff regarding the operation, maintenance, and periodic testing of the primary and backup Alert and Notification System (ANS) in the plume pathway Emergency Planning Zone. The inspectors reviewed monthly trend reports and siren test failure records from July 2015 to February 2017. Information gathered during document reviews and interviews were used to determine whether the ANS equipment was maintained and tested in accordance with Emergency Plan commitments and procedures. Documents reviewed are listed in the Attachment to this report.

This ANS evaluation inspection constituted one sample as defined in IP 71114.02–06.

b. Findings

No findings were identified.

1EP3 Emergency Response Organization Staffing and Augmentation System (71114.03)

.1 Emergency Response Organization Staffing and Augmentation System

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 staff as well as the provisions for maintaining the plant's ERO team and qualification lists. The inspectors reviewed reports and a sample of CAP records of unannounced off-hour augmentation drills, which were conducted from July 2015 to February 2017, to determine the adequacy of the drill critiques and associated corrective actions. The inspectors also reviewed a sample of the training records of approximately six 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 71114.03–06.

b. Findings

No findings were identified.

1EP5 Maintenance of Emergency Preparedness (71114.05)

.1 Maintenance of Emergency Preparedness

a. Inspection Scope

The inspectors reviewed the nuclear oversight staff's April 2016 audit of the Quad Cities Nuclear Power Station's Emergency Preparedness Program to determine that the independent assessments met the requirements of 10 CFR 50.54(t). The inspectors reviewed samples of CAP records associated with the 2016 biennial exercise, as well as various EP drills conducted in 2016, in order to determine whether the licensee fulfilled drill commitments and to evaluate the licensee's efforts to identify and resolve identified issues. The inspectors reviewed a sample of EP items and corrective actions related to the station's EP program, and activities to determine whether corrective actions were completed in accordance with the site's CAP. Documents reviewed are listed in the Attachment to this report.

This maintenance of EP inspection constituted one sample as defined in IP 71114.05-06.

b. Findings

No findings were identified.

1EP6 Drill Evaluation (71114.06)

.1 Emergency Preparedness Drill Observation

a. Inspection Scope

The inspectors evaluated the conduct of a routine licensee emergency drill on February 15, 2017, 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 and operations 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 EP drill inspection constituted one sample as defined in IP 71114.06-06.

b. Findings

No findings were identified.

## 2. RADIATION SAFETY

### 2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01)

#### .1 Radiological Hazard Assessment (02.02)

##### a. Inspection Scope

The inspectors assessed the licensee's current and historic isotopic mix, including alpha emitters and other hard-to-detect radionuclides. The inspectors evaluated whether survey protocols were reasonable to identify the magnitude and extent of the radiological hazards.

The inspectors determined if there have been changes to plant operations since the last inspection that may have resulted in a significant new radiological hazard for onsite individuals. The inspectors evaluated whether the licensee assessed the potential impact of these changes and implemented periodic monitoring, as appropriate, to detect and quantify the radiological hazard. The inspectors reviewed the last two radiological surveys from selected plant areas and evaluated whether the thoroughness and frequency of the surveys were appropriate for the given radiological hazard.

The inspectors conducted walkdowns of the facility, including radioactive waste processing, storage, and handling areas to evaluate material conditions and performed independent radiation measurements as needed to verify conditions were consistent with documented radiation surveys.

The inspectors assessed the adequacy of pre-work surveys for select radiologically risk-significant work activities.

The inspectors evaluated the radiological survey program to determine if hazards were properly identified. The inspectors discussed procedures, equipment, and performance of surveys with radiation protection staff and assessed whether technicians were knowledgeable about when and how to survey areas for various types of radiological hazards.

The inspectors reviewed work in potential airborne areas to assess whether air samples were being taken appropriately for their intended purpose and reviewed various survey records to assess whether the samples were collected and analyzed appropriately. The inspectors also reviewed the licensee's program for monitoring contamination which has the potential to become airborne.

These inspection activities constituted one complete sample as defined in IP 71124.01-05.

##### b. Findings

No findings were identified.

.2 Instructions to Workers (02.03)

a. Inspection Scope

The inspectors reviewed select radiation work permits used to access high radiation areas and evaluated the specified work control instructions or control barriers. The inspectors also assessed whether workers were made aware of the work instructions and area dose rates.

The inspectors reviewed electronic alarming dosimeter dose and dose rate alarm setpoint methodology. For selected electronic alarming dosimeter occurrences, the inspectors assessed the worker's response to the alarm, the licensee's evaluation of the alarm, and any follow-up investigations.

The inspectors reviewed the licensee's methods for informing workers of changes in plant operations or radiological conditions that could significantly impact their occupational dose.

The inspectors reviewed the labeling of select containers of licensed radioactive material that could cause unplanned or inadvertent exposure to workers.

These inspection activities constituted one complete sample as defined in IP 71124.01-05.

b. Findings

No findings were identified.

.3 Contamination and Radioactive Material Control (02.04)

a. Inspection Scope

The inspectors observed locations where the licensee monitors material leaving the radiologically controlled area and assessed the methods used for control, survey, and release of material from these areas. As available, the inspectors observed health physics personnel surveying and releasing material for unrestricted use.

The inspectors observed workers leaving the radiologically controlled area and assessed their use of tool and personal contamination monitors and reviewed the licensee's criteria for use of the monitors.

The inspectors assessed whether instrumentation was used at its typical sensitivity levels based on appropriate counting parameters or whether the licensee had established a de facto release limit.

The inspectors selected several sealed sources from the licensee's inventory records and assessed whether the sources were accounted for and verified to be intact. The inspectors also evaluated whether any transactions, since the last inspection, involving nationally tracked sources were reported in accordance with 10 CFR 20.2207.

These inspection activities constituted one complete sample as defined in IP 71124.01-05.

b. Findings

No findings were identified.

.4 Radiological Hazards Control and Work Coverage (02.05)

a. Inspection Scope

The inspectors evaluated ambient radiological conditions during tours of the facility. The inspectors assessed whether the conditions were consistent with applicable posted surveys, radiation work permits, and worker briefings.

The inspectors evaluated the adequacy of radiological controls, such as required surveys, radiation protection job coverage, and contamination controls. The inspectors evaluated the licensee's use of electronic alarming dosimeters in high noise areas as high radiation area monitoring devices.

The inspectors assessed whether radiation monitoring devices were placed on the individual's body consistent with licensee procedures. The inspectors assessed whether the dosimeter was placed in the location of highest expected dose or that the licensee properly employed a U.S. Nuclear Regulatory Commission approved method of determining effective dose equivalent.

The inspectors reviewed the application of dosimetry to effectively monitor exposure to personnel in work areas with significant dose rate gradients.

For select airborne area radiation work permits, the inspectors reviewed airborne radioactivity controls and monitoring, the potential for significant airborne levels, containment barrier integrity, and temporary filtered ventilation system operation.

The inspectors examined the licensee's physical and programmatic controls for highly activated or contaminated materials stored within pools and assessed whether appropriate controls were in place to preclude inadvertent removal of these materials from the pool.

These inspection activities constituted one complete sample as defined in IP 71124.01-05.

b. Findings

No findings were identified.

.5 High Radiation Area and Very High Radiation Area Controls (02.06)

a. Inspection Scope

The inspectors observed posting and physical controls for high radiation areas and very high radiation areas to assess adequacy.

The inspectors conducted a selective inspection of posting and physical controls for high radiation areas and very high radiation areas to assess conformance with performance indicators.



The inspectors reviewed procedural changes to assess the adequacy of access controls for high and very high radiation areas to determine whether procedural changes substantially reduced the effectiveness and level of worker protection.

The inspectors assessed the controls the high radiation areas greater than 1 rem/hour and areas with the potential to become high radiation areas greater than 1 rem/hour for compliance with TS and procedures.

The inspectors assessed the controls for very high radiation areas and areas with the potential to become very high radiation areas. The inspectors also assessed whether individuals were unable to gain unauthorized access to these areas.

These inspection activities constituted one complete sample as defined in IP 71124.01–05.

b. Findings

No findings were identified.

.6 Radiation Worker Performance and Radiation Protection Technician Proficiency (02.07)

a. Inspection Scope

The inspectors observed radiation worker performance and assessed their performance with respect to radiation protection work requirements, the level of radiological hazards present and radiation work permit controls.

The inspectors assessed worker awareness of electronic alarming dosimeter set points, stay times or permissible dose for radiologically significant work as well as expected response to alarms.

The inspectors observed radiation protection technician performance and assessed whether the technicians were aware of the radiological conditions and radiation work permit controls and whether their performance was consistent with training and qualifications for the given radiological hazards.

The inspectors observed radiation protection technician performance of radiation surveys and assessed the appropriateness of the instruments being used, including calibration and source checks.

These inspection activities constituted one complete sample as defined in IP 71124.01–05.

b. Findings

No findings were identified.

.7 Problem Identification and Resolution (02.08)

a. Inspection Scope

The inspectors assessed whether problems associated with radiological hazard assessment and exposure controls were being identified at an appropriate threshold and

were properly addressed for resolution. For select problems, the inspectors assessed the appropriateness of the corrective actions. The inspectors also assessed the licensee's program for reviewing and incorporating operating experience.

The inspectors reviewed select problems related to human performance errors and assessed whether there was a similar cause and whether corrective actions taken resolve the problems.

The inspectors reviewed select problems related to radiation protection technician error and assessed whether there was a similar cause and whether corrective actions taken resolve the problems.

These inspection activities constituted one complete sample as defined in IP 71124.01–05.

b. Findings

No findings were identified.

2RS2 Occupational As-Low-As-Reasonably-Achievable Planning and Controls (71124.02)

.1 Implementation of As-Low-As-Reasonably-Achievable and Radiological Work Controls (02.04)

a. Inspection Scope

The inspectors conducted observations of in-plant work activities and assessed whether the licensee had effectively integrated the planned administrative, operational, and engineering controls into the actual field work to maintain occupational exposure As-Low-As-Reasonably-Achievable (ALARA). The inspectors observed pre-job briefings and determined if the planned controls were discussed with workers. The inspectors evaluated the placement and use of shielding, contamination controls, airborne controls, radiation work permit controls and other engineering work controls against the ALARA plans.

These inspection activities supplemented those documented in NRC Integrated Inspection Report 05000254/2016002 and 05000265/2016002 and constituted a partial sample as defined in IP 71124.02–05.

b. Findings

No findings were identified.

.2 Radiation Worker Performance (02.05)

a. Inspection Scope

The inspectors observed radiation worker and radiation protection technician performance during work activities being performed in radiation areas, airborne radioactivity areas, or high radiation areas to assess whether workers demonstrated the ALARA philosophy in practice and followed procedures. The inspectors observed radiation worker performance to evaluate whether the training and skill level was sufficient with respect to the radiological hazards and the work involved.

The inspectors interviewed individuals from selected work groups to assess their knowledge and awareness of planned and/or implemented radiological and ALARA work controls.

These inspection activities supplemented those documented in NRC Integrated Inspection Report 05000254/2016002 and 05000265/2016002 and constituted a partial complete sample as defined in IP 71124.02–05.

b. Findings

No findings were identified.

2RS3 In-Plant Airborne Radioactivity Control and Mitigation (71124.03)

.1 Engineering Controls (02.02)

a. Inspection Scope

The inspectors reviewed procedural guidance for use of ventilation systems and assessed whether the systems were used, to the extent practicable, during high-risk activities to control airborne radioactivity and minimize the use of respiratory protection. The inspectors assessed whether installed ventilation airflow capacity, flow path, and filter/charcoal unit efficiencies for selected systems were consistent with maintaining concentrations of airborne radioactivity in work areas below the concentrations of an airborne area to the extent practicable. The inspectors also evaluated whether selected temporary ventilation systems used to support work in contaminated areas were consistent with licensee procedural guidance and ALARA.

These inspection activities supplemented those documented in NRC Integrated Inspection Report 05000254/2016002 and 05000265/2016002 and constituted one complete sample as defined in IP 71124.03–05.

b. Findings

No findings were identified.

.2 Use of Respiratory Protection Devices (02.03)

a. Inspection Scope

The inspectors reviewed records of air testing for supplied-air devices and self-contained breathing apparatus (SCBA) bottles to assess whether the air used met or exceeded Grade D quality. The inspectors evaluated whether plant breathing air supply systems satisfied the minimum pressure and airflow requirements for the devices.

The inspectors reviewed training curricula for use of respiratory protection devices to assess whether individuals are adequately trained on donning, doffing, function checks, and how to respond to a malfunction.

The inspectors observed the physical condition of respiratory protection devices ready for issuance and reviewed records of routine inspection for selected devices. The inspectors reviewed records of maintenance on the vital components for selected devices and assessed whether onsite personnel assigned to repair vital components received vendor-provided training.

These inspection activities supplemented those documented in NRC Integrated Inspection Report 05000254/2016002 and 05000265/2016002 and constituted one complete sample as defined in IP 71124.03–05.

b. Findings

No findings were identified.

.3 Self-Contained Breathing Apparatus for Emergency Use (02.04)

a. Inspection Scope

The inspectors reviewed the status and surveillance records for select SCBAs. The inspectors evaluated the licensee's capability for refilling and transporting SCBA air bottles to and from the control room and operations support center during emergency conditions.

The inspectors assessed whether control room operators and other emergency response and radiation protection personnel were trained and qualified in the use of SCBAs and evaluated whether personnel assigned to refill bottles were trained and qualified for that task.

The inspectors assessed whether appropriate mask sizes and types were available for use. The inspectors evaluated whether on-shift operators had no facial hair that would interfere with the sealing of the mask and that appropriate vision correction was available.

The inspectors reviewed the past two years of maintenance records for selected in service SCBA units used to support operator activities during accident conditions. The inspectors assessed whether maintenance or repairs on an SCBA unit's vital components were performed by an individual certified by the manufacturer of the device to perform the work. The inspectors evaluated the onsite maintenance procedures governing vital component work to determine whether there was any inconsistencies with the SCBA manufacturer's recommended practices. The inspectors evaluated whether SCBA cylinders satisfied the hydrostatic testing required by the U.S. Department of Transportation.

These inspection activities constituted one complete sample as defined in IP 71124.03–05.

b. Findings

No findings were identified.

.4 Problem Identification and Resolution (02.05)

a. Inspection Scope

The inspectors assessed whether problems associated with the control and mitigation of in-plant airborne radioactivity were being identified by the licensee at an appropriate threshold and were properly addressed for resolution. Additionally, the inspectors evaluated the appropriateness of the corrective actions for selected problems involving airborne radioactivity documented by the licensee.

These inspection activities constituted one complete sample as defined in IP 71124.03–05.

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (71124.04)

.1 External Dosimetry (02.03)

a. Inspection Scope

The inspectors evaluated the calibration of active dosimeters. The inspectors assessed the bias of the active dosimeters compared to passive dosimeters and the correction factor used. The inspectors also assessed the licensee's program for comparing active and passive dosimeter results, investigations for substantial differences, and recording of dose. The inspectors assessed whether there were adverse trends for active dosimeters.

These inspection activities supplemented those documented in NRC Integrated Inspection Report 05000254/2016003 and 05000265/2016003 and constituted one complete sample as defined in IP 71124.04–05.

b. Findings

No findings were identified.

.2 Internal Dosimetry (02.04)

a. Inspection Scope

The inspectors reviewed procedures used to determine internal dose using in vitro analysis to assess the adequacy of sample collection, determination of entry route and assignment of dose.

The inspectors reviewed the licensee's program for dose assessment based on air sampling, as applicable, and calculations of derived air concentration. The inspectors determined whether flow rates and collection times for air sampling equipment were adequate to allow lower limits of detection to be obtained. The inspectors also reviewed the adequacy of procedural guidance to assess internal dose if respiratory protection was used.

These inspection supplemented those documented in NRC Integrated Inspection Report 05000254/2016003 and 05000265/2016003 and constituted one complete sample as defined in IP 71124.04–05.

b. Findings

No findings were identified.

.3 Special Dosimetric Situations (02.05)

a. Inspection Scope

The inspectors assessed whether the licensee informs workers of the risks of radiation exposure to the embryo/fetus, the regulatory aspects of declaring a pregnancy, and the specific process to be used for declaring a pregnancy. The inspectors selected individuals who had declared pregnancy during the current assessment period and evaluated whether the monitoring program for declared pregnant workers was technically adequate to assess the dose to the embryo/fetus. The inspectors assessed results and/or monitoring controls for compliance with regulatory requirements.

The inspectors reviewed the licensee's methodology for monitoring external dose in nonuniform radiation fields or where large dose gradients exist. The inspectors evaluated the licensee's criteria for determining when alternate monitoring was to be implemented. The inspectors reviewed dose assessments performed using multibadging to evaluate whether the assessment was performed consistently with licensee procedures and dosimetric standards.

The inspectors evaluated the licensee's methods for calculating shallow dose equivalent from distributed skin contamination or discrete radioactive particles.

The inspectors evaluated the licensee's program for neutron dosimetry, including dosimeter types and/or survey instrumentation. The inspectors reviewed select neutron exposure situations and assessed whether dosimetry and/or instrumentation was appropriate for the expected neutron spectra, there was sufficient sensitivity, and neutron dosimetry was properly calibrated. The inspectors also assessed whether interference by gamma radiation had been accounted for in the calibration and whether time and motion evaluations were representative of actual neutron exposure events.

For the special dosimetric situations reviewed in this section, the inspectors assessed how the licensee assigned dose of record. This included an assessment of external and internal monitoring results, supplementary information on individual exposures, and radiation surveys and/or air monitoring results when dosimetry was based on these techniques.

These inspection activities constituted one complete sample as defined in IP 71124.04–05.

b. Findings

No findings were identified.

.4 Problem Identification and Resolution (02.06)

a. Inspection Scope

The inspectors assessed whether problems associated with occupational dose assessment were being identified by the licensee at an appropriate threshold and were properly addressed for resolution. The inspectors assessed the appropriateness of the corrective actions for a selected sample of problems documented by the licensee involving occupational dose assessment.

These inspection constituted one complete sample as defined in IP 71124.04–05.

b. Findings

No findings were identified.

4. **OTHER ACTIVITIES**

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

4OA1 Performance Indicator 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 performance indicator (PI) for Quad Cities Nuclear Power Station, Units 1 and 2, for the period from the first quarter 2016 through the fourth quarter 2016. 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 7, dated August 31, 2013, were used. The inspectors reviewed the licensee’s operator narrative logs, IRs, event reports, and NRC integrated inspection reports for the period of January 1, 2016, through December 31, 2016, to validate the accuracy of the submittals. The inspectors also reviewed the licensee’s IR database to determine if any problems had been identified with the PI data collected or transmitted for this indicator, and none were identified. Documents reviewed are listed in the Attachment to this report.

This inspection constituted two unplanned scrams per 7000 critical hours samples as defined in IP 71151–05.

b. Findings

No findings were identified.

## .2 Unplanned Scrams with Complications

### a. Inspection Scope

The inspectors sampled licensee submittals for the Unplanned Scrams with Complications PI for Quad Cities Nuclear Power Station, Units 1 and 2, for the period from the first quarter 2016 through the fourth quarter 2016. 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 7, dated August 31, 2013, were used. The inspectors reviewed the licensee's operator narrative logs, IRs, event reports, and NRC integrated inspection reports for the period of January 1, 2016 through December 31, 2016, to validate the accuracy of the submittals. The inspectors also reviewed the licensee's IR database to determine if any problems had been identified with the PI data collected or transmitted for this indicator, and none were identified. Documents reviewed are listed in the Attachment to this report.

This inspection constituted two unplanned scrams with complications samples as defined in IP 71151-05.

### b. Findings

No findings were identified.

## .3 Unplanned Power Changes per 7000 Critical Hours

### a. Inspection Scope

The inspectors sampled licensee submittals for the Unplanned Transients per 7000 Critical Hours PI for Quad Cities Nuclear Power Station, Units 1 and 2, for the period from the first quarter 2016 through the fourth quarter 2016. 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 7, dated August 31, 2013, were used. The inspectors reviewed the licensee's operator narrative logs, IRs, maintenance rule records, event reports, and NRC integrated inspection reports for the period of January 1, 2016 through December 31, 2016 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. Documents reviewed are listed in the Attachment to this report.

This inspection constituted two unplanned transients per 7000 critical hours samples as defined in IP 71151-05.

### b. Findings

No findings were identified.



.4 Drill and Exercise Performance

a. Inspection Scope

The inspectors sampled licensee submittals for the Drill and Exercise Performance (DEP) Indicator for the fourth quarter 2016. To determine the accuracy of the PI data reported during that period, PI definitions and guidance contained in the NEI Document 99-02, "Regulatory Assessment PI Guideline," Revision 7, 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 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 2016 biennial exercise; and performance during other drills. Documents reviewed are listed in the Attachment to this report.

This inspection constitutes one DEP sample as defined in IP 71151-05.

b. Findings

No findings were identified.

.5 Emergency Response Organization Drill Participation

a. Inspection Scope

The inspectors sampled licensee submittals for the ERO Drill Participation PI for the fourth quarter of 2016. To determine the accuracy of the PI data reported during that period, PI definitions and guidance contained in NEI Document 99-02, "Regulatory Assessment PI Guideline," Revision 7, 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 NEI guidance. Specifically, the inspectors reviewed licensee records and processes, including procedural guidance on assessing opportunities for the PI; participation during the 2016 biennial exercise and other drills; and revisions of the roster of personnel assigned to key ERO positions. Documents reviewed are listed in the Attachment to this report.

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

b. Findings

No findings were identified.

.6 Alert and Notification System Reliability

a. Inspection Scope

The inspectors sampled licensee submittals for the ANS PI for the fourth quarter of 2016. To determine the accuracy of the PI data reported during that period, PI definitions and guidance contained in NEI Document 99-02, "Regulatory Assessment PI Guideline," Revision 7, 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 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. Documents reviewed are listed in the Attachment to this report.

This inspection constitutes one ANS sample as defined in IP 71151-05.

b. Findings

No findings were identified.

4OA2 Identification and Resolution of Problems (71152)

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

a. Inspection Scope

As discussed in previous sections of this report, the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify they were being entered into the licensee's CAP at an appropriate threshold, adequate attention was being given to timely corrective actions, and adverse trends were identified and addressed. Some minor issues were entered into the licensee's CAP as a result of the inspectors' observations; however, they are not discussed in this report.

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

b. Findings

No findings were identified.

.2 Annual Follow-up of Selected Issues

a. Inspection Scope

The inspectors selected the following issues and condition reports for in-depth review:

- IR 3967424, "Unit 1C RHRSW Pump Abnormal Indications;"
- Aggregate review of operator burdens; and
- IR 3985153, "Core Spray Keep Fill Valve 1-1402-64B, Stuck."

As appropriate, the inspectors verified the following attributes during their review of the licensee's corrective actions for the above condition reports and other related condition reports:

- complete and accurate identification of the problem in a timely manner commensurate with its safety significance and ease of discovery;
- consideration of the extent of condition, generic implications, common cause, and previous occurrences;
- evaluation and disposition of operability/functionality/reportability issues;

- classification and prioritization of the resolution of the problem commensurate with safety significance;
- identification of the root and contributing causes of the problem; and
- identification of corrective actions, which were appropriately focused to correct the problem;
- completion of corrective actions in a timely manner commensurate with the safety significance of the issue;
- effectiveness of corrective actions taken to preclude repetition;
- evaluate applicability for operating experience and communicate applicable lessons learned to appropriate organizations.

The inspectors discussed the corrective actions and associated evaluations with licensee personnel.

This review constituted three in-depth problem identification and resolution inspection samples as defined in IP 71152.

b. Findings

(1) Failure to Ensure Hardware Secure for Breaker Mechanism Operated Contact Switch Linkage

Introduction: A finding of very low safety significance and an associated NCV of 10 CFR 50, Appendix B, Criterion V, was self-revealed on January 27, 2017, when the Unit 1C RHRSW pump was started for a routine surveillance evolution and all expected annunciators and equipment failed to operate properly. This led to the licensee declaring the Unit 1C RHRSW pump inoperable. Specifically, the licensee failed to establish a procedure for the mechanism operated contact (MOC) switch linkage arm that was appropriate to the circumstances (i.e. ensure the component would continue to perform its function).

Description: On January 27, 2017, the licensee started the Unit 1C RHRSW pump to support a RHR pump surveillance. Upon starting the pump, the control room received an RHRSW pump trip alarm. Equipment operators in the field reported that the 1C RHRSW pump was running; however, room cooler fans for the pump were not operating and the breaker light indication for the pump at Bus 14 was not lit. The licensee then verified the breakers for the pump room cooler fans were closed. Consequently, the licensee secured the RHR and RHRSW pumps, declared the Unit 1C RHRSW pump inoperable, and began troubleshooting the issue.

The licensee's troubleshooting revealed that the linkage for the Unit 1C RHRSW pump breaker MOC switch had become disconnected. This prevented the MOC switch, which controls other component functions (e.g. alarms and room cooler fan operation) through the use of auxiliary contacts, from functioning as expected.

The licensee's equipment CAP evaluation identified that the licensee's procedure for periodic inspection of the breaker cubicle lacked specific guidance to ensure the MOC switch linkage assembly hardware was adequately fastened. Specifically, the licensee's procedures for performing maintenance and inspections of 4 kilo-volt (kV) breakers lacked appropriate acceptance criteria or instructions that would ensure the linkage arm for the MOC switch would not come loose during repeated breaker cycling. The

procedure, QCEPM 0200–11, “Inspection and Maintenance of Horizontal 4kV Cubicles,” Section 4.5.9.1, directed the user to “Verify MOC switch linkage hardware is in place and tight.” The procedure did not specify a method for ensuring the hardware was tight. The licensee implemented corrective actions to establish appropriate instructions (i.e. mechanically verify tightness by using a tool, etc.) to ensure the MOC switch linkage would remain properly secured.

Analysis: The inspectors determined that the licensee’s failure to establish a procedure for the MOC switch linkage arm that was appropriate to the circumstances (i.e. ensure the component would continue to perform its function) was contrary to 10 CFR 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” and was a performance deficiency.

The performance deficiency was determined to be more than minor because the finding was associated with the Mitigating Systems cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to ensure the MOC switch linkage arm was adequately fastened led to the failure of the component and its associated 1C RHRSW pump during breaker operation on January 27, 2017.

Using Inspection Manual Chapter (IMC) 0609, Attachment 4, “Initial Characterization of Findings,” and IMC 0609, Appendix A, “The Significance Determination Process for Findings at Power,” issued June 19, 2012, the finding was screened against the Mitigating Systems cornerstone and determined to be of very low safety significance (Green), because the inspectors answered “No” to all of the questions in Exhibit 2, “Mitigating Systems Screening Questions,” Section A, “Mitigating SSCs and Functionality.”

The inspectors determined this finding affected the cross-cutting area of human performance, in the aspect of avoid complacency, which states, “Individuals recognize and plan for the possibility of mistakes, latent issues, and inherent risk, even while expecting successful outcomes.” Specifically, the licensee failed to recognize a potential risk and inherent latent issue for a condition identified in 2015 at Quad Cities, when a MOC switch failed to perform its function due to a missing nut in a different breaker’s linkage assembly. The licensee identified and corrected the condition, but failed to evaluate the cause of the missing nut because it did not impact the operability of the component. In the 2015 instance, the MOC switch issue only affected indications for the component and had no adverse impact on the ability of the component to perform its function [H.12].

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” requires, in part, that activities affecting quality be prescribed by documented procedures of a type appropriate to the circumstances and be accomplished in accordance with these procedures. The licensee established QCEPM 0200–11, “Inspection and Maintenance of Horizontal 4kV Cubicles,” Revision 37, as the implementing procedure for performing inspections and maintenance on 4kV safety-related breaker cubicles, an activity affecting quality.

Contrary to the above, prior to January 27, 2017, licensee procedure QCEPM 0200–11 failed to be of a type appropriate to the circumstances. Specifically, procedure

QCEPM 0200–11 did not contain instruction to ensure that the MOC switch linkage arm was adequately fastened and would continue to perform its function. On January 27, 2017, during operation of the 1C RHRSW pump breaker, the MOC switch linkage arm became disconnected, preventing the MOC switch from performing its function, and led the licensee to declare the 1C RHRSW pump inoperable.

The licensee’s corrective actions included reconnecting the MOC switch linkage arm assembly and testing it by starting the 1C RHRSW pump prior to declaring the pump operable. In addition, the licensee planned procedure revisions to QCEPM 0200–11 that would specify a torque value to ensure the MOC switch linkage arm was adequately secured and could perform its function. Because the violation was of very low safety significance and was entered into the licensee’s CAP as IR 3967424, this violation is being treated as a NCV, consistent with Section 2.3.2 of the Enforcement Policy. **(NCV 05000254/2017001–01; 05000265/2017001–01; Failure to Ensure Hardware Secure for Breaker MOC Switch Linkage)**

40A3 Follow-Up of Events and Notices of Enforcement Discretion (71153)

.1 Unit 2 Alert Declared Following a Fire that Caused Damage to ‘E’ Automatic Depressurization System Indication and Control Circuitry

a. Inspection Scope

The inspectors reviewed the plant’s response to a small fire in the Unit 2 control room panel that caused damage to the ‘E’ automatic depressurization system (ADS) electromatic relief valve (ERV) indication and control circuitry.

At approximately 7:29 p.m. on February 1, 2017, a reactor operator was changing the closed-light indication light bulb on Unit 2 ‘E’ ADS valve, 2–0203–3E. After inserting the new bulb with a bulb tool (a rubber sleeve that holds the small bulb), the operator noticed sparking, and attempted to remove the bulb. When he removed the light, the bulb had separated from the base, leaving the base in the light socket. The reactor operator noticed arcing continued and went to the back of the control panel and identified a flame in the underside of the panel. Another operator in the control room retrieved a fire extinguisher and discharged a short burst to extinguish the flame, the flame was out at 7:32 p.m. No equipment operated and no annunciators were received.

The Unit 2 supervisor declared the ‘E’ ADS valve inoperable and the licensee entered Limiting Conditions for Operation (LCOs) 3.4.3, “RCS Safety and Relief Valves,” Condition A, for one relief valve inoperable and LCO 3.5.1, “ECCS [Emergency Core Cooling Systems]—Operating,” Condition H, for one ADS valve inoperable. The licensee subsequently declared an ALERT at 7:38 p.m. for Emergency Action Level MA5, “Hazardous event affecting a SAFETY SYSTEM required for the current operating mode.” Specifically, the Emergency Action Level conditions present were: a “FIRE AND the event caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure required by TS for the current operating mode.”

Following visual inspections of the control panel and verifications that there were no other equipment issues impacting plant operations, the licensee terminated from the event at 11:36 p.m on February 1, 2017.

Licensee corrective actions included replacing the light sockets and wiring for the open and closed indications for the 'E' ADS valve, in addition to replacing the fuses for both the normal and alternate power supplies for the control circuitry. The licensee declared the 'E' ADS valve operable on February 2, 2017. Both units remained at full power throughout the event.

The licensee entered this issue into their CAP as IR 3969324, "Light Socket for 2-203-3E Damaged during Bulb Change," and their root cause evaluation was in-progress at the end of this inspection period. This event follow-up review, including inspection of the licensee's evaluation of the event and planned corrective actions was in-progress at the end of this inspection period and continued into the next inspection period.

Documents reviewed are listed in the Attachment to this report.

This event follow-up review constituted a partial sample and continued into the next inspection period.

b. Findings

No findings were identified.

.2 (Closed) Licensee Event Report 05000254/2017-001-00: Secondary Containment Interlock Doors Opened Simultaneously

On January 24, 2017, the licensee identified that both doors in the secondary containment interlock on the 595' elevation between the reactor building and the Unit 2 reactor feed pump room were opened simultaneously for approximately 3 seconds. This resulted in the licensee making an unplanned entry into LCO 3.6.4.1, Condition A, for an inoperable secondary containment. The licensee immediately closed the interlock doors to reestablish secondary containment and administratively controlled personnel entry and egress through the doors thereafter. The inspectors determined this issue was minor because secondary containment pressure remained negative throughout the condition, although the event resulted in an unplanned entry into the licensee's TS. The cause of the event was a dirty contact that caused the interlock relay to stick. Corrective actions taken by the licensee included inspecting and cleaning of the interlock relay contacts.

The inspectors reviewed the licensee event report (LER). No findings or violations of NRC requirements were identified. This LER is closed.

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

4OA5 Other Activities

.1 (Closed) NRC Temporary Instruction 2515/192, "Inspection of the Licensee's Interim Compensatory Measures Associated with the Open Phase Condition Design Vulnerabilities in Electric Power Systems"

a. Inspection Scope

The objective of this performance based Temporary Instruction is to verify implementation of interim compensatory measures associated with an open phase

condition (OPC) design vulnerability in electric power system for operating reactors. The inspectors conducted an inspection to determine if the licensee had implemented the following interim compensatory measures. These compensatory measures are to remain in place until permanent automatic detection and protection schemes are installed and declared operable for OPC design vulnerability. The inspectors verified the following:

- The licensee had identified and discussed with plant staff the lessons-learned from the OPC events at the US operating plants, including the Byron station OPC event and its consequences. This included conducting operator training for promptly diagnosing, recognizing consequences, and responding to an OPC event.
- The licensee had updated plant operating procedures to help operators promptly diagnose and respond to OPC events on off-site power sources credited for safe shutdown of the plant.
- The licensee had established and continues to implement periodic walkdown activities to inspect switchyard equipment such as insulators, disconnect switches, and transmission line and transformer connections associated with the offsite power circuits to detect a visible OPC.
- The licensee had ensured that routine maintenance and testing activities on switchyard components have been implemented and maintained. As a part of the maintenance and testing activities, the licensee assessed and managed plant risk in accordance with 10 CFR 50.65(a)(4) requirements.

a. Findings and Observations

No findings of significance were identified. The inspectors verified the criteria were met.

.2 (Closed) Unresolved Item 05000254/2013003-02; 05000265/2013003-02: Question Concerning Licensing Bases of the Ultimate Heat Sink

a. Inspection Scope

During the 2013 Triennial Heat Sink Inspection, the inspectors identified an unresolved item (URI) concerning the current licensing bases with respect to failure of Lock and Dam No. 14 on the Mississippi River. Specifically, the inspectors were concerned that the licensee had revised its licensing basis as a result of a 1998 UFSAR change without NRC approval. The licensee's historical documents stated the loss of river event was from a loss of Dam No. 14, whereas the current UFSAR discusses the loss of river event as damage to the lock. However, there was no discussion in the historical documents as to what caused Dam No. 14 failure or the extent of the failure. Although both causes result in the river being disconnected from the plant, there would be a significant time difference as to how long it would be before the river was no longer available to cool plant equipment and the amount of time available for the plant staff to identify and take appropriate actions to address the failure at the dam.

The licensee revised the UFSAR to clarify the loss of river event based on the Ashton Study, "Study of Mississippi River Water Stage at Quad Cities Nuclear Power Plant," dated April 24, 1998, which was performed to resolve a previous NRC URI with the loss of dam event. This issue concerned the effects of the ultimate heat sink (UHS) temperature being above the design temperature limit for several plant components

cooled by the service water systems. This issue was documented in NRC Inspection Report 05000254/1998201; 05000265/1998201 (ML9805180380) and subsequently closed in NRC Inspection Report 05000254/1998019; 05000265/1998019 (ML9812290041). The closure of the 1998 URI was based on the results of the Ashton study, which concluded that the most likely failure of the dam was a navigation event that would result in the loss of the dam lock. The study concluded that it would take 48 hours for the river level to lower to the point it disconnected from the UHS. In addition, the study concluded based on the assumed low seismic region where the dam was located, a seismic event would not cause a failure of the dam, but result in the inability to operate the dam's rolling and miter gates. In addition, subsequent to the UFSAR change, the NRC granted Quad Cities an amendment for an extended power uprate, dated December 21, 2001. The Safety Evaluation Report associated with this amendment (ML013540222) discussed the loss of dam event using the clarified UFSAR wording of the lock failure as a basis for its approval.

Based on the review of historical records and discussions with the Office of Nuclear Reactor Regulation, the inspectors did not identify a concern with the current licensing basis with respect to the failure of Mississippi River Lock and Dam No. 14. As a result, this URI is closed.

b. Findings

No findings were identified.

.3 (Closed) Unresolved Item 05000254/2013003-04; 05000265/2013003-04: Question Concerning Availability of Dam Following a Seismic Event

a. Inspection Scope

During the 2013 Triennial Heat Sink Inspection, the inspectors identified a URI concerning the assumed availability of Mississippi River Lock and Dam No.14 following a design bases earthquake event. Discussion in the UFSAR implied the river was considered available during a Design Basis Event (DBE) even though the downstream dam was not designed or constructed to remain functional during the assumed DBE. Although the site appeared to be within their licensing bases (assume availability of the river during a DBE), the inspectors questioned whether this assumption considered actual potential consequences, i.e., the need to assume a loss of dam during a seismic event.

The NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design-Basis External Events," dated March 12, 2012, which is being addressed by licensees based on the guidance of NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." Per Section 5 of the guidance document, the licensee was to address impact on the availability of the UHS that relies on a non-seismically robust downstream dam to contain water used as the source of water for the UHS. The licensee submitted their response in a letter, "Overall Integrated Plan in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated February 28, 2013. The NRC reviewed the licensee plan and issued "Quad Cities Nuclear Power Station, Units 1 and 2—Interim Staff Evaluation Relating to Overall



Integrated Plan in Response to Order EA–12–049 (Mitigation Strategies),” dated November 22, 2013. The evaluation stated the integrated plan to address the order did not provide sufficient information to evaluate conformance with NEI 12–06, Consideration 3. As a result, the NRC established Open Item 3.1.1.2.B for licensees to assess a postulated downstream dam failure from a seismic event. In a letter, “Fifth Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design-Basis External Events (Order Number EA–12–049),” dated August 28, 2015, the licensee documented its proposed actions to address this scenario from a FLEX standpoint. This included designing and installing a single deep well as a seismically qualified source of water for the FLEX mitigation strategy. This single deep well would be fully capable of supplying both Unit 1 and Unit 2 FLEX requirements simultaneously. The alternate approach discussed in the letter consisted of a FLEX pump and portable submersible pump that would take suction from the discharge canal. The discharge canal would supply the necessary backup water supply. Although the discharge canal has not been seismically evaluated, there is reasonable assurance that this water supply will remain available as a source of water following a seismic event effecting the downstream dam due to the size of the two diffuser pipes which connect to the main channel of the Mississippi River.

These actions will be reviewed by the NRC in a safety evaluation to assess the licensee’s response to the order. Since this URI is being addressed by NRC Order EA–12–049, this URI is closed.

b. Findings

No findings were identified.

4OA6 Management Meetings

.1 Exit Meeting Summary

On April 11, 2017, the inspectors presented the inspection results to Mr. S. Darin, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

.2 Interim Exit Meetings

Interim exits were conducted for:

- The results of the ultimate heat sink URI inspection was conducted by phone with Mr. T. Petersen, Regulatory Assurance Lead, on February 27, 2017.
- The results of the Emergency Preparedness Program inspection were presented to Mr. K. Ohr, Plant Manager, on March 9, 2017.
- The results of the Radiation Safety Program review were presented to Mr. S. Darin, Site Vice President, on March 31, 2017.
- The results of the ISI inspection were presented to Mr. S. Darin, Site Vice President, and other members of the licensee staff on March 31, 2017.

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

ATTACHMENT: SUPPLEMENTAL INFORMATION

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### Licensee

S. Darin, Site Vice President  
W. Beck, Regulatory Assurance Manager  
J. Bries, Operations Support and Services Senior Manager  
J. Colgan, Chemistry Supervisor  
D. Collins, Radiation Protection Manager  
R. Craddick, Performance Improvement Manager  
H. Dodd, Operations Director  
G. Harris, Fleet Assessment  
R. Hight, Maintenance Director  
D. Luebbe, Work Control Manager  
T. Petersen, Regulatory Assurance Lead  
R. Sieprawski, Training Support Manager  
T. Wojcik, Engineering Manager

#### U.S. Nuclear Regulatory Commission

K. Stoedter, Chief, Reactor Projects Branch 1  
R. Murray, Senior Resident Inspector  
K. Carrington, Resident Inspector

#### Illinois Emergency Management Agency

C. Mathews, IEMA  
C. Settles, IEMA

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

05000254/2017001-01; 05000265/2017001-01	NCV	Failure to Ensure Hardware Secure for Breaker MOC Switch Linkage (Section 4OA2.3)
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### Closed

05000254/2017001-01; 05000265/2017001-01	NCV	Failure to Ensure Hardware Secure for Breaker MOC Switch Linkage (Section 4OA2.3)
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05000254/2017001-00	LER	Secondary Containment Interlock Doors Opened Simultaneously (Section 4OA3.2)
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2515/192	TI	Inspection of the Licensee Interim Compensatory Measures Associated with the Open Phase Condition Design Vulnerabilities in Electric Power Systems (Section 4OA5.1)
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05000254/2013003-02; 05000265/2013003-02	URI	Question Concerning Licensing Bases of the Ultimate Heat Sink (Section 4OA5.2)
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05000254/2013003-04; 05000264/2013003-04	URI	Question Concerning Availability of Dam Following a Seismic Event (Section 4OA5.3)
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### Discussed

None.

## LIST OF DOCUMENTS REVIEWED

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

<u>Section Number</u>	<u>Document Number</u>	<u>Description or Title</u>	<u>Revision or Date</u>
<b>Section 1R01</b>			
1R01		WC-A-107: Seasonal Readiness—Revision 18 Summary of Changes	
1R01		2016 Site Winter Readiness Challenge Meeting	
1R01	SVP 16-072	2016-2017 Quad Cities Certification Letter for Winter Readiness	11/18/2016
1R01	WC-AA-107	Seasonal Readiness	17
<b>Section 1R04</b>			
1R04	QCOP 6600-23	Unit 1 Diesel Generator Preparation for Standby Operation	2
1R04	QCOP 6600-24	Unit 2 Diesel Generator Preparation for Standby Operation	2
1R04	QOM 2-1300-01	RCIC Valves on Rack 2202-58 Checklist (RCIC Room)	4
1R04	QOM 2-1300-02	Unit 2 RCIC Valve Checklist	11
1R04	GEK-9597	Chapter 27	
1R04	QOM 2-6900-12	250 Vdc Reactor Building MCC 2B Breaker Checklist	7
1R04	QCOS 1000-26	RHR Valve Position Verification	23
1R04	QCOP 1900-23	Unit 1 Fuel Pool Cooling System Startup and Shutdown	13
<b>Section 1R05</b>			
1R05	FZ 11.2.1	Quad Cites Generating Station Pre-Fire Plan: Unit 1 RB 554'-0" Elev. SW Corner Room—1B Core Spray	July 2009
1R05		Fire Hazards Analysis Methodology and Assumptions	Revision 21
1R05	FZ 8.2.6.B	Unit 1 Turbine Bldg, El. 595'-0" L.P. Heater Bay	October 2013
1R05	FZ 8.2.7.B	Unit 1 Turbine Bldg. El. 615'-6" LP Heater Bay (East)/D Heater Bay	October 2013
1R05	FZ 8.2.7.C	Unit ½ Turbine Bldg Mezzanine Floor	
<b>Section 1R06</b>			
1R06	IR 2207744	Pan 125 1D RHRSW Vault Penetration LLRT Exceeds 50 SCFH	09/11/2014
1R06	IR 2386350	High Leakage Rate on 2D RHRSW Vault Penetration	09/25/2014
1R06	IR 2386366	High Leakage Rate on 2D RHRSW Vault Penetration	09/25/2014
1R06	IR 2711786	Water in Cable Vaults	09/02/2016

1R06	IR 3943664	MK-504 1D RHRSW Vault Penetration Exceeds 50 SCFH	11/21/2016
1R06	IR 3953663	MK-478 1D RHRSW Vault Penetration Exceeds 50 SCFH	11/21/2016
1R06	IR 3974107	NRC ID: Corroded Piping Penetration	02/14/2017
1R06	IR 3974108	NRC ID: Mounting Plate Corroded	02/14/2017
1R06	IR 3974132	NRC ID: 2D RHR SW Pump Oil Bubbler Darker Than Others	02/14/2017
1R06	IR 3974143	NRC ID: 1B/C RHRSW Vault Door Seal Worn	02/14/2017
1R06	Drawing FL-1	Flood Barriers Basement Floor	D
1R06	QCOS 0100-01	Unit 1 RHR Service Water Vault Flood Seal Leakage Testing	1
1R06	QCOS 0100-02	Unit 2 RHR Service Water Vault Flood Seal Leakage Testing	1
1R06	QCTP 0130-14	Evaluation of RHRSW Vault Flood Protection Leakage Test Results	
1R06	QCTP 0130-14, Attachment A	1A RHRSW Vault—Evaluation for Condensate Pump Room	08/07/2015
1R06	QCTP 0130-14, Attachment B	1B/C RHRSW Vault—Evaluation for Condensate Pump Room Flood	06/06/2016
1R06	QCTP 0130-14, Attachment D	Evaluation of Flood Barriers Between 1A and 1B/C RHRSW Vaults	08/07/2015
1R06	QCOS 0100-01, Attachment E	1D and 1B/C RHR Service Water Vault Wall	11/18/2016
1R06	QCOS 0100-01, Attachment C	1D RHR Service Water Vault Condensate Pump Room Wall	11/18/2016
1R06	QCTP 0130-14, Attachment F	2A RHRSW Vault—Evaluation for Condensate Pump Room Flood	06/08/2016
1R06	QCOS 0100-02, Attachment B	2B/C RHR Service Water Vault Condensate Pump Room Wall	09/24/2016
1R06	QCOS 0100-02, Attachment I	Evaluation of Flood Barriers Between 2A and 2B/C RHRSW Vaults	06/07/2016
1R06	QCOS 0100-02, Attachment E	2D and 2B/C RHR Service Water Vault Wall	11/18/2016
1R06	QDC-0030-M-0772	Determination of Allowable Leakage Rates for RHRSW Vaults Flood Protection	12/01/1998
<b>Section 1R07</b>			
1R07	ER-AA-340-1002	Service Water Heat Exchanger Inspection Guide	6
1R07	WO 1757717	Clean/Inspect Heat Exchanger Control Room HVAC Train B RCU Condenser	01/11/2017
1R07	EC 39054	Request Torque on End Caps for RCU 0-9400-102	00
1R07	IR 3962368	'B' Control Room HVAC Inspection Results	01/12/2017
<b>Section 1R08</b>			
1R08	IR 2464920	Indications Found during NDE on Reactor Head Vent Piping	03/07/2015
1R08	IR 2465233	PSU—IVVI New Indication on Core Spray Weld 2P4D	03/08/2015

1R08	IR 2465734	FME—1" x 1/2" Diameter Round Stock Found in RPV Annulus	03/09/2015
1R08	IR 2466464	FME Historical 3/8" Steel Flat Washer on Top of Tie Rod	03/10/2015
1R08	IR 2267257	FME PSU Ball Bearing Case Found in RPV	03/12/2015
1R08	IR 2467669	PSU Q1R23 IVI Jet Pump 2 & 7 AD-3 Weld Indications	03/12/2015
1R08	IR 2467887	Flange on Piping Is Damaged and Needs Repair	03/13/2015
1R08	IR 2468353	FME Q1R23 Manual Core Spray Injection Tool Failure	03/13/2016
1R08	IR 2545901	Unit 1 Shroud Weld IVVI Exams Not in Compliance with BRWVIP	08/25/2015
1R08	IR 2682384	Foreign Material Identified in Spent Fuel Pool	06/16/2016
1R08	EC 400050	Evaluation of Q1R23 IVVI Inspection Findings	0
1R08	ER-AA-335-003	Magnetic Particle Examination	7
1R08	ER-AA-335-010	Guidelines for ASME Code Allowable Flaw Evaluation and ASME Code Coverage Calculations	6
1R08	ER-AA-335-014-2008	VT-1 Visual Examination in Accordance with ASME 2007 Edition, 2008 Addenda	0
1R08	ER-AA-335-016	VT-3 Visual Examination of Component Supports, Attachments and Interiors of Reactor Vessels	10
1R08	ER-AA-335-018	Visual Examination of ASME IWE Class MC and Metallic Liners of IWL Class CC Components	12
1R08	ER-AA-335-1008	Code Acceptance & Recording Criteria for Nondestructive (NDE) Surface Examination	4
1R08	ER-AA-335-F-02	PDI Generic Procedure for the Ultrasonic Examination of Ferritic Pipe Welds	1
1R08	GEH-PDI-UT-1	PDI Generic Procedure for the Ultrasonic Examination of Ferritic Pipe Welds	10
1R08	NDE Report Q1R24-UT-016	Elbow-Pipe Weld 30A-S11	03/30/2017
1R08	NDE Report Q1R24-UT-017	Elbow-Pipe Weld 30B-S10	03/30/2017
1R08	NDE Report Q1R24-MT-001	Guide with 8 Lugs Welded to Pipe	03/29/2017
1R08	NDE Report Q1R24-MT-004	Variable Spring Can with 4 Lugs Welded to Pipe	03/29/2017
1R08	NDE Report Q1R24-MT-005	Collar-Torus Shell	03/28/2017
1R08	NDE Report 17-VT3-024	General Visual Examination: ASME IWE (Class MC) Containment and IWL (Class CC) Metallic Liners	04/10/2017
1R08	NDE Report Q1R24-VT-001	Flued Head Anchor	03/29/2017
1R08	NDE Report Q1R24-VT-015	Box Guide	03/28/2017

1R08	NDE Report Q1R24-VT-016	4 Lugs Welded to Pipe	03/29/2017
1R08	NDE Report Q1R24-VT-022	2 Variable Spring Cans	03/29/2017
1R08	PQR 1-50C		01/03/1984
1R08	PQR A-001		10/19/1998
1R08	PQR A-002		03/09/1999
1R08	WO 1636433-01	MM Upgrade U1 Head Vent Line Socket Welds to EPRI 2: 1 Welds	03/12/2015
1R08	WO 1636433-07	MM Contingent—Repair Indication(s) Found During PT Exams	03/11/2015
1R08	WO 1877257-01	MM Re-route Piping as Required to Support New Motor Install	11/20/2015
1R08	WPQ ID No. V9896	Record No. WPQ22427	11/12/2013
1R08	WPQ ID No. 50	Record No. WPQ12116	07/30/2003
1R08	WPQ ID No. N1206	Record No. WPQ14848	01/23/2007
1R08	WPQ ID No. T2733	Record No. WPQ22292	03/15/2012
1R08	WPQ ID No. T2733	Record No. WPQ21376	03/07/2012
1R08	WPS 1-1- GTSM-PWHT		2
1R08	IR 3990603	NRC Identified—Documentation Issue in Q1R23 90-Day Report	03/28/2017
1R08	IR 3991149	LL Q1R24—NRC In-Office Preparation Week Document Request	03/29/2017
1R08	IR 3991531	Q1R24 ISI Inspection: Issue with ECR 418116 on Material Removed	03/30/2017
1R08	IR 3991743	Q1R24 ISI Inspection: Observation on Procedure CC-AA-407	03/30/2017
<b>Section 1R11</b>			
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4OA2	EACE 3956145	Feedwater Heater Trip and Emergency Power Reduction	02/13/2017
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4OA2	IR 3981113	Received 902-5 H6 Alarm	03/03/2017
4OA2	IR 3979804	U2 Turbine Oil Reservoir Level Rising	02/28/2017
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4OA2	IR 3983620	1B RPS EPA's Tripped Following MG Set Start	03/09/2017
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4OA2	IR 3990217	Received 902-5 H-6, SBLC Squib Valve Circuit Alarm—A Squib	03/27/2017

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4OA2	IR 3983983	1A RFP FME Impeller Pieces Found Missing During Maintenance	03/10/2017
4OA2	EC 618850	Lost Parts Evaluation Per ER-AA-2008 for the Lost Parts Missing from 1A Reactor Feed Pump 1-3201-A Prior to Q1R24 During Maintenance Under WO 1842789	0
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4OA2	CY-QC-120-735, Attachment 1	Main Chimney & Reactor Vent Noble Gas Release Rate—Noble Gas Release Rates	04/15/2016
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## LIST OF ACRONYMS USED

ALARA	As-Low-As-Reasonably-Achievable
ADAMS	Agencywide Document Access Management System
ADS	Automatic Depressurization System
ANS	Alert and Notification System
ASME	American Society of Mechanical Engineers
CAP	Corrective Action Program
CFR	Code of Federal Regulations
DBE	Design Basis Event
DEP	Drill and Exercise Performance
DGCWP	Diesel Generator Cooling Water Pump
DRP	Division of Reactor Projects
EC	Engineering Change
EDG	Emergency Diesel Generator
EP	Emergency Preparedness
ERO	Emergency Response Organization
ERV	Electromatic Relief Valve
FZ	Fire Zone
HPCI	High Pressure Coolant Injection
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Issue Report
ISI	Inservice Inspection
LCO	Limiting Condition for Operation
LER	Licensee Event Report
LPCI	Low Pressure Coolant Injection
MOC	Mechanism Operated Contact
MT	Magnetic Particle Examination
NCV	Non-Cited Violation
NDE	Non-Destructive Examination
NEI	Nuclear Energy Institute
NRC	U.S. Nuclear Regulatory Commission
OPC	Open Phase Condition
OSP	Outage Safety Plan
PARS	Publicly Available Records System
PI	Performance Indicator
PMT	Post-Maintenance Testing
RCIC	Reactor Core Isolation Cooling
RFO	Refueling Outage
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
SCBA	Self-Contained Breathing Apparatus
SSCs	Structures, Systems, and Components
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
UHS	Ultimate Heat Sink
URI	Unresolved Item
VDC	Voltage Direct Current
VT	Visual Examination
WO	Work Order