



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION III  
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August 1, 2017

Mr. Bryan C. Hanson  
Exelon Nuclear  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

**SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2—NRC  
INTEGRATED INSPECTION REPORT 05000254/2017002 AND  
05000265/2017002**

Dear Mr. Hanson:

On June 30, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Quad Cities Nuclear Power Station, Units 1 and 2. On July 11, 2017, the NRC inspectors discussed the results of this inspection with Mr. K. Ohr 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 four issues that were evaluated under the risk significance determination process as having very low safety significance (Green). The NRC has also determined that three violations are associated with these issues. Because the licensee initiated condition reports to address these issues, these violations are being treated as Non-Cited Violations (NCVs), consistent with Section 2.3.2 of the Enforcement Policy. These NCVs are described in the subject inspection report.

If you contest the violations or significance of these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with 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 05000254/2017002; 05000265/2017002

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Letter to Bryan C. Hanson from Karla Stoedter dated August 1, 2017

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2—NRC  
INTEGRATED INSPECTION REPORT 05000254/2017002 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: 05000254/2017002; 05000265/2017002

Licensee: Exelon Generation Company, LLC

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

Location: Cordova, IL

Dates: April 1 through June 30, 2017

Inspectors: R. Murray, Senior Resident Inspector  
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J. Cassidy, Senior Health Physicist  
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Approved by: K. Stoedter, Chief  
Branch 1  
Division of Reactor Projects

Enclosure

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## SUMMARY

Inspection Report 05000254/2017002, 05000265/2017002; 04/01/2017–06/30/2017; Quad Cities Nuclear Power Station, Units 1 and 2; Operability Determinations and Functional Assessments, Outage Activities, Identification and Resolution of Problems, Other Activities.

This report covers a 3-month period of inspection by resident inspectors and announced baseline inspections by regional inspectors. Four Green findings were identified by the inspectors. Three of the findings involved Non-Cited Violations 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: Initiating Events**

Green. The inspectors identified a finding of very low safety significance for the licensee's failure to provide an adequate technical justification for deferral of a preventative maintenance task to replace or refurbish the Unit 1 2D main steam isolation valve (MSIV) in accordance with WC-AA-120, "Preventive Maintenance (PM) Database Revision Requirements." Specifically, overhaul or replacement of the 2D MSIV was deferred despite the historical performance of the valve, the as-found test results during Q1R24, and the amount of time that was available to plan for the overhaul to meet the maintenance strategy requirement of every seventh outage. Corrective actions for this issue included the licensee scheduling replacement of the Unit 1 2D MSIV during the next scheduled refueling outage (RFO). This issue was captured in the licensee's corrective action program (CAP) as Issue Report (IR) 4017529.

The inspectors determined the performance deficiency was more than minor because it was associated with the Initiating Events Cornerstone attribute of Equipment Performance and impacted the cornerstone objective because the MSIV preventative maintenance overhaul/replacement frequency was not effectively managed to ensure the reliability of the MSIV closure time performance to meet Technical Specification (TS) requirements on a consistent basis. The inspectors determined the finding could be evaluated using IMC 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 1, for the Initiating Events screening questions and determined the finding was of very low safety significance. The inspectors determined the finding had a cross-cutting aspect in the area of Human Performance, Conservative Bias, which states, "Individuals use the decision making practices that emphasize prudent choices over those that are simply allowable" [H.14]. (Section 4OA2)

### **Cornerstone: Mitigating Systems**

Green. A finding of very low safety significance and an associated non-cited violation of Technical Specification (TS) Section 5.4.1 was self-revealed for the licensee's failure to establish a procedure as governed by Regulatory Guide 1.33, Revision 2, Appendix A that was appropriate for performing adjustments to the governing control system for the

Unit 1 reactor core isolation cooling (RCIC) system. Specifically, on April 14, 2017, the licensee failed to ensure procedure QCIPM 1300–04, “RCIC Woodward Governor EG–M Control Box and Ramp Generator/Signal Converter in Field Calibration,” was appropriate for the accurate calibration of the RCIC system turbine governor actuator such that the system would be capable supplying its TS required flowrate of 400 gallons per minute (gpm). Immediate corrective actions included the licensee declaring the Unit 1 RCIC system inoperable and performing required calibrations at normal operating temperatures and pressures. Additional corrective actions included the licensee making procedural revisions to QCIPM 1300–04 to include specific guidance on performing turbine governor calibration adjustments and providing training to maintenance control system technicians on performing the procedure tasks and other related tasks that led to the inadequate adjustment. The issue was entered into the licensee’s CAP as IR 3998478.

The performance deficiency was determined to be more than minor, and a finding, because it impacted the Mitigating Systems Cornerstone attribute of Equipment Performance and affected the cornerstone objective because the failure to properly calibrate the RCIC governor led to the system becoming inoperable. The inspectors determined the finding could be evaluated using IMC 0609, Appendix A, “Significance Determination Process (SDP) for Findings At-Power,” Exhibit 2, “Mitigating Systems Screening Questions,” and determined that the finding required a detailed risk evaluation by a senior reactor analyst (SRA) because it resulted in the loss of the RCIC system function. A SRA performed a detailed risk evaluation of the performance deficiency using the Quad Cities SPAR Model and determined the total Delta Core Damage Frequency ( $\Delta$ CDF) was  $7E-9$  (Green). The inspectors determined this finding affected the cross-cutting area of Human Performance, in the aspect of Training, because the licensee failed to ensure the technicians performing the calibration understood null voltage adjustments to the RCIC turbine governor could only be performed when the system was at a specified rated speed and pressure [H.9]. (Section 1R15)

Green. The inspectors identified a finding of very low safety significance and an associated non-cited violation of Technical Specification (TS) 3.0.1 on April 12, 2017, for the licensee’s failure to meet TS Limiting Condition for Operation (LCO) 3.5.2, “Emergency Core Cooling Systems (ECCS)–Shutdown.” Specifically, on April 12, 2017, the licensee failed to ensure two low pressure ECCS subsystems were operable in Mode 4 in accordance with TS LCO 3.5.2 and failed to verify the LCO action conditions were met. Immediate corrective actions included restoring the 1A core spray pump to an operable status within 4 hours in order to comply with TS 3.5.2. This issue was entered into the licensee’s CAP as IR 3997127.

The performance deficiency was determined to be more than minor, and a finding, because it impacted the Mitigating Systems Cornerstone attribute of Equipment Performance and affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). The finding was screened using IMC 0609, Appendix G, Attachment 1, “Shutdown Operations Significance Determination Process Phase 1 Initial Screening and Characterization of Findings,” against the questions in Exhibit 3, “Mitigating Systems Screening Questions.” The inspectors answered “No” to all of the questions and determined the finding could be screened as very low safety significance. The inspectors determined this finding affected the cross-cutting aspect of Human Performance, in the aspect of Work Management, because the licensee failed to

ensure proper controls were in place while performing multiple activities which rendered multiple low pressure ECCS systems inoperable. In addition, the licensee failed to identify and manage the risk associated with performing multiple evolutions concurrently so that TS LCO 3.5.2 would be met and the required actions taken as necessary [H.5]. (Section 1R20)

Green. The inspectors identified a finding of very low safety significance and an associated non-cited violation of TS Section 5.4.1.c, "Procedures," for the licensee's failure to establish and maintain the fire response procedure. Specifically, Procedure QCOA 0010-12 "Fire/Explosion," Revision 47, failed to provide adequate instructions to ensure that the reactor core isolation cooling (RCIC) system would not be potentially affected by a single spurious operation of any of its associated valves in the event of a fire in Fire Area TB-II. The licensee entered the issue into their CAP as IR 2595878 and planned to revise the affected procedures.

The performance deficiency was determined to be more-than-minor because it impacted the Mitigating Systems Cornerstone attribute of Protection Against External Events (Fire), and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the lack of adequate procedural guidance in the fire response procedure did not ensure a single spurious operation would not potentially impair the operation of RCIC system in the event of a fire in TB-II. The finding was screened using IMC 0609, Appendix F, Attachment 1, "Fire Protection Significance Determination Process Worksheet." The inspectors determined the finding required a detailed risk evaluation by a Senior Reactor Analyst. The finding screened as very low safety significance because the calculated total Delta Core Damage Frequency ( $\Delta CDF$ ) was  $9.5E-7/yr$  per the detailed risk evaluation. The inspectors did not identify a cross-cutting aspect associated with this finding because it was not confirmed to reflect current performance due to the age of the performance deficiency. (Section 4OA5.1.b(1))

## **REPORT DETAILS**

### **Summary of Plant Status**

#### **Unit 1**

The unit began the inspection period shut down for RFO Q1R24. On April 13, 2017, operators commenced a startup of the unit and synchronized the unit's turbine generator to the grid the next day. As the unit was continuing its startup power ascension on April 15, while at approximately 80 percent power, the Number 4 electrohydraulic turbine control valve failed closed due to a loose cable connection. Power on the unit was immediately reduced to approximately 59 percent power in accordance with procedures. The issue with the control valve was repaired later that day and the power ascension was resumed; full power was achieved on April 16, 2017.

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

#### **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, and power changes as requested by the TSO.

### **1. REACTOR SAFETY**

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

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

##### .1 Readiness of Offsite and Alternate Alternating Current Power Systems

##### a. Inspection Scope

The inspectors verified that plant features and procedures for operation and continued availability of offsite and alternate alternating current (AC) power systems during adverse weather were appropriate. The inspectors reviewed the licensee's procedures affecting these areas and the communications protocols between the TSO and the plant to verify that the appropriate information was being exchanged when issues arose that could impact the offsite power system. Examples of aspects considered in the inspectors' review included:

- coordination between the TSO and the plant during off-normal or emergency events;
- explanations for the events;
- estimates of when the offsite power system would be returned to a normal state; and
- notifications from the TSO to the plant when the offsite power system was returned to normal.

The inspectors also verified that plant procedures addressed measures to monitor and maintain availability and reliability of both the offsite AC power system and the onsite alternate AC power system prior to or during adverse weather conditions. Specifically, the inspectors verified that the procedures addressed the following:

- actions to be taken when notified by the TSO that the post-trip voltage of the offsite power system at the plant would not be acceptable to assure the continued operation of the safety-related loads without transferring to the onsite power supply;
- compensatory actions identified to be performed if it would not be possible to predict the post-trip voltage at the plant for the current grid conditions;
- re-assessment of plant risk based on maintenance activities which could affect grid reliability, or the ability of the transmission system to provide offsite power; and
- communications between the plant and the TSO when changes at the plant could impact the transmission system, or when the capability of the transmission system to provide adequate offsite power was challenged.

Documents reviewed are listed in the Attachment to this report. The inspectors also reviewed 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.

This inspection constituted one readiness of offsite and alternate AC power systems sample as defined in Inspection Procedure (IP) 71111.01–05.

b. Findings

No findings were identified.

.2 Summer Seasonal Readiness Preparations

a. Inspection Scope

The inspectors performed a review of the licensee's preparations for summer weather for selected systems, including conditions that could lead to an extended drought.

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. Documents reviewed are listed in the Attachment to this report. The inspectors also reviewed 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. The inspectors' reviews focused specifically on the following plant systems:

- fuel pool cooling; and
- reactor recirculation flow control system.

This inspection constituted one seasonal adverse weather sample as defined in 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:

- 'B' control room emergency ventilation system during emergent maintenance associated with 'A' control room heating ventilation and air conditioning system and following reactor building ventilation isolation for planned maintenance;
- ½ 'B' train of standby gas treatment (SBGT) system during ½ 'A' train SBGT planned maintenance;
- Unit 2 reactor core isolation cooling (RCIC) system during Unit 2 high pressure coolant injection (HPCI) system planned maintenance; and
- Unit 2 'A' residual heat removal (RHR) system during planned core spray (CS) maintenance.

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.

## .2 Semi-Annual Complete System Walkdown

### a. Inspection Scope

On May 16–17, 2017, the inspectors performed a complete system alignment inspection of the Unit 1 CS system to verify the functional capability of the system. This system was selected because it was considered both safety significant and risk significant in the licensee’s probabilistic risk assessment. The inspectors walked down the system to review mechanical and electrical equipment lineups; electrical power availability; system pressure and temperature indications, as appropriate; component labeling; component lubrication; component and equipment cooling; hangers and supports; operability of support systems; and to ensure that ancillary equipment or debris did not interfere with equipment operation. A review of a sample of past and outstanding WOs was performed to determine whether any deficiencies significantly affected the system function. In addition, the inspectors reviewed the CAP database to ensure that system equipment alignment problems were being identified and appropriately resolved. Documents reviewed are listed in the Attachment to this report.

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

### b. Findings

No findings were identified.

## 1R05 Fire Protection (71111.05)

### .1 Routine Resident Inspector Tours (71111.05Q)

#### a. Inspection Scope

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

- Fire Zone (FZ) 3.0, Service Building, Elevation 609’, Cable Spreading Room;
- FZ 1.2.1, Unit 1 Reactor Building, Elevation 544’-666’6”, Drywell And Drywell Expansion Gap;
- FZ 1.1.1.3, Unit 1 Reactor Building, Elevation 623’-0”, Mezzanine Level and FZ 1.1.2.3, Unit 2 Reactor Building, Elevation 623’-0”, Mezzanine Level; and
- FZ 8.2.6.A, Unit 1 Turbine Building, Elevation 595’-0”, Hallway and FZ 8.2.6.A, Unit 1 Turbine Building, Elevation 595’0”, ‘D’ Reactor Feed Pumps.

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.

.2 Fire Protection (71111.05T)

a. Inspection Scope

In 2011, the inspectors opened an Unresolved Item (URI) 05000254/2011004-05; 05000265/2011004-05 associated with the licensee transition time frame from the QGA procedures to QCARP procedures. The licensee entered the URI concern into their CAP as Action Request (AR) 01271644 "NRC [Nuclear Regulatory Commission] URI—Post-Fire Safe Shutdown Procedure Entry Requirements." Subsequently, the licensee performed a fire safe shutdown time zero evaluation per EC 385597 and provided recommendations for revising the fire response procedure, QCOA 0010-12, to improve the transition from the QGA Procedures to the QCARP procedures. The inspectors reviewed the licensee corrective actions and evaluations related to this URI and identified one finding as described below.

b. Findings

(1) (Closed) Unresolved Item 05000254/2011004-05; 05000265/2011004-05: Failure to have Adequate Guidance in the Fire/Explosion Response Procedure

Introduction: The inspectors identified a finding of very-low safety significance (Green) and an associated Non-Cited Violation (NCV) of the TS Section 5.4.1.c, "Procedures," for the licensee's failure to establish and maintain the fire response procedure. Specifically, Procedure QCOA 0010-12 "Fire/Explosion," Revision 47, failed to provide adequate instructions to ensure that the RCIC system would not be potentially affected by a single spurious operation of any of its associated valves in the event of a fire in Fire Area TB-II.

Description: The inspectors reviewed the licensee evaluations and procedures including two evaluations for multiple spurious operations (MSOs), Scenario 2ac for the potential to isolate the suction path to the RCIC pump, and Scenario 8I for potential RCIC pump damage if the turbine cooling water supply valve spuriously closes when the pump is running. The inspectors noticed that engineering change (EC) evaluations EC 384980 and EC 384995 for MSO 2ac and MSO 8I evaluations respectively, identified that spurious operation of associated valves could potentially damage the RCIC pump and affect Unit 2 safe shutdown in the event of a fire in Fire Area TB-II. Cables associated

with Motor Operated Valves MO 2-1301-22 (RCIC contaminated condensate storage tank suction valve), MO 2-1301-25 and MO 2-1301-26 (normally closed RCIC torus suction valves), and MO 2-1301-62 (normally closed RCIC turbine lube oil cooler) were routed through TB-II. The safe shutdown analysis relied on RCIC as the only pump credited for Unit 2 shutdown in the event of a fire in TB-II.

Engineering Evaluations EC 384980 and EC 384995 concluded that the existing mitigation strategy as specified in the QCARP Procedures for Unit 2 shutdown in the event of a fire in TB-II was sufficient and no additional actions were required. Licensee evaluations credited the mitigation strategies identified in QCARPs by locally tripping the RCIC pump and opening the power supply breakers for the associated motor operated valves and verifying that all valves were in their required safe shutdown positions prior to locally starting the RCIC pump.

The inspectors reviewed the updated Attachment 'E' of QCOA 0010-12, Revision 47, and noticed several discrepancies between the procedure and the recommendation of EC 385597. Specifically, EC 385597 identified that cables and circuits associated with HPCI, RCIC, RHR, and the safe shut down makeup pump were routed through Fire Area TB-II Unit 2 and could result in spurious operation of valves associated with these systems. However, Attachment 'E' of QCOA 0010-12 listed HPCI as the only spurious operation concern. Operation of RCIC locally was also shown as the HPCI protected equipment, but no other guidance was given indicating that RCIC valves could be affected by the fire event and could spuriously operate to undesired safe shutdown positions. There were no protective actions specified in the procedure listed in Attachment 'E' to be performed by the operators to protect credited equipment.

The inspectors were concerned that based on the discussion with the licensee's senior licensed operators and lack of instructions provided in QCOA 0010-12 that in the event of a fire in Fire Area TB-II, RCIC could be running or started from the control room to provide RPV level makeup capability and due to fire damage to RCIC circuits, the pump itself could be affected and damaged due to a single spurious operation of its associated valves as shown above. Specifically, if the RCIC pump was running from the control room and a fire induced failure disabled the low suction trip function, the pump could be damaged due to low suction pressure when a fire-induced circuit failure caused one of its suction valves to close. Similarly, the RCIC pump could be damaged if it was running from the control room and a fire induced failure caused the RCIC turbine lube oil cooler valve to close or fail to open.

The licensee entered this issue into their CAP as AR 02595878 and planned to revise affected procedures.

Analysis: The inspectors determined that the licensee's failure to establish and maintain the fire response procedure was contrary to TS Section 5.4.1.c and a performance deficiency. Specifically, Procedure QCOA 0010-12 failed to provide guidance to ensure that RCIC, which was credited for safe shutdown of Unit 2 in the event of a fire in Fire Area TB-II, would not be damaged due to a single spurious operation or other fire-induced failure of any of its associated valves. Procedure QCOA 0010-12 failed to provide guidance that circuits associated with RCIC valves were routed through Fire Areas TB-II and could potentially cause the valves to spuriously operate and could potentially affect/damage the pump if RCIC was not locally operated.

The performance deficiency was determined to be more-than-minor because it was associated with the Mitigating Systems Cornerstone attribute of protection against external events (Fire), and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Also, if left uncorrected, the performance deficiency would have the potential to lead to a more significant safety concern. Specifically, lack of adequate procedural guidance in the fire response procedure did not ensure a single spurious operation would not potentially impair the operation of RCIC in the event of a fire in TB-II.

The inspectors evaluated the finding in accordance with Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," Table 3, "Significance Determination Process Appendix Router." In question 2 of Section E, "Fire Protection," the inspectors answered "Yes" to the screening question "Does the finding ... (3) ... affect the ability to reach and maintain safe shutdown conditions in case of a fire?" In accordance with IMC 0609, Appendix F, Attachment 2, "Degradation Rating Guidance," the inspectors assigned a high degradation factor to the finding because the plant conditions cannot be assessed or readily inferred from information available to the operators or as addressed in existed procedures. Using IMC 0609, Appendix F, Attachment 1, "Fire Protection Significance Determination Process Worksheet," the inspectors were not able to screen out the finding in Phase I.

A detailed risk evaluation was performed by a Region III senior reactor analyst (SRA). The delta core damage frequency ( $\Delta$ CDF) for spurious actuations from a fire that could result in a Unit 2 RCIC suction valve [i.e., MO 2-1301-22 (condensate storage tank suction) or MO 2-1301-25, MO 2-1301-26 (torus suction)] going closed were evaluated. Also, the  $\Delta$ CDF for spurious actuations from a fire that could result in the Unit 2 RCIC cooling water supply valve MO 2-1301-62 going closed were evaluated. Spurious actuations of this type could result in damage to the Unit 2 RCIC.

The total  $\Delta$ CDF was obtained by summing the  $\Delta$ CDF contributions for spurious actuations from a fire that could affect the Unit 2 RCIC suction valves (8.6E-8/yr) and for spurious actuations from a fire that could affect the Unit 2 RCIC cooling water supply valve (8.6E-7/yr). The total  $\Delta$ CDF was thus 9.5E-7/yr. This result is considered to be a bounding estimate because of the conservatism applied. The dominant sequences involved a spurious actuation for a fire that resulted in the RCIC cooling water supply valve MO 2-1301-62 going closed. Based on the detailed risk evaluation, the senior reactor analysts determined that the finding was of very low safety significance (Green).

The inspectors did not identify a cross-cutting aspect associated with this finding because it was not confirmed to reflect current performance due to the age of the performance deficiency. Specifically, the corrective actions for the URI were evaluated and completed more than three years ago.

Enforcement: Technical Specification Section 5.4.1.c, "Procedures," requires, in part, that written procedures shall be established, implemented, and maintained covering the fire protection program. Procedure QCOA 0010-12 "Fire/Explosion," Revision 47, was the implementing procedure for responding to a fire event in the plant.

Contrary to the above, prior to December 3, 2015, the licensee failed to establish and maintain a fire response procedure as required per TS Section 5.4.1.c. Specifically,

Procedure QCOA 0010–12, Revision 47, failed to include guidance to ensure that RCIC would not be affected or damaged due to fire induced spurious operation of any of its associated valves in the event of a fire in Fire Area TB–II. The safe shutdown analysis assumed that RCIC was not running prior to the initiation of the fire event and credited the operation of RCIC locally per the QCARP procedures for Unit 2 in the event of a fire in Fire Area TB–II. The QCOA Procedure failed to provide guidance to indicate that circuits associated with RCIC motor operated valves were routed through this fire area and could potentially cause the valves to spuriously operate and could potentially damage the pump if the pump was in operation.

The licensee had planned corrective actions to revise affected procedures. This violation is being treated as an NCV consistent with Section 2.3.2 of the Enforcement Policy. The violation was entered into the licensee’s CAP as IR 02595878.

**(NCV 05000254/2017002–04; 05000265/2017002–04: Failure to have Adequate Guidance in the Fire/Explosion Response Procedure)**

Unresolved Item 05000254/2011004–05; 05000265/2011004–05 is closed.

1R11 Licensed Operator Requalification Program (71111.11)

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

a. Inspection Scope

On May 29, 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 April 13–14, 2017, the inspectors observed the Unit 1 reactor startup from refueling outage (RFO) Q1R24. This was an activity that required heightened awareness or 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 (if applicable);
- correct use and implementation of procedures;
- control board (or equipment) manipulations;
- oversight and direction from supervisors; and
- ability to identify and implement appropriate TS actions and Emergency Plan actions and notifications (if applicable).

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:

- main steam.

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 Title 10 of the *Code of Federal Regulations* (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 one quarterly maintenance effectiveness sample 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 17–14–04: Unit 2 online risk change to yellow and Unit 1 shutdown safety risk yellow during RFO Q1R24—Week 2;
- Work Week 17–15–05: Unit 2 online risk change to yellow and Unit 1 shutdown safety risk yellow during RFO Q1R24—Week 3;
- Work Week 17–17–07: Unit 1 RHR logic testing, Unit 2 RHR room cooler work, cable spreading room scaffold builds; and
- Work Week 17–20–10: Unit 2 online risk change to yellow for HPCI emergent maintenance, Unit 1 online risk change to yellow for RCIC planned maintenance, and Unit 1B residual heat removal non-outage logic testing.

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) 3985178: U1 EDGCWP [emergency diesel generator cooling water pump] Failed QCOS 6600–06 Flow Rate Test;
- IR 3998478: U1 RCIC Failed Surveillance Testing;
- IR 3996143: U1 RCIC 16 Valve Preconditioning;
- IR 3990393: 1C RHR Pump Seal Cooler Piping Clogged; and
- IR 4017529: NRC Concerns Associated with 1–0203–2D MSIV [main steam isolation valve] Actuator (Partial Sample).

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 Updated Final Safety Analysis Report (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. One partial sample associated with IR 4017529 continued into the next inspection period.

b. Findings

Failure to Establish a Procedure Appropriate for Calibration of Reactor Core Isolation Cooling Governor

Introduction: A finding of very low safety significance (Green) and an associated non-cited violation (NCV) of TS 5.4.1 was self-revealed on April 15, 2017, due to the licensee’s failure to establish a procedure as required by Regulatory Guide (RG) 1.33, Revision 2, Appendix A. Specifically, on April 14, 2017, the licensee failed to ensure procedure QCIPM 1300–04, “RCIC Woodward Governor EG–M Control Box and Ramp

Generator/Signal Converter in Field Calibration,” was appropriate for the accurate calibration of the RCIC turbine electronic governor control system, such that the system would be capable of outputting its TS required flowrate of 400 gallons per minute (gpm). The inability to supply the TS required flow resulted in the RCIC system being declared inoperable

Description: On April 15, 2017, the licensee performed QCOS 1300–26, “RCIC Pump Comprehensive Performance Test,” Revision 4, at rated pressure (920–1005 psig) during the Unit 1 plant startup following RFO Q1R24. During the test, the turbine governor did not respond to the flow indicating controller signal as expected. It initially took the governor 1 minute and 30 seconds to open far enough to achieve a flowrate of 400 gpm. This response was unexpected since it would normally take approximately 12 seconds to achieve the desired flow. As the test progressed, adjustments were made to increase the discharge pressure of the pump. However, during the pressure adjustments, the flowrate changed erratically, and as a result, the licensee secured the pump, declared the RCIC system inoperable and unavailable, and initiated troubleshooting.

The licensee concluded that a maintenance run was required at the rated pressure and speed and conducted QCOS 1300–17, “RCIC Pump Test Slow Roll after Maintenance,” Revision 26. During this maintenance run, instrument maintenance division was able to calibrate and adjust the null voltage governor (in accordance with QCIPM 1300–04) in concert with Operations adjusting system flow, as required. Instrument maintenance division was able to achieve the acceptable and optimal null voltage during this maintenance run. Manual and automatic functions of the flow controller were tested and proper operation of the governor was verified before the turbine was remotely tripped. The licensee then satisfactorily performed QCOS 1300–26 later in the day on April 15, 2017, and declared the system operable.

The licensee’s investigation determined the null voltage had been improperly adjusted on April 14, during the initial slow roll/ maintenance run at low pressures and prior to the turbine being at rated speed, which resulted in the governor not responding properly. The licensee determined that the technicians did not have the knowledge of when the null voltage adjustments were expected to be performed and the prerequisites/requirements for the calibration were not clearly stated in QCIPM 1300–04.

Analysis: The inspectors determined the failure to establish a procedure that was appropriate for calibrating the RCIC governor was a performance deficiency. The performance deficiency was determined to be more than minor, and a finding, because it impacted the Mitigating Systems Cornerstone attribute of Equipment Performance, and adversely affected the cornerstone objective to prevent initiating events and ensure the availability, reliability, and capability of systems that respond to initiating events. Specifically, the failure of the licensee to have a procedure for properly calibrating the RCIC governor resulted in the system being unable to output the TS required flowrate of 400 gpm during a surveillance run which led to the system being declared inoperable.

The inspectors evaluated the issue using IMC 0609, Attachment 4, “Initial Characterization of Findings,” and Appendix A, “For Findings at Power,” issued June 19, 2012. The inspectors screened the finding against the Mitigating Systems screening questions in Exhibit 3, and answered “Yes” to question A.2, since the finding

resulted in the loss of the RCIC system function, and the finding required a detailed risk evaluation. A senior reactor analyst (SRA) performed a detailed risk evaluation of the performance deficiency using the Quad Cities SPAR Model, and failing the RCIC pump for an exposure period of one day. The dominant sequence was a loss of condenser heat sink, where core heat removal fails due to the performance deficiency in combination with unrelated equipment failures on injection systems. The  $\Delta$ CDF result was 7E-9 (Green).

The inspectors determined this finding affected the cross-cutting area of Human Performance, in the aspect of Training, which states, "Organization provides training and ensures knowledge transfer to maintain a knowledgeable, technically competent workforce and instill nuclear safety values." Specifically, the licensee failed to ensure the technicians performing the calibration understood that the adjustments to the null voltage could only be done when the system was at rated speed and pressure. In addition, the technicians had not been properly trained on the guidance in the vendor manual [H.9].

Enforcement: Technical Specification Section 5.4.1 states, in part, that "written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in RG 1.33, Revision 2, Appendix A, February 1978."

The NRC RG 1.33, Appendix A, addresses "Typical Procedures for Pressurized Water Reactors and Boiling Water Reactors," that are to be covered by written procedures. Section 8 of RG 1.33 addresses "Procedures for Control of Measuring and Test Equipment and for Surveillance Tests, Procedures, and Calibrations," and states, in part, specific procedures for calibrations should be written for RCIC tests (Section 8b.(2)(r)).

The licensee established QCIPM 1300-04, "RCIC Woodward Governor EG-M Control Box and Ramp Generator/Signal Converter (RG/SC) in Field Calibration" as the implementing procedure for performing calibrations of the RCIC turbine electronic governor control system.

Contrary to the above, on and prior to April 15, 2017, the licensee failed to establish an appropriate procedure for the calibration of the Unit 1 RCIC system. Specifically, the licensee failed to ensure procedure QCIPM 1300-04 was appropriate for the accurate calibration of RCIC turbine electronic governor control system such that the system would output its TS required flowrate of 400 gpm.

Immediate corrective actions included the licensee declaring the RCIC system inoperable and performing required calibrations at rated turbine speed and pressure. Additional corrective actions included the licensee making procedural revisions to QCIPM 1300-04, to include specific guidance on when to perform turbine governor calibration adjustments, and providing training to instrument maintenance technicians on performing the procedure tasks and other related tasks that led to the inadequate adjustment. Because the violation was of very low safety significance and was entered into the licensee's CAP as IR 3998478, this violation is being treated as an NCV, consistent with Section 2.3.2 of the Enforcement Policy. **(NCV 05000254/2017002-01; 05000265/2017002-01: Failure to Establish a Procedure Appropriate for Calibration of RCIC Governor)**

1R19 Post-Maintenance Testing (71111.19)

.1 Post-Maintenance Testing

a. Inspection Scope

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

- post-maintenance testing following Unit 1A RHR motor replacement—Baker testing and breaker trip checks
- post-maintenance testing of reactor coolant system following RFO Q1R24—reactor vessel hydrostatic test;
- post-maintenance testing of the U1 emergency diesel generator cooling water pump following pipe replacement; and
- post-maintenance testing of the U1 RHR pump 1001–19A and 19B cross-tie valves following 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 four post-maintenance testing 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 RFO, Q1R24, conducted March 27–April 13, 2017, 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;
- implementation of clearance activities and confirmation that tags were properly hung and equipment appropriately configured to safely support the work or testing;
- 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;
- licensee fatigue management, as required by 10 CFR 26, Subpart I;
- refueling activities, including fuel handling and sipping to detect fuel assembly leakage;
- startup and ascension to full power operation, tracking of startup prerequisites, walkdown of the drywell (primary containment) to verify that debris had not been left which could block emergency core cooling system suction strainers, and reactor physics testing; and
- licensee identification and resolution of problems related to RFO activities.

Documents reviewed are listed in the Attachment to this report.

This inspection constituted one RFO sample as defined in IP 71111.20–05.

b. Findings

Failure to Ensure Two Low Pressure Emergency Core Cooling Systems Operable in MODE 4

Introduction: A finding of very low safety significance (Green) and an associated NCV of TS 3.0.1 was identified by the inspectors on April 12, 2017, when the licensee failed to meet TS Limiting Condition for Operation (LCO) 3.5.2, “Emergency Core Cooling System (ECCS)—Shutdown,”. Specifically, the licensee failed to ensure two low pressure ECCSs were operable in Mode 4 (cold shutdown or vessel temperature less than 212 degrees Fahrenheit) in accordance with TS LCO 3.5.2 and failed to verify the required actions to ensure the LCO action conditions were met.

Description: On April 12, 2017, during RFO Q1R24, the inspectors were conducting a walkdown of the Unit 1 control room panels to verify system lineups and shutdown risk.

The inspectors identified that three Division I low pressure ECCS pumps (1A RHR, 1B RHR, and 1A core spray (CS)) were inoperable and unavailable because tags on the pump switches indicated their breakers were racked in their "Test" positions. In addition, the inspectors observed the 1B CS pump control switch was in the "Pull-to-lock" position (this rendered the system inoperable and unavailable) to support filling and venting of the CS system. The inspectors also noted that the licensee had not documented log entries relative to being in any action statements for TS LCO 3.5.2, "ECCS – Shutdown," which required at least two low pressure ECCS systems to be operable in Mode 4. In the plant configuration observed by the inspectors, the only operable low pressure ECCS pumps were the 1C and 1D RHR pumps, which constitute only one low pressure ECCS subsystem (the 'B' train RHR subsystem). The NRC questioned the licensee on how they were meeting TS LCO 3.5.2. TS 3.0.1 requires that LCOs be met during the modes or other specified conditions stated in the applicability section. Following their review, the licensee recognized they were not meeting TS LCO 3.5.2, as required by TS 3.0.1, and entered Condition A, for one low pressure ECCS system inoperable. The LCO actions required the licensee to restore a low pressure subsystem to an operable status within 4 hours. The licensee completed the required actions by returning the 1A CS subsystem to service within 4 hours. The licensee captured this issue into their CAP as IR 3997127.

Investigation into the issue by the licensee revealed that Operations did not effectively manage multiple operations (surveillance testing, system restoration, etc.) and failed to recognize when the unit no longer had the required number of operable subsystems. In addition, the licensee identified that there was some misinterpretation of what constituted an operable subsystem for the RHR system. The inspectors also noted that multiple shifts (night shift into day shift) did not recognize the failure to meet the requirements of TS 3.5.2. Corrective actions made by the licensee included procedure changes to clarify the requirements of the low pressure ECCS systems, in addition to adding training for operators on the requirements and TS Bases for TS LCO 3.5.2.

Analysis: The inspectors determined the failure to meet TS 3.0.1 and ensure two low pressure injection/spray subsystems were operable while in Mode 4, as required by TS LCO 3.5.2, was a performance deficiency. The performance deficiency was determined to be more than minor, and a finding, because it impacted the Mitigating Systems Cornerstone attribute of Equipment Performance and affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). The inspectors evaluated the issue using IMC 0609, Attachment 4, "Initial Characterization of Findings," and IMC 0609, Appendix G, Attachment 1, "Shutdown Operations Significance Determination Process Phase 1 Initial Screening and Characterization of Findings," issued May 9, 2014. The inspectors screened the finding against Exhibit 3, "Mitigating Systems Screening Questions," and answered "No" to all of the questions. Therefore, the finding screened as very low safety significance (Green).

The inspectors determined this finding affected the cross-cutting area of Human Performance, in the aspect of Work Management, which states, "The organization implements a process of planning, controlling, and executing work activities such that nuclear safety is the overriding priority. The work process includes the identification and management of risk commensurate to the work and the need for coordination with different groups or job activities." Specifically, the licensee failed to ensure proper controls were in place while performing multiple activities which rendered multiple low

pressure ECCS systems inoperable. In addition, the licensee failed to identify and manage the risk associated with performing multiple evolutions concurrently such that TS LCO 3.5.2 was met or the required actions completed as necessary [H.5].

Enforcement: Technical Specification 3.0.1 requires, in part, that LCOs be met during the modes or other specified conditions stated in the applicability section.

Technical Specification LCO 3.5.2, "ECCS–Shutdown," states, "Two low pressure injection/spray subsystems shall be OPERABLE" when the unit is in Mode 4.

Contrary to the above, on April 12, 2017, from 12:05 a.m. to 3:21 a.m. and from 5:45 a.m. to 8:18 a.m., the licensee failed to meet TS 3.0.1 when they failed to ensure two Unit 1 low pressure ECCS injection/spray subsystems were operable while the unit was in Mode 4, as required by TS 3.5.2.

Immediate corrective actions included restoring the 1A CS pump to an operable status within 4 hours, in order to comply with TS 3.5.2. Planned corrective actions included training operators on the requirements of TS 3.5.2 and making procedural changes to RHR line up procedures to clarify the requirements for shutdown ECCS systems. The violation is being treated as an NCV, consistent with Section 2.3.2 of the Enforcement Policy. The violation was entered into the licensee's CAP as IR 3997127. **(NCV 05000254/2017002–02; 05000265/2017002–02: Failure to Ensure Two Low Pressure ECCS Systems Operable in MODE 4)**

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:

- QCOS 2300–13: High Pressure Coolant Injection (HPCI) System Manual Initiation Test (Routine);
- QOS 6500–01: 4 kV 13–1 Undervoltage Functional Test (Routine);
- QCTS 0600–05: Main Steam Isolation Valve Local Leak Rate Test (Containment Isolation Valve); and
- QCOS 6600–37: Unit ½ EDG Largest Load Reject (Routine).

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 three routine surveillance testing samples and one containment isolation valve sample as defined in IP 71111.22, Sections–02 and–05.

b. Findings

No findings were identified.

1EP6 Drill Evaluation (71114.06)

.1 Emergency Preparedness Drill Observation

a. Inspection Scope

The inspectors evaluated the conduct of a routine licensee emergency drill on May 17, 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 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 CAP. As part of the inspection, the inspectors reviewed the drill package and other documents listed in the Attachment to this report.

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

b. Findings

No findings were identified.

**2. RADIATION SAFETY**

2RS8 Radioactive Solid Waste Processing and Radioactive Material Handling, Storage and Transportation (71124.08)

.1 Radioactive Material Storage (02.02)

a. Inspection Scope

The inspectors selected areas where containers of radioactive waste are stored, and evaluated whether the containers were labeled in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 20.1904, or controlled in accordance with 10 CFR 20.1905.

The inspectors assessed whether the radioactive material storage areas were controlled and posted in accordance with the requirements of 10 CFR Part 20. For materials stored or used in the controlled or unrestricted areas, the inspectors evaluated whether they were secured against unauthorized removal and controlled in accordance with 10 CFR 20.1801 and 10 CFR 20.1802.

The inspectors evaluated whether the licensee established a process for monitoring the impact of low-level radioactive waste storage that was sufficient to identify potential unmonitored, unplanned releases or nonconformance with waste disposal requirements.

The inspectors evaluated the licensee's program for container inventories and inspections. The inspectors selected containers of stored radioactive material, and assessed for signs of swelling, leakage, and deformation.

These inspection activities constituted one complete sample as defined in IP 71124.08–05.

b. Findings

No findings were identified.

.2 Radioactive Waste System Walk-Down (02.03)

a. Inspection Scope

The inspectors walked down accessible portions of select radioactive waste processing systems to assess whether the current system configuration and operation agreed with the descriptions in plant and/or vendor manuals.

The inspectors reviewed administrative and/or physical controls to assess whether equipment, which is not in service or abandoned in place would not contribute to an unmonitored release path and/or affect operating systems or be a source of unnecessary personnel exposure. The inspectors assessed whether the licensee reviewed the safety significance of systems and equipment abandoned in place in accordance with 10 CFR 50.59.

The inspectors reviewed the adequacy of changes made to the radioactive waste processing systems since the last inspection. The inspectors evaluated whether changes from what is described in the Final Safety Analysis Report were reviewed and documented in accordance with 10 CFR 50.59 or that changes to vendor equipment were made in accordance with vendor manuals. The inspectors also assessed the impact of these changes on radiation doses to occupational workers and members of the public.

The inspectors selected processes for transferring radioactive waste resin and/or sludge discharges into shipping/disposal containers and assessed whether the waste stream mixing, sampling, and waste concentration averaging were consistent with the process control program, and provided representative samples of the waste product for the purposes of waste classification.

The inspectors evaluated whether tank recirculation procedures provided sufficient mixing.

The inspectors assessed whether the licensee's process control program correctly described the current methods and procedures for dewatering and waste stabilization.

These inspection activities constituted one complete sample as defined in IP 71124.08-05.

b. Findings

No findings were identified.

.3 Waste Characterization and Classification (02.04)

a. Inspection Scope

For select waste streams, the inspectors assessed whether the licensee's radiochemical sample analysis results were sufficient to support radioactive waste characterization as required by 10 CFR Part 61. The inspectors evaluated whether the licensee's use of scaling factors and calculations to account for difficult-to-measure radionuclides was technically sound and based on current 10 CFR Part 61 analysis.

The inspectors evaluated whether changes to plant operational parameters were taken into account to: (1) maintain the validity of the waste stream composition data between the sample analysis update; and (2) assure that waste shipments continued to meet the requirements of 10 CFR Part 61.

The inspectors evaluated whether the licensee had established and maintained an adequate quality assurance program to ensure compliance with the waste classification and characterization requirements of 10 CFR 61.55 and 10 CFR 61.56.

These inspection activities constituted one complete sample as defined in IP 71124.08–05.

b. Findings

No findings were identified.

.4 Shipment Preparation (02.05)

a. Inspection Scope

The inspectors observed radiation workers during the conduct of radioactive waste processing and radioactive material shipment preparation and receipt activities.

The inspectors observed shipment packaging, surveying, labeling, marking, placarding, vehicle checks, emergency instructions, disposal manifest, shipping papers provided to the driver, and licensee verification of shipment readiness. The inspectors assessed whether shippers were knowledgeable of the shipping regulations and demonstrated adequate skills to accomplish package preparation requirements. The inspectors evaluated whether the licensee was maintaining shipping procedures in accordance with current regulations. The inspectors assessed whether the licensee was meeting the expectations in NRC Bulletin 79–19, “Packaging of Low-Level Radioactive Waste for Transport and Burial,” and 49 CFR Part 172, Subpart H, “Training.”

The inspectors evaluated whether the requirements for Type B shipment Certificates of Compliance had been met. The inspectors determined whether the user was a registered package user and had an NRC–approved quality assurance program. The inspectors assessed whether procedures for cask loading and closure were consistent with vendor procedures.

The inspectors assessed whether non–Type B shipments were made in accordance with the package quality documents.

The inspectors assessed whether the receiving licensee was authorized to receive the shipment packages.

These inspection activities constituted one complete sample as defined in IP 71124.08–05.

b. Findings

No findings were identified.

.5 Shipping Records (02.06)

a. Inspection Scope

The inspectors reviewed select shipments to evaluate whether the shipping documents indicated the proper shipper name; emergency response information and a 24–hour

contact telephone number; accurate curie content and volume of material; and appropriate waste classification, transport index, and UN number. The inspectors assessed whether the shipment marking, labeling, and placarding was consistent with the information in the shipping documentation.

These inspection activities constituted one complete sample as defined in IP 71124.08–05.

b. Findings

No findings were identified.

.6 Identification and Resolution of Problems (02.07)

a. Inspection Scope

The inspectors assessed whether problems associated with radioactive waste processing, handling, storage, and transportation, were being identified by the licensee at an appropriate threshold, were properly characterized, and were properly addressed for resolution. Additionally, the inspectors evaluated whether the corrective actions were appropriate for a selected sample of problems documented by the licensee that involve radioactive waste processing, handling, storage, and transportation.

These inspection activities constituted one complete sample as defined in IP 71124.08–05.

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 Reactor Coolant System Leakage

a. Inspection Scope

The inspectors sampled licensee submittals for the reactor coolant system (RCS) leakage performance indicator (PI) for Quad Cities, Units 1 and 2, for the period from the second quarter 2016 through the first quarter 2017. 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 logs, RCS leakage tracking data, IRs, event reports and NRC integrated inspection reports for the period of April 1, 2016, through March 30, 2017, 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 RCS leakage samples as defined in IP 71151–05.

b. Findings

No findings were identified.

.2 Occupational Exposure Control Effectiveness

a. Inspection Scope

The inspectors sampled licensee submittals for the Occupational Exposure Control Effectiveness PI for the period from the third quarter of 2016 through the first quarter of 2017. The inspectors used PI definitions and guidance contained in the NEI Document 99–02, “Regulatory Assessment Performance Indicator Guideline,” Revision 7, dated August 2013 to determine the accuracy of the PI data reported during those periods. The inspectors reviewed the licensee’s assessment of the PI for occupational radiation safety to determine if indicator related data was adequately assessed and reported. To assess the adequacy of the licensee’s PI data collection and analyses, the inspectors discussed with radiation protection staff, the scope and breadth of its data review and the results of those reviews. The inspectors independently reviewed electronic personal dosimetry dose rate and accumulated dose alarms and dose reports and the dose assignments for any intakes that occurred during the time period reviewed to determine if there were potentially unrecognized occurrences. The inspectors also conducted walkdowns of numerous locked high and very high radiation area entrances to determine the adequacy of the controls in place for these areas. Documents reviewed are listed in the Attachment to this report.

This inspection constituted one occupational exposure control effectiveness 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 Semi-Annual Trend Review

a. Inspection Scope

The inspectors performed a review of the licensee's CAP and associated documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors' review was focused on repetitive equipment issues associated with Unit 1 main stream isolation valve (MSIV) closure times from 2011–2017.

The review also included issues documented outside the CAP in major equipment problem lists, repetitive and/or rework maintenance lists, departmental problem/challenges lists, system health reports, quality assurance audit/surveillance reports, self-assessment reports, and Maintenance Rule assessments. The inspectors compared and contrasted their results with the results contained in the licensee's CAP trending reports. Corrective actions associated with a sample of the issues identified in the licensee's trending reports were reviewed for adequacy.

This review constituted one semi-annual trend review inspection sample as defined in IP 71152.

b. Findings

Failure to Justify MSIV Maintenance Deferral

Introduction: The inspectors identified a finding (FIN) of very low safety significance (Green) for the licensee's failure to provide an adequate technical justification for deferral of a preventative maintenance task to replace or refurbish the 2D MSIV in accordance with WC-AA-120, "Preventive Maintenance (PM) Database Revision Requirements."

Description: On April 27, 2017, four main steam isolation valves failed surveillance test QCOS 0250-04, "MSIV Closure Stroke Time," Revision 26. MSIVs 1-0203-1B, 1-0203-1D, 1-0203-2C, and 1-0203-2D failed to close within the cold shutdown TS closure time of greater than or equal to 3 seconds and less than or equal to 5 seconds. The licensee captured the issue and documented their Equipment Corrective Action Program Evaluation (ECAPE) under IR 3990038, "MSIVs 1-0203-1B, 1-0203-1D, 1-0203-2C and 1-0203-2D Closure Times Exceeded the Maximum TS Limit of ≤ 5 Seconds."

The replacement/refurbishment of the Unit 1 2D MSIV was identified by preventive maintenance identification number (PMID) 21065-02, "2D MSIV Air/ Hydraulic Overhaul." Preventive Maintenance Identification Number 21065-02 had a maintenance frequency of every seventh outage, or every 14 years. The Unit 1 2D MSIV was last replaced in 2002. Refuel outage Q1R24 was the due date for the performance of the 2D MSIV replacement/ overhaul.

Preventive Maintenance Deferral (PMD) 17-001645, was generated on April 12, 2017, as an action item following the generation of IR 3996714, "2D MSIV Actuator

Replacement Decision,” written on April 11, 2017. Issue Report 3996174 and PMD 17-001645 were written to document the technical justification for deferring PMID 21065-02, and were required by WC-AA-120, “Preventive Maintenance (PM) Database Revision Requirements.”

The inspectors determined the licensee’s technical justification was not adequate based on the following issues:

- Performance of PMID 21065-02 within the maintenance strategy requirements of every seventh outage was within the licensee’s ability to control. In fact, IR 2637138, “1-0203-02D MSIV Actuator Needs to be Replaced in Q1R24,” was written on March 7, 2016, one year prior to RFO Q1R24. Work Order 1908942 was written to replace 1-0203-2D and was planned for RFO Q1R24.
- WC-AA-120, Step 4.2.4 states, in part, that if there was an opportunity to perform the PM in an appropriate work window before the late date, but PM was not performed due to poor preparation or missed opportunities, an IR shall be initiated. Step 4.2.6 states, in part, that the IR should identify why the PM could not be performed by its late date. Contrary to these requirements, IR 3996174 did not address the missed opportunities to perform the PM nor why the PM could not be performed prior to its late date. Work Order 1908942 had been planned and commenced up to and including erecting scaffold to perform the work.
- The licensee’s technical justification in PMD 17-001645 states, in part, that past equipment history and engineering assessment of elastomers justifies the deferral to the following refueling outage (RFO) Q1R25, in 2019. In addition, under the section for consideration of previous failure analysis or failure investigations, the licensee did not document any previous equipment performance issues, but rather states, “previous revisions were based on good equipment history...” Contrary to these statements, the licensee failed to include historical MSIV performance dating back to 2011, when there was a noticeable change in the performance of the MSIV closure time, as documented in 2013 Equipment Apparent Cause Evaluation 1485944. The licensee’s justification also failed to address actuator failure analysis from 2013 refuel outage Q1R22, as documented in the vendor (Hiller) engineering analysis EA-001-14, Revision 1, dated February 14, 2014, which stated, in part, that at 11.75 years old “the useful life of the seals was expended. The seal may continue to seal after taking a compression set provided the temperature and supply pressure remain steady and no motion of force causes a break in the line of seal contact. Since a steady state system is not postulated during a [design basis event] DBE, the installed service life should be limited to six years.”
- PMD 17-001645 documented the cause of the 2D MSIV slow closure time as being due to a less than optimal replacement frequency of the MSIV actuator, yet concluded that extending the frequency was justified.

Following the failure of the as-found closure time in 2017, ECAPE 3990038 documented the cause of the MSIV slow closure times as “due to a less than optimal replacement frequency of the MSIV actuator. The ECAPE also stated that “this was based on the number of failures that have occurred with the MSIV actuators, the degradation seen on the elastomers, the lifespan of the hydraulic fluid and the Performance Centered Maintenance (PCM) Template recommendation.”

Based on the results of the licensee’s evaluation, the historical performance of the 2D MSIV, the age of the 2D MSIV, and the as-left closure time, the inspectors questioned whether the 2D MSIV closure time would meet the TS requirements during the as-found testing scheduled for 2019, in RFO 1QR25. The licensee documented the inspectors’ concerns in IR 4017529, “NRC Concerns Associated with 1–0203–2D MSIV Actuator.” The inspectors reviewed the licensee operability evaluation engineering change (EC) 619951, “Evaluate the Possible Drift in Closure Timing of MSIV 1–0203–2D,” under Section 1R15 “Operability Evaluations.” The licensee was continuing to evaluate the inspectors’ follow-up concerns regarding EC 619951 at the end of the inspection period. The inspectors did not have an immediate safety or operability concern because the 2D MSIV as-left closure time was within the TS closure time requirements.

The licensee’s long term corrective actions included planning the replacement of the Unit 1 2D MSIV during the next RFO, Q1R25. In addition, the licensee planned to change the overall PM task frequency for MSIV actuator overhaul to every fourth outage, which would match the PCM template and more closely align with the vendor recommendations.

Analysis: The inspectors determined the licensee’s failure to provide adequate technical justification for deferral of a PM task to replace or refurbish the 2D MISV in accordance with WC-AA-120, “Preventive Maintenance (PM) Database Revision Requirements,” Revision 1, was a performance deficiency.

The inspectors determined the performance deficiency was more than minor because it was associated with the Initiating Events Cornerstone attribute of Equipment Performance and impacted the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the MSIV PM overhaul/replacement frequency was not effectively managed to ensure the reliability of the MSIV closure time performance to meet TS requirements on a consistent basis.

In accordance with Inspection Manual Chapter (IMC) 0609, “Significance Determination Process,” Attachment 0609.04, “Initial Characterization of Findings,” Table 2, the inspectors determined the finding affected the Initiating Events Cornerstone. As a result, the inspectors determined the finding could be evaluated using Appendix A, “The Significance Determination Process (SDP) for Findings At-Power,” Exhibit 1, for the Initiating Events screening questions. The inspectors determined the finding screened as very low safety significance (Green) in Exhibit 1 because they answered “No” to all of the screening questions.

The inspectors determined the finding had a cross-cutting aspect in the area of Human Performance, Conservative Bias, which states, “Individuals use the decision making practices that emphasize prudent choices over those that are simply allowable.

A proposed action is determined to be safe in order to proceed, rather than unsafe in order to stop.” Specifically, overhaul of the 2D MSIV was deferred despite the historical performance of the valve, the as-found test results during RFO Q1R24, and the amount of time that was available to plan for the overhaul to meet the maintenance strategy requirement of every seventh outage [H.14].

Enforcement: The inspectors did not identify a violation of regulatory requirements associated with this finding. This issue was captured in the licensee’s CAP as IR 4017529, “NRC Concerns Associated with 1–0203–2D MSIV Actuator.”

**(FIN 05000254/2017002–03; 05000265/2017002–03: Failure to Justify MSIV Maintenance Deferral)**

### .3 Annual Follow-Up of Selected Issues

#### a. Inspection Scope

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

- IR 1484316: Part 21 Anchor Darling Wedge Pin Failure; and
- IR 3990885: PSU Q1R24 1–0220–105B Failed Outage PM Opening Force Check.

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;
- 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; and
- 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 two in-depth problem identification and resolution inspection sample as defined in IP 71152.

#### b. Findings

No findings were identified.

#### 4OA3 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. The inspectors' review of the event was documented in NRC Inspection Report 05000254/2017001; 05000265/2017001 Section 4OA3. During this inspection period, the inspectors reviewed the licensee's root cause report, including planned corrective actions.

This event, which occurred on February 1, 2017, was initiated while the Unit 2 reactor operator was replacing the closed indicating light bulb for the 2-0203-3E ADS ERV in the 902-3 control room panel. A short circuit was initiated during the bulb replacement which resulted in arcing and a small flame in the panel. The flame was quickly extinguished by the operators, who noted visible damage to the socket assembly, and an Alert was declared due to the fire and unknown condition of the safety-related circuit. Testing performed subsequent to the event showed that the relief valve remained capable of performing its design function (to open) throughout the event.

The licensee's root cause report was completed under IR 3969324, "Light Socket for 2-203-3E Damaged during Bulb Change." The licensee determined the root cause to be "the original indicating light circuit design for the 2-0203-3E allowed an electrical fault to be sustained within the closed light indication for the relief valve. The sustained electrical fault created enough heat to produce a visible flame and damage to the light socket components." A contributing cause was identified as "previous damage to the 2-0203-3E (light socket) spring tab caused the tab to become displaced from the socket center post and move into close proximity to the socket wall during bulb installation, causing a short circuit."

Licensee immediate corrective actions included: replacing the light sockets and wiring for the open and closed indications for the 'E' ADS valve and replacing the fuses for both the normal and alternate power supplies for the control circuitry. To address the root and contributing causes, the licensee determined they would "re-evaluate indicating light circuits to determine if similar events can occur; where an electrical fault initiating in a socket assembly can potentially result in [either] a fire or safety-related equipment becoming inoperable. Identified circuits would be enhanced by either mitigating the potential for a short circuit (with socket assembly modifications) or by mitigating the effects of a short circuit (current-limiting devices installed in the circuit)." The licensee planned extent of condition reviews to determine if other indicating circuits had a similar vulnerability should there be a short circuit in a socket assembly. The scope of the review would include circuits that could impact safety-related equipment or result in a control room fire or other sensitive areas, with the understanding that this could include non-safety related circuits.

The inspectors determined that the design of the Quad Cities ADS light circuitry was in conformance with design standards at the time of plant construction in 1970 and was previously approved by the NRC. This event, however, exposed circuit vulnerabilities

that would not have otherwise been evident prior to its occurrence. The inspectors determined that the circuit issues identified were not within the licensee's ability to foresee and correct; therefore, no performance deficiency was identified.

Documents reviewed are listed in the Attachment to this report.

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

b. Findings

No findings were identified.

.2 (Closed) Licensee Event Report 05000254/2016001-01: Secondary Containment Differential Pressure Momentarily Lost Due to Air Line Failure (RWCU Hx Rm)

This licensee event report (LER) was a revision to an LER that was submitted and closed in NRC Inspection Report 05000254/2016001; 05000265/2016001. The licensee submitted the revision to update the cause of the tube fitting failure on an air-line to ventilation dampers. Failure analysis indicated the cause was most likely a manufacturing defect that propagated over time rather than vibration induced fatigue failure.

Documents reviewed are listed in the Attachment to this report. This LER is closed.

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

.3 (Closed) Licensee Event Report 05000254/2016002-01: Secondary Containment Differential Pressure Momentarily Lost Due to Air Line Failure (RWCU Pump Rm)

This LER was a revision to an LER that was submitted and closed in NRC Inspection Report 05000254/2016001; 05000265/2016001. The licensee submitted the revision to update the cause of the tube fitting failure on an air-line to ventilation dampers. Failure analysis indicated the cause was most likely a manufacturing defect that propagated over time rather than vibration induced fatigue failure.

Documents reviewed are listed in the Attachment to this report. This LER is closed.

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

.4 (Closed) Licensee Event Report 05000254/2017-002: MSIV Outside of TS Allowed Closure Time

On March 27, 2017, during RFO Q1R24, four Unit 1 MSIVs failed their as-found closure time test when they failed to close within the TS required time of less than or equal to 5 seconds. The licensee determined the cause of three of the closure time failures (MSIVs 1B, 1D, and 2D) was a less than optimal replacement frequency for the MSIV actuators, and the cause of the fourth closure time failure (MSIV 2C) was a less than optimal replacement frequency of the MSIV springs. Two of the MSIV (1B and 1D) actuators were replaced during Q1R24 and the 2C MSIV had its springs replaced in Q1R24. The licensee deferred replacement of MSIV 2D actuator until RFO Q1R25

in 2019. The inspectors performed a semi-annual trend sample review of the Unit 1 MSIV closure time trends under IP 71152 and documented one finding in Section 4OA2 of this report.

Documents reviewed are listed in the Attachment to this report. This LER is closed.

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

#### 4OA5 Other Activities

.1 (Closed) Unresolved Item 05000254/2014008–03; 05000265/2014008–03: Testing of Main Steam Isolation Valves with Instrument Air or Drywell Pneumatic System Aligned to Actuators

a. Inspection Scope

During the 2014 Component Design Basis Inspection, the inspectors identified an unresolved item (URI) regarding the testing of the MSIVs. Specifically, the inspectors identified that the MSIV closure timing surveillance tests were performed with non-safety related instrument air or the drywell pneumatic system aligned to the actuators. The MSIVs were designed with safety-related accumulators to provide pressure to assist in closing the valves; however, these air accumulators would be expected to provide less pressure than the non-safety related instrument air or drywell pneumatic systems. The inspectors were concerned that the surveillance test acceptance criteria could be non-conservative. The licensee was unable to retrieve testing conducted in the 1980's that may have resolved the inspectors concern. The licensee documented this issue in Action Request (AR) 02420923, "CDBI—Missing MSIV Special Test Results."

To resolve the inspectors' concern, the licensee conducted testing on a spare MSIV. Testing was performed by work order (WO) 1905957–01 and evaluated in EC 618315, "MSIV Accumulator Only Testing for URI Closure," Revision 0. Testing was conducted with the spare MSIV with a 20 gallon air tank used as the accumulator. The air tank was slightly smaller than the installed accumulator to add some additional conservatism into the testing. Testing was conducted at several initial pressures in the air tank (104, 100, 90, and 80 psig). Normal instrument air pressure of the system is 104 psig with an alarm for low air pressure at 85 psig such that the testing bounded the potential conditions where the MSIV would be required to function. At each pressure, the licensee measured the close stroke time for the valve to ensure it would meet the TS Surveillance Requirement 3.6.1.3.6 for isolation time of each MSIV to be  $\geq 3$  seconds and  $\leq 5$  seconds. The test results ranged from a closure time of 3.13 to 3.38 seconds over the range of initial air pressures. Although stroke time did increase with less pressure in the air tank, the increase was not significant (0.25 seconds maximum) and the stroke time remained within the TS limits.

Based on the testing conducted by the licensee, the inspectors issue with the testing of the MSIVs was resolved. As a result, this URI is closed.

b. Findings

No findings were identified.

#### 4OA6 Management Meetings

##### .1 Exit Meeting Summary

On July 11, 2017, the inspectors presented the inspection results to Mr. K. Ohr, Site Vice President, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

##### .2 Interim Exit Meetings

Interim exits were conducted for:

- An interim exit on the results of the fire protection inspection were presented to Mr. K. Ohr, Plant Manager, on May 16, 2017.
- The results of the Component Design Basis Inspection Unresolved Item inspection was conducted by phone with Mr. T. Petersen, Regulatory Engineer/NRC Coordinator, on May 31, 2017.
- The results of the Radiation Safety Program review with Mr. H. Dodd, Director of Operations, on June 9, 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

K. Ohr, Site Vice President  
W. Beck, Regulatory Assurance Manager  
T. Bell, Engineering Director  
C. Berry, CAP Manager  
J. Colgan, Chemistry Supervisor  
B. Donaldson, Site Communicator  
A. Green, Radiation Protection Technical Support Manager  
R. Hight, Maintenance Director  
M. Humphrey, Regulatory Assurance Specialist  
T. Kelley, Maintenance Deputy Director  
T. Petersen, Regulatory Assurance Lead  
T. Scott, Work Management Director  
B. Wake, Shift Operations Superintendent  
T. Wojcik, Engineering Manager

#### U.S. Nuclear Regulatory Commission

R. Murray, Senior Resident Inspector  
K. Carrington, Resident Inspector

#### Illinois Emergency Management Agency

C. Mathews, IEMA

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

05000254/2017002-01; 05000265/2017002-01	NCV	Failure to Establish a Procedure Appropriate for Calibration of RCIC Governor (Section 1R15)
05000254/2017002-02; 05000265/2017002-02	NCV	Failure to Ensure Two Low Pressure ECCS Systems Operable in MODE 4 (Section 1R20)
05000254/2017002-03; 05000265/2017002-03	FIN	Failure to Justify MSIV Maintenance Deferral (Section 4OA2)
05000254/2017002-04; 05000265/2017002-04	NCV	Failure to have Adequate Guidance in the Fire/Explosion Response Procedure (Section 4OA5.1.b(1))

### Closed

05000254/2017002-01; 05000265/2017002-01	NCV	Failure to Establish a Procedure Appropriate for Calibration of RCIC Governor (Section 1R15)
05000254/2017002-02; 05000265/2017002-02	NCV	Failure to Ensure Two Low Pressure ECCS Systems Operable in MODE 4 (Section 1R20)
05000254/2017002-03; 05000265/2017002-03	FIN	Failure to Justify MSIV Maintenance Deferral (Section 4OA2)
05000254/2017002-04; 05000265/2017002-04	NCV	Failure to have Adequate Guidance in the Fire/Explosion Response Procedure (Section 4OA5.1.b(1))
05000254/2016001-01	LER	Secondary Containment Differential Pressure Momentarily Lost Due to Air Line Failure (RWCU Hx Rm) (Section 4OA3.02)
05000254/2016002-01	LER	Secondary Containment Differential Pressure Momentarily Lost Due to Air Line Failure (RWCU Pump Rm) (Section 4OA3.03)
05000254/2017002-00	LER	MSIV Outside of TS Allowed Closure Time (Section 4OA3.04)
05000254/2011004-05; 05000265/2011004-05	URI	Failure to have Adequate Guidance in the Fire/Explosion Response Procedure (Section 4OA5.1.b(1))
05000254/2014008-03; 05000265/2014008-03	URI	Testing of MSIVs with Instrument Air or Drywell Pneumatic System Aligned to Actuators (Section 4OA5.2)

## LIST OF DOCUMENTS REVIEWED

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

<u>Section Number</u>	<u>Document Number</u>	<u>Description or Title</u>	<u>Revision or Date</u>
<b>Section 1R01</b>			
1R01	IR 2707062	Fuel Pool Pump Discharge Discrepancy	08/22/2016
1R01	IR 3947389	2B CRD Pump Degrading Pressure (IR 2702862 Follow-Up)	11/30/2016
1R01	Exelon Generation Memo SVP-17-025	Quad Cities Station Certification of 2017 Summer Readiness	05/12/2017
1R01	IR 4027263	Questions from NRC during Walkdown of 345 KV Switchyard	06/29/2017
1R01	OP-AA-108-107	Switchyard Control	4
1R01	OP-AA-108-107-1002	Interface Procedure Between ComED/PECO and Exelon Generation (Nuclear/Power) for Transmission Operators	11
1R01	QCAN 912 D-4	Unit Stability Trip is Armed	5
<b>Section 1R04</b>			
1R04	QCOP 5750-9	Control Room Ventilation System	61
1R04	Drawing M-44	Diagram of Standby Gas Treatment	AP
1R04	QOM 0-7500-01	U1/2 Standby Gas Treatment Valve Checklist	7
1R04	Drawing M-89, Sheet 1	Diagram of Reactor Core Isolation Cooling RCIC Piping	BG
1R04	QOM 2-1300-02	Unit 2 RCIC Valve Checklist (RCIC Room)	11
1R04	Drawing M-36	Diagram of Core Spray Piping	BI
1R04	QOM 1-1400-08	Core Spray System Fuse and Breaker Checklist	3
1R04	QOM 1-1400-09	Unit 1 'A' Core Spray Valve Checklist	8
1R04	QOM 1-1400-10	Unit 1 'B' Core Spray Valve Checklist	8
1R04		Unit 1 System Health Report for CS 1400—Core Spray	1/1/2016 through 3/31/2016
<b>Section 1R05</b>			
1R05	QCMMS 4100-01	Fire Extinguisher Inspection	55
1R05	QCMMS 4100-71	Periodic Hand Held Fire Extinguisher Inspection	39
1R05	QCMMS 4100-72	Annual Wheeled Fire Extinguisher Inspection	10

1R05	Quad Cities Generating Station Pre-Fire Plan	Fire Zone 1.2.1: Unit 1 Reactor Building, Elevation 544'-666'6", Drywell and Drywell Expansion Gap	July 2009
1R05	Quad Cities Generating Station Pre-Fire Plan	Fire Zone 3.0: Service Building, Elevation 609', Cable Spreading Room	October 2013
1R05	Quad Cities Generating Station Pre-Fire Plan	FZ 1.1.2.3: Unit 2 RB 623'-0" Elevation Mezzanine Level	October 2013
1R05	Quad Cities Generating Station Pre-Fire Plan	FZ 1.1.1.3: Unit 1 RB 623'-0" Elevation Mezzanine Level	July 2012
1R05	Quad Cities Generating Station Pre-Fire Plan	FZ 8.2.6.A: Unit 1 TB 595'-0" Elevation. Hallway	June 2012
1R05	QCOP 1300-02	RCIC System Manual Startup (Injection/Pressure Control)	31
1R05	QCARP 0030-04	TB-II Unit 2—Injection with RCIC and Bringing the Unit to Cold Shutdown	25
1R05	EC 384980	MSO 2AC—RCIC Suction Valve Spurious Operation	0
1R05	EC 384995	MSO 8I	0
1R05	QCOA 0010-12	Fire/Explosion	47
1R05	EC 385597	Fire Safe Shutdown Time Zero Evaluation	0
1R05	CR 01271644	NRC URI—Post Fire Safe Shutdown Procedure Entry Requirements	October 2011
<b>Section 1R11</b>			
1R11	QCGP 1-1	Normal Unit 1 Startup	110
<b>Section 1R12</b>			
1R12	IR 4002515	MRULE A1DE Required for Main Steam RX0203-02	04/25/2017
<b>Section 1R13</b>			
1R13		Protected Equipment Checklist	04/25/2017
1R13	IR 3990646	OLL U2 Online Risk Color Change Not Properly Communicated	03/28/2017
1R13	IR 3991724	Operations EP Crew Clock Resets: Unit 2 Online Risk	03/30/2017
1R13		Protected Equipment Checklist	05/16/2017
<b>Section 1R15</b>			
1R15	IR 2466501	OOT, EPN 1-1360-8205B, Trend Code B4	03/10/2015
1R15	IR 3998137	U-1 RCIC Flow Controller Issue	04/14/2017
1R15	IR 3998478	U1 RCIC Failed Surveillance Testing	04/15/2017
1R15	QCIPM 1300-04	RCIC Woodward Governor EG-M Control Box and Ramp Generator/Signal Convertor (RG/SC) in Field Calibration	3
1R15	SIL No. 351	HPCI and RCIC Turbine Control System Calibration	1
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## LIST OF ACRONYMS USED

ΔCDF	Delta Core Damage Frequency
AC	Alternating Current
ADAMS	Agencywide Document Access and Management System
ADS	Automatic Depressurization System
AR	Action Request
CAP	Corrective Action Program
CFR	<i>Code of Federal Regulations</i>
CS	Core Spray
DRP	Division of Reactor Projects
EC	Engineering Change
ECAPE	Equipment Corrective Action Program Evaluation
ECCS	Emergency Core Cooling System
EDGCWP	Emergency Diesel Generator Cooling Water Pump
ERV	Electromatic Relief Valve
FIN	Finding
FZ	Fire Zone
gpm	gallons per minute
HPCI	High Pressure Coolant Injection
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Issue Report
LCO	Limiting Condition for Operation
LER	Licensee Event Report
MSIV	Main Steam Isolation Valve
MSO	Multiple Spurious Operations
NCV	Non-Cited Violation
NEI	Nuclear Energy Institute
NRC	U.S. Nuclear Regulatory Commission
OSP	Outage Safety Plan
PCM	Performance Centered Maintenance
PI	Performance Indicator
PM	Planned or Preventative Maintenance
PMD	Preventive Maintenance Deferral
PMID	Preventive Maintenance Identification Number
RCIC	Reactor Core Isolation Cooling
RCS	Reactor Coolant System
RFO	Refueling Outage
RG	Regulatory Guide
RHR	Residual Heat Removal
SBGT	Standby Gas Treatment
SDP	Significance Determination Process
SRA	Senior Reactor Analyst
SSC	Structure, System, and Component
TS	Technical Specification
TSO	Transmission System Operator
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
WO	Work Order