



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION III  
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February 12, 2018

Mr. Bryan C. Hanson  
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President and CNO, Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

**SUBJECT: BYRON STATION, UNITS 1 AND 2—NRC INTEGRATED INSPECTION REPORT  
05000454/2017004; 05000455/2017004; AND EMERGENCY PREPAREDNESS  
ANNUAL INSPECTION REPORT 05000454/2017501; 05000455/2017501**

Dear Mr. Hanson:

On December 31, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Byron Station, Units 1 and 2. On January 10, 2018, the NRC inspectors discussed the results of this inspection with Mr. T. Chalmers and other members of your staff. The results of this inspection are documented in the enclosed report. The U.S. Nuclear Regulatory Commission also completed its annual inspection of the Emergency Preparedness Program. This inspection began on January 1, 2017, and the issuance of this letter closes Inspection Report 05000454/2017501; 05000455/2017501.

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

If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, Region III; the Director, Office of Enforcement, and the NRC Resident Inspector at the Byron Station.

If you disagree with the cross-cutting aspect assignment 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 Byron Station.

This letter, its enclosure, and your response (if any) will be made available for public inspections 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, Requests for Withholding."

Sincerely,

*/RA/*

Eric Duncan, Chief  
Branch 3  
Division of Reactor Projects

Docket Nos. 50-454; 50-455  
License Nos. NPF-37; NPF-66

Enclosure:  
IR 05000454/2017004; 05000455/2017004;  
05000454/2017501; 05000455/2017501

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Letter to Bryan Hanson from Eric Duncan dated February 12, 2018

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 50-454; 50-455  
License Nos: NPF-37; NPF-66

Report No: 05000454/2017004; 05000455/2017004;  
05000454/2017501; 05000455/2017501

Licensee: Exelon Generation Company, LLC

Facility: Byron Station, Units 1 and 2

Location: Byron, IL

Dates: October 1 through December 31, 2017

Inspectors: J. McGhee, Senior Resident Inspector  
C. Hunt, Resident Inspector  
G. Edwards, Health Physicist  
K. Pusateri, Reactor Engineer  
B. Bartlett, Project Engineer  
V. Meghani, Reactor Inspector  
C. Zoia, Senior Operations Engineer  
G. Hansen, Senior Emergency Preparedness Inspector  
C. Thompson, Resident Inspector,  
Illinois Emergency Management Agency

Approved by: E. Duncan, Chief  
Branch 3  
Division of Reactor Projects

Enclosure

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## SUMMARY

Inspection Report 05000454/2017004, 05000455/2017004, 05000454/2017501, 05000455/2017501; 10/01/2017 – 12/31/2017; Byron Station, Units 1 and 2; Fire Protection.

This report covers a 3-month period of inspection by resident inspectors and announced baseline inspections by regional inspectors. In addition, this report covers the annual summary report for Emergency Preparedness. One Green finding was identified by the inspectors. The finding was considered a non-cited violation (NCV) of U.S. Nuclear Regulatory Commission (NRC) regulations. 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.

### **NRC-Identified and Self-Revealed Findings**

#### **Cornerstone: Initiating Events**

- Green. A finding of very low safety significance and an associated NCV of Technical Specification 5.4.1.c, "Procedures," was self-revealed when an Operations department supervisor identified that a fire door separating two rooms containing safety-related equipment was impaired and did not meet the requirements specified in fire protection program procedures. Specifically, on October 5, 2017, a fire door was left unattended and unable to latch due to the presence of tape over the door latch assembly. The supervisor promptly removed the tape to restore the fire door's functionality and documented the as-found condition in IR 04059911, "Fire Door 0DSD474 Improperly Impaired – Tape Over Latch."

This issue was determined to be of more than minor significance because it was associated with the Initiating Events Cornerstone attribute of Protection Against External Factors (Fire) and adversely affected the cornerstone objective of limiting the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. The finding screened as having very low safety significance (Green) using IMC 0609, Appendix F, "Fire Protection Significance Determination Process," Question 1.4.3–A, since the fire finding category was determined to be Fire Containment, due to the door not being able to latch, and the combustion loading on both sides of the door was determined to result in less than the 1.5 hour threshold. The finding affected the cross-cutting area of Human Performance in the aspect of Avoiding Complacency (H.12) because the individual that impaired the door did not recognize the inherent risk in their actions and use error reduction tools to mitigate that risk. [Section 1R05]

### **Licensee-Identified Findings**

None.

## **REPORT DETAILS**

### **Summary of Plant Status**

During this inspection period, both Units 1 and 2 at Byron Station were periodically requested by the grid operator to reduce power up to as much as a few hundred megawatts for short periods to help ease congestion on the transmission system or to support the economic dispatch agreement between Exelon and the grid operator.

#### **Unit 1**

Unit 1 began the period at full power and operated at scheduled power levels for the entire inspection period.

#### **Unit 2**

Unit 2 began the period at full power and on October 1, 2017, began lowering power to support refueling outage (RFO) B2R20, which began on October 2. Unit 2 was subsequently restarted on October 20, and was synchronized to the electrical grid on October 21, 2017. Unit 2 subsequently reached full power on October 24, 2017, and operated at scheduled power levels for the remainder of the inspection period.

### **1. REACTOR SAFETY**

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

1R01 Adverse Weather Protection (71111.01)

.1 Winter Seasonal Readiness Preparations

a. Inspection Scope

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

- essential service water system;

- Unit 1 and Unit 2 main power transformers.

This activity constituted one winter seasonal readiness preparations 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 a partial system walkdown of the following risk-significant system:

- 0B control room ventilation (VC) train with the 0A VC train out-of-service during modification.

The inspectors selected this system based on its risk significance relative to the Reactor Safety Cornerstones at the time it was 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, the UFSAR, Technical Specification (TS) requirements, outstanding work orders (WOs), issue reports (IRs), and the impact of ongoing work activities on the redundant train of equipment to identify conditions that could have rendered the system incapable of performing its intended functions. The inspectors also walked down accessible portions of the system to verify system components and support equipment were aligned correctly and were 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.

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

b. Findings

No findings were identified.

.2 Semi-Annual Complete System Walkdown

a. Inspection Scope

On October 27, 2017, the inspectors performed a complete system alignment inspection of the Unit 2 component cooling water system to verify its functional capability. 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 and reviewed 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; the operability of support systems; and ensured 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.

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 the availability, accessibility, and condition of firefighting equipment in the following risk-significant plant areas:

- Unit 2 main steam & auxiliary feedwater pipe tunnels;
- Unit 1 Division 12 safety-related 4160 volts alternating current (VAC) switchgear room;
- Unit 1 Division 11 safety-related 4160 VAC switchgear room;
- Unit 2 electrical cable tunnel;
- 1B safety injection (SI) pump room and Unit 1 refueling water storage tank (RWST) tunnel; and
- 2B SI pump room and Unit 2 RWST tunnel.

The inspectors reviewed areas to assess if the licensee had implemented a fire protection program that adequately controlled combustibles and ignition sources within the plant, effectively maintained fire detection and suppression capability, maintained passive fire protection features in good material condition, and implemented adequate compensatory measures for out-of-service, degraded or inoperable fire protection equipment, systems, or features in accordance with the licensee's fire plan. The inspectors selected fire areas based on their overall contribution to internal fire risk as documented in the plant's Individual Plant Examination of External Events with later additional insights, their potential to impact equipment which could initiate or mitigate a plant transient, or their impact on the plant's ability to respond to a security event. 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 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.

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

b. Findings

Introduction: A finding of very low safety significance (Green) and an associated non-cited violation (NCV) of TS 5.4.1.c, “Procedures,” was self-revealed when an Operations department supervisor identified that a fire door separating two rooms containing safety-related equipment had hazard tape over the door latch assembly, which prevented the door from latching and did not meet the requirements of fire protection program procedures.

Description: During the day shift on October 5, 2017, the inside door knob on door 0DSD474 was discovered to be broken in a way that allowed the knob to spin, but would not unlatch the door from inside the room. Fire door 0DSD474 separated the direct current (DC) Bus 211 room and the Rod Control/DC Bus 212 room in the Unit 2 Miscellaneous Electrical Equipment Room (MEER). Plant personnel documented the deficiency in IR 04059628 to initiate a repair of the door knob and operating department personnel determined that the credited functions of the door (i.e. fire and high energy line break) remained available because the door latch still functioned, did not impair access to the room for operations and fire brigade personnel, and two other doors remained available to allow personnel egress from the room if necessary.

At 11:31 p.m. on October 5, 2017, an Operations department supervisor entering the area identified yellow and black hazard tape covering the latch on the door and concluded that the latch had been taped to prevent the door from latching. The supervisor noted that the door was not labelled to indicate that the door impairment had been approved and was being tracked as required by OP–MW–201–007, “Fire Protection System Impairment Control.” The supervisor removed the tape, closed the door, and notified station security personnel of the unauthorized impairment. The issue was subsequently documented in IR 04059911, “Fire Door 0DSD474 Improperly Impaired – Tape Over Latch,” and a prompt investigation was initiated.

The duration of the vulnerability was determined to be limited since the supervisor had traversed that same route 2 hours previously and the door had not been impaired at that time. However, since the room had multiple entrance/exit points and three security card readers allowed access to the area during the refueling outage activities, several work groups were identified to have accessed the area and interviews failed to identify the individual that taped the latch. After a discussion with several individuals, the inspectors concluded that while the tape was intentionally installed most likely to allow egress through the door while moving equipment or working in the room as a personnel safety concern due to the broken knob, the act of leaving the door impaired was an oversight and not intentional.

Analysis: The failure to follow fire protection program procedures when impairing a fire door was a performance deficiency. Specifically, the impairment of a fire door in a manner that was not in accordance with station procedures bypassed barriers established to aggregately assess the impact on the fire protection design and safe shutdown analysis. It also bypassed considerations to ensure appropriate compensatory measures were put in place to minimize the associated risk to station and plant personnel.

The performance deficiency was more than minor because it was associated with the Initiating Events Cornerstone attribute of Protection Against External Factors (Fire) and adversely affected the cornerstone objective of limiting the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the impairment of the fire door reduced the fire containment capability of the door and created a potential unmitigated risk to both divisions of safety-related DC power to Unit 2.

The finding screened as having very low safety significance (Green) using IMC 0609, Appendix F, "Fire Protection Significance Determination Process," Question 1.4.3–A, since the fire finding category was determined to be Fire Containment due to the door not being able to latch, and the combustion loading on both sides of the door was determined to result in less than the 1.5 hour threshold.

The inspectors determined that this finding affected the cross-cutting area of Human Performance in the aspect of Avoiding Complacency (H.12) because the individual that impaired the door did not recognize the inherent risk in their actions and use error reduction tools to mitigate that risk. Specifically, the work group did not communicate with either the fire marshal or the Operations department to ensure appropriate assessments were performed and mitigating actions were in place while the fire barrier (i.e. fire door) was impaired.

Enforcement: Technical Specification 5.4.1.c, "Procedures" requires, in part, that written procedures be established, implemented, and maintained covering Fire Protection Program implementation.

Procedure OP–MW–201–007, "Fire Protection System Impairment Control," established administrative controls for tracking, reporting, and restoring fire protection impairments to minimize duration and implement appropriate compensatory measures.

Section 4.4 of OP–MW–201–007 described the actions to be taken for planned impairments, including impairment review and approval actions.

Step 4.4.1.4 of OP–MW–201–007 stated that the implementing department shall impair the fire protection system, structure, or component only after the Impairment Permit is authorized.

Contrary to the above, for about 2 hours on October 5, 2017, the licensee failed to implement Step 4.4.1.4 of OP–MW–201–007 of the Fire Protection Program. Specifically, a fire barrier was impaired without obtaining the required risk review and authorization when an individual used tape to prevent a fire door from latching without obtaining the required fire marshal review and authorization to impair the barrier from the Operations Shift Manager. Upon discovery by Operations personnel, the tape was removed, door functionality was restored, and the issue was entered into the CAP as IR 04059911, Fire Door 0DSD474 Improperly Impaired – Tape Over Latch."  
**(NCV 050000455/2017004–01; Fire Barrier Impaired without Authorization)**

1R06 Flooding (71111.06)

.1 Underground Vaults

The inspectors did not identify a history of cable degradation or failure due to submergence at the site. Therefore, the underground vaults inspection sample was not performed as defined in IP 71111.06, Section-02.

1R08 Inservice Inspection Activities (71111.08)

From October 2, 2017, to October 13, 2017, the inspectors conducted a review of the implementation of the licensee's Inservice Inspection (ISI) Program for monitoring degradation of the Unit 2 reactor coolant system (RCS), steam generator (SG) tubes, emergency feedwater systems, risk-significant piping and components, and containment systems.

The reviews described in Sections 1R08.1, 1R08.2, 1R08.3, 1R08.4, and 1R08.5 below constituted one inspection sample as described by IP 71111.08.

.1 Piping Systems Inspection

a. Inspection Scope

The inspectors observed and/or reviewed records of the following Non-Destructive Examinations (NDE) required by the American Society of Mechanical Engineers, (ASME) Section XI Code, and/or Title 10 of the *Code of Federal Regulations* (CFR), Part 50.55a to evaluate compliance with the ASME Code, Section XI and Section V requirements, and if any indications and defects were detected, to determine whether these were dispositioned in accordance with the ASME Code or a U.S. Nuclear Regulatory Commission (NRC) approved alternative requirement:

- dye penetrant examination of safety injection system pipe to closure plate weld 2SI08JA-1.5/W-16;
- dye penetrant examination of reactor head nozzle 6 and 68;
- ultrasonic (UT) examination of the reactor vessel head penetrations;
- UT examination of RCS welds 2RC21AA-8/J07, 2RC21AA-8/J08, 2RC21AA-8/J09, and 2RC21AA-8/J10;
- bare metal visual examination of the reactor vessel head;
- visual examination (VT-1) of pressure retaining bolting, and reactor pressure vessel closure head washers and nuts; and
- UT examination of reactor pressure vessel closure head studs.

The inspectors observed the following NDE conducted as part of the licensee's industry initiative inspection program for thermal fatigue cracking to determine if the examination was conducted in accordance with the licensee's augmented inspection program and associated licensee examination procedures and, if any indications and defects were detected, to determine if these were dispositioned in accordance with approved procedures and NRC requirements:

- UT examination of RCS pipe bends 2RC14AA-2, 2RC14AB-2, 2RC14AC-2, and 2RC14-AD-2 in the RCS to meet Materials Reliability Program (MRP) -146,

“Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines.”

The inspectors reviewed the following examination record with relevant/recordable conditions/indications identified by the licensee to determine whether acceptance of these indications for continued service was in accordance with the ASME Code Section XI or an NRC approved alternative:

- magnetic particle examination of the welded stanchion weld; 2MS07AD-28/E-2.

The inspectors reviewed records of the following risk-significant pressure boundary ASME Code Section XI Class 1, 2, and 3 welds fabricated since the beginning of the last refueling outage to determine if the licensee followed the welding procedure, applied appropriate weld filler material, and implemented the applicable Section XI or Construction Code NDEs and acceptance criteria. Additionally, the inspectors reviewed the welding procedure specification and supporting weld procedure qualification records to determine if the weld procedure was qualified in accordance with the requirements of Construction Code and ASME Code Section IX:

- welds 1 and 2 in the SG bowl drain 2A, WO 01492481-01.

b. Findings

No findings were identified.

.2 Reactor Pressure Vessel Upper Head Penetration Inspection Activities

a. Inspection Scope

For the Unit 2 vessel head, a bare metal visual examination as well as non-visual examinations were required this outage pursuant to 10 CFR 50.55a(g)(6)(ii)(D).

The inspectors observed portions of the visual examination conducted on the Unit 2 reactor vessel head to determine if the activities were conducted in accordance with the requirements of ASME Code Case N-729-1 and 10 CFR 50.55a(g)(6)(ii)(D). In particular, the inspectors determined for a sample of penetration locations whether:

- the required visual examination scope/coverage was achieved and limitations (if applicable) were recorded in accordance with the licensee procedures;
- the licensee criteria for visual examination quality and instructions for resolving interference and masking issues were adequate; and
- if indications of potential through-wall leakage were identified, the licensee entered the condition into the CAP and implemented appropriate corrective actions.

The inspectors observed the UT conducted on the Unit 2 reactor vessel head penetrations, to determine whether the activities were conducted in accordance with the requirements of ASME Code Case N-729-1 and 10 CFR 50.55a(g)(6)(ii)(D). In particular, the inspectors determined for a sample of the head penetration locations whether:

- the required examination scope (volumetric and surface coverage) was achieved and limitations (if applicable) were recorded in accordance with the licensee procedures;
- the UT equipment and procedures applied were demonstrated by blind demonstration testing;
- if indications or defects were identified, the licensee documented the conditions in examination reports and/or entered this condition into the CAP and implemented appropriate corrective actions; and
- if indications were accepted for continued service, the licensee evaluation and acceptance criteria were in accordance with the ASME Section XI Code, 10 CFR 50.55a(g)(6)(ii)(D) or an NRC-approved alternative.

The licensee did not perform any welded repairs to vessel head penetration nozzles since the beginning of the preceding outage for Unit 2. Therefore, no NRC review was completed for this inspection procedure attribute.

b. Findings

No findings were identified.

.3 Boric Acid Corrosion Control

a. Inspection Scope

On October 2, 2017, the inspectors performed an independent walkdown of portions of the RCS and connected systems within containment which had received a recent licensee boric acid walkdown to determine if the licensee's visual examinations had effectively identified boric acid leakage that potentially degraded safety-related components. The inspectors compared the issues identified with the results of the boric acid corrosion control walkdown to evaluate the thoroughness of the program implementation. In addition, the issues were reviewed prior to containment closure at the end of the refueling outage to evaluate the licensee's corrective actions.

The inspectors reviewed the following licensee evaluation of RCS components with boric acid deposits to determine if degraded components were documented and properly evaluated in the CAP and for degraded components whether the planned or completed corrective actions met the Construction Code, ASME Section XI Code, and/or an NRC approved alternative:

- boric acid corrosion control evaluation IR 02558108; U2 FC pump leaking at casing bolting.

The inspectors reviewed the following corrective actions related to evidence of boric acid leakage to determine whether the corrective actions completed were consistent with the requirements of the ASME Code Section XI and 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action:"

- IR 02657121; Inactive Leak (2RC8037C); and
- IR 02659198; Puddle in U-2 VCT Valve Aisle, Leak from 2CV8548A.

b. Findings

No findings were identified.

.4 Steam Generator Tube Inspection Activities

a. Inspection Scope

The inspectors observed acquisition of eddy current (ET) data, interviewed ET data personnel, and reviewed documentation related to the SG ISI program to determine if:

- in-situ SG tube pressure testing screening criteria used were consistent with those identified in the Electric Power Research Institute (EPRI) TR-107620, SG In-Situ Pressure Test Guidelines and that these criteria were properly applied to screen degraded SG tubes for in-situ pressure testing;
- the numbers and sizes of SG tube flaws/degradation identified was bound by the licensee's previous outage operational assessment predictions;
- the SG tube ET examination scope and expansion criteria were sufficient to meet TS, and the EPRI 1003138, "Pressurized Water Reactor SG Examination Guidelines;"
- the SG tube ET examination scope included potential areas of tube degradation identified in prior outage SG tube inspections and/or as identified in NRC generic industry operating experience applicable to these SG tubes;
- the licensee identified new tube degradation mechanisms and implemented adequate extent of condition inspection scope and repairs for the new tube degradation mechanism;
- the licensee implemented repair methods which were consistent with the repair processes allowed in the plant TS requirements and implemented at appropriate tube locations;
- to determine if qualified depth sizing methods were applied to degraded tubes accepted for continued service;
- the licensee implemented an inappropriate "plug on detection" tube repair threshold (e.g., no attempt at sizing of flaws to confirm tube integrity);
- the licensee primary-to-secondary leakage (e.g., SG tube leakage) was below 3 gallons-per-day or the detection threshold during the previous operating cycle;
- the ET probes and equipment configurations used to acquire data from the SG tubes were qualified to detect the known/expected types of SG tube degradation in accordance with Appendix H, "Performance Demonstration for ET Examination," of EPRI 1003138, "Pressurized Water Reactor SG Examination Guidelines;"
- the licensee performed secondary side SG inspections for location and removal of foreign materials; and
- the licensee implemented repairs for SG tubes damaged by foreign material.

The licensee did not perform in-situ pressure testing of SG tubes. Therefore, no NRC review was completed for this inspection attribute.

b. Findings

No findings were identified.

.5 Identification and Resolution of Problems

a. Inspection Scope

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

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

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

b. Findings

No findings were identified.

1R11 Licensed Operator Regualification Program and Licensed Operator Performance (71111.11)

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

a. Inspection Scope

On November 1, 2017, the inspectors observed a crew of licensed operators in the plant's simulator during licensed operator regualification 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.

This inspection constituted one quarterly licensed operator regualification program simulator sample as defined in IP 71111.11-05 and satisfied the inspection program requirement for the resident inspectors to observe a portion of an in-progress annual

requalification operating test during a training cycle in which it was not observed by the NRC during the biennial portion of this IP.

b. Findings

No findings were identified.

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

a. Inspection Scope

On October 1, 2017, the inspectors observed operators maneuvering the unit to shut down for the beginning of Unit 2 refueling outage (RFO) B2R20. On October 20 and 21, 2017, the operators observed Unit 2 startup activities. These were activities that required heightened awareness. 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 procedures;
- control board manipulations;
- oversight and direction from supervisors; and
- ability to identify and implement appropriate TS actions.

The performance in these areas was compared to pre-established operator action expectations, procedural compliance and task completion requirements.

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

b. Findings

No findings were identified.

.3 Annual Operating Test Results (71111.11A)

a. Inspection Scope

The inspectors reviewed the overall pass/fail results of the Annual Operating Test administered by the licensee from September 20, 2017, through December 1, 2017, required by Title 10 of the *Code of Federal Regulations* (CFR) Part 55.59(a). The results were compared to the thresholds established in IMC 0609, Appendix I, "Licensed Operator Requalification Significance Determination Process," to assess the overall adequacy of the licensee's Licensed Operator Requalification Training Program to meet the requirements of 10 CFR 55.59. (Section 02.02)

This inspection constituted one annual licensed operator requalification examination results sample as defined in Inspection Procedure 71111.11-05.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

.1 Routine Quarterly Evaluations (71111.12Q)

a. Inspection Scope

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

- unplanned failure of steam generator pressure instrument (Function FW–17).

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

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

The inspectors assessed performance issues with respect to the reliability, availability, and condition monitoring of the system. In addition, the inspectors verified maintenance effectiveness issues were entered into the CAP with the appropriate significance characterization.

This activity 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:

- elevated risk during reactor cavity drain and head removal;
- elevated risk for non-routine activities involving low temperature overpressure protection for the RCS during plant cooldown; and
- elevated risk during reactor cavity drain down and head reinstallation.

These activities were selected based on their potential risk significance relative to the Reactor Safety Cornerstones. The inspectors verified that risk assessments were performed as required by 10 CFR 50.65(a)(4) and were accurate and complete. 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 to verify risk analysis assumptions were valid and applicable risk management requirements were met.

These activities constituted three maintenance risk assessments and emergent work samples as defined in IP 7111.13–05.

b. Findings

No findings were identified.

1R15 Operability Determinations and Functional Assessments (7111.15)

.1 Operability Evaluations

a. Inspection Scope

The inspectors reviewed the following issues:

- grayboot connectors 10 CFR Part 21 notification;
- 2A essential service water (SX) pump oil cooler found plugged with silt during Generic Letter 89–13 inspection;
- entry into modes 4, 3, 2, and 1 with 2PR11J, DC charger 212, auxiliary feedwater (AF) auto-actuation relays and turbine overspeed protection inoperable, and entry into modes 4, 3, and 2 with 2AF014G, 2AF01PB, and 2AF013A–H inoperable;
- 2B diesel generator fuel oil leak accumulation; and
- functionality assessment for fuel pool cooling system leak.

The inspectors selected these potential operability and functionality 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 TSs and USFAR 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 sample of corrective action documents to verify that the licensee was identifying and correcting any deficiencies associated with operability evaluations.

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

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18)

.1 Plant Modifications

a. Inspection Scope

The inspectors reviewed the following plant modifications:

- EC 617266; Provide Capability to Disable Water Hammer Prevention System (WHPS) Feedwater (FW) Isolation Signals during Normal Power Operations & Change WHPS SG Low Pressure/Level Control Relay Operation from Actuate on De-energized to Actuate on Energized; and
- EC 406564; Install New Valve 2CV8351 as a Redundant Isolation Valve to 2CV8350.

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

This activity constituted two permanent plant modification samples as defined in IP 71111.18–05.

b. Findings

No findings were identified.

## 1R19 Post-Maintenance Testing (71111.19)

### .1 Post-Maintenance Testing

#### a. Inspection Scope

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

- residual heat removal pump suction check valve 2RH8702A retest following maintenance required for failing the seat leakage surveillance test;
- 2B AF pump test following 12 year preventative maintenance activity for the diesel including turbocharger repair, replacement of all flexible hoses, and power head rebuilds;
- 2B centrifugal charging (CV) pump shaft replacement and upgrade;
- replacement of the 2D reactor containment fan cooler (RCFC) motor after a high speed winding fault was identified; and
- 2B main steam isolation valve (MSIV) test following repair of leaking actuator cylinder.

These activities were selected based upon the SSC's ability to impact risk. The inspectors evaluated these activities for the following: 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.

This activity constituted five 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 Safe Shutdown Management Plan (SSMP) and contingency plans for Unit 2 RFO B2R20 conducted from October 2-21, 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 RFO activities listed below:

- licensee configuration management, including maintenance of defense-in-depth commensurate with the SSMP 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;
- the status and configuration of electrical systems and switchyard activities to ensure that TS and SSMP requirements were met;
- 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;
- licensee fatigue management, as required by 10 CFR 26, Subpart I;
- refueling activities, including fuel handling;
- startup and ascension to full power operation, tracking of startup prerequisites, walkdown of the 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.

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

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22)

.1 Surveillance Testing

a. Inspection Scope

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

- 1BOSR 5.5.8.RH.5–2a; Group A Inservice Testing (IST) Requirements for Residual Heat Removal Pump 1RH01PB (IST);
- 2BOSR XII–1; Gaseous Leak Testing of the 2SI8811A/B Valve Containment Assemblies (ISOL);

- 2BOSR 4.13.1–1; Unit 2 Reactor Coolant System Water Inventory Balance Surveillance Computer Calculation (RCS); and
- 2BOSR AF–1; Verification of Unit 2 Diesel Driven Auxiliary Feedwater Pump Remote Start Capability (routine).

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

- did preconditioning occur;
- were the effects of the testing adequately addressed by control room personnel or engineers prior to the commencement of the testing;
- were acceptance criteria clearly stated, sufficient to demonstrate operational readiness, and consistent with the system design basis;
- was plant equipment calibration correct, accurate, and properly documented;
- were as-left setpoints within required ranges; and was the calibration frequency in accordance with TSs, the UFSAR, plant procedures, and applicable commitments;
- was measuring and test equipment calibration current;
- was the test equipment used within the required range and accuracy, and were applicable prerequisites described in the test procedures satisfied;
- did test frequencies meet TS requirements to demonstrate operability and reliability;
- were tests performed in accordance with the test procedures and other applicable procedures;
- were jumpers and lifted leads controlled and restored where used;
- were test data and results accurate, complete, within limits, and valid;
- was test equipment removed following testing;
- where applicable for IST activities, was testing performed in accordance with the applicable version of Section XI of the ASME Code and were reference values consistent with the system design basis;
- was the unavailability of the tested equipment appropriately considered in the performance indicator (PI) data;
- were test results not meeting acceptance criteria addressed with an adequate operability evaluation or was the system or component declared inoperable;
- was the reference setting data accurately incorporated into the test procedure;
- was equipment returned to a position or status required to support the performance of its safety functions following testing;
- were problems identified during the testing appropriately documented and dispositioned in the licensee's CAP;
- were annunciators and other alarms demonstrated to be functional and were setpoints consistent with design requirements; and
- were alarm response procedure entry points and actions consistent with the plant design and licensing documents.

These inspections constituted one routine surveillance testing sample, one in-service testing sample, one reactor coolant system leak detection inspection sample, and one containment isolation valve testing sample as defined in IP 71111.22, Sections 02 and 05.

b. Findings

No findings were identified.

1EP4 Emergency Action Level and Emergency Plan Changes (71114.04)

a. Inspection Scope

This inspection covers the period from July 1, 2016, through June 30, 2017. There were no changes made to the Byron Station Emergency Plan and Emergency Action Levels during this inspection period. Therefore, there were no minimum samples available to conduct this inspection.

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 December 12, 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 classifications, 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**

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

.1 Engineering Controls (02.02)

a. Inspection Scope

The inspectors reviewed procedural guidance for the use of ventilation systems and assessed whether the systems were used, to the extent practicable, during high-risk activities to control airborne radioactivity and minimize the use of respiratory protection.

The inspectors assessed whether installed ventilation airflow capacity, flow path, and filter/charcoal unit efficiencies for selected systems were consistent with maintaining concentrations of airborne radioactivity in work areas below the concentrations of an airborne area to the extent practicable. The inspectors also evaluated whether selected temporary ventilation systems used to support work in contaminated areas were consistent with licensee procedural guidance and were as-low-as-reasonably-achievable.

The inspectors reviewed select airborne monitoring protocols to assess whether alarms and setpoints were sufficient to prompt worker action. The inspectors assessed whether the licensee established trigger points for evaluating levels of airborne beta-emitting and alpha-emitting radionuclides.

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

b. Findings

No findings were identified.

.2 Use of Respiratory Protection Devices (02.03)

a. Inspection Scope

The inspectors assessed whether the licensee provided respiratory protection devices for those situations where it was impractical to employ engineering controls such that occupational doses were as-low-as-reasonably-achievable (ALARA). For select instances where respiratory protection devices were used, the inspectors assessed whether the licensee concluded that further engineering controls were not practical. The inspectors also assessed whether the licensee had established a means to verify that the level of protection provided by the respiratory protection devices was at least as good as that assumed in the work controls and dose assessment.

The inspectors assessed whether the respiratory protection devices used to limit the intake of radioactive materials were certified by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA) or had been approved by the NRC. The inspectors evaluated whether the devices were used consistent with their NIOSH/MSHA certification or any conditions of their NRC approval.

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

The inspectors evaluated whether selected individuals qualified to use respiratory protection devices had been deemed fit to use the devices by a physician.

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

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

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

b. Findings

No findings were identified.

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

a. Inspection Scope

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

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

The inspectors assessed whether appropriate mask sizes and types were available for use. The inspectors evaluated whether on-shift operators had facial hair that would interfere with the sealing of the mask and that appropriate vision correction was available.

The inspectors reviewed the past 2 years of maintenance records for selected in-service SCBA units used to support operator activities during accident conditions. The inspectors assessed whether maintenance or repairs on an SCBA unit’s vital components were performed by an individual certified by the manufacturer of the device to perform the work. The inspectors evaluated the onsite maintenance procedures governing vital component work to determine whether there was any inconsistencies with the SCBA manufacturer’s recommended practices. The inspectors evaluated whether SCBA cylinders satisfied the hydrostatic testing required by the U.S. Department of Transportation.

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

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (71124.04)

.1 Source Term Characterization (02.02)

a. Inspection Scope

The inspectors evaluated whether the licensee had characterized the radiation types and energies being monitored and that the characterization included gamma, beta, hard-to-detect radionuclides, and neutron radiation.

The inspectors assessed whether the licensee had developed scaling factors for including hard-to-detect nuclide activity in internal dose assessments.

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

b. Findings

No findings were identified.

.2 External Dosimetry (02.03)

a. Inspection Scope

The inspectors evaluated whether the licensee's dosimetry vendor was National Voluntary Laboratory Accreditation Program accredited and if the approved irradiation test categories for each type of personnel dosimeter used were consistent with the types and energies of the radiation present and the way the dosimeter was being used.

The inspectors evaluated the onsite storage of dosimeters before their issuance, during use, and before processing/reading. For personal dosimeters stored on-site during the monitoring period, the inspectors evaluated whether they were stored in low dose areas with control dosimeters. For personal dosimeters that were taken off-site during the monitoring period, the inspectors evaluated the guidance provided to individuals with respect to the care and storage of the dosimeter.

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

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

b. Findings

No findings were identified.

.3 Internal Dosimetry (02.04)

a. Inspection Scope

The inspectors reviewed procedures used to assess internal dose using whole body counting equipment to evaluate whether the procedures addressed methods for differentiating between internal and external contamination, the release of contaminated individuals, the route of intake, and the assignment of dose. The inspectors assessed whether the frequency of measurements was consistent with the biological half-life of the nuclides available for intake. The inspectors reviewed the licensee's evaluation for the use of portal radiation monitors as a passive monitoring system to determine if instrument minimum detectable activities were adequate to detect internally deposited radionuclides sufficient to prompt additional investigation. The inspectors reviewed whole body counts and evaluated the equipment sensitivity, nuclide library, review of results, and incorporation of hard-to-detect radionuclides.

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

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

The inspectors reviewed select internal dose assessments and evaluated the monitoring protocols, equipment, and data analysis.

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

b. Findings

No findings were identified.

.4 Special Dosimetric Situations (02.05)

a. Inspection Scope

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

The inspectors reviewed the licensee's methodology for monitoring external dose in non-uniform radiation fields or where large dose gradients exist. The inspectors evaluated the licensee's criteria for determining when alternate monitoring was to

be implemented. The inspectors reviewed dose assessments performed using multi-badging to evaluate whether the assessment was performed consistently with licensee procedures and dosimetric standards.

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

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

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

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

b. Findings

No findings were identified.

**4. OTHER ACTIVITIES**

**Cornerstones: Mitigating Systems and Occupational Radiation Safety**

4OA1 Performance Indicator Verification (71151)

.1 Mitigating Systems Performance Index—Emergency AC Power System

a. Inspection Scope

The inspectors sampled licensee submittals for the Units 1 and 2 mitigating systems performance index (MSPI) - Emergency AC [Alternating Current] Power Systems performance indicator (PI) for the period from the fourth quarter of 2016 through the third quarter of 2017. The inspectors used guidance contained in NEI 99–02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, dated August 31, 2013, to determine the accuracy of the PI data reported during those periods. The inspectors reviewed the licensee's operator narrative logs, MSPI derivation reports, issue reports, event reports and NRC Integrated Inspection Reports for the period of October 2016 through September 2017 to validate the accuracy of the submittals. The inspectors reviewed the MSPI component risk coefficient to determine if it had changed by more than 25 percent in value since the previous inspection, and if so, whether the change was in accordance with applicable NEI guidance. The inspectors also reviewed the licensee's issue report database to determine if any problems had been identified with the PI data collected or transmitted for this indicator.

This activity constituted two MSPI emergency AC power system samples as defined in IP 71151–05.

b. Findings

No findings were identified.

.2 Mitigating Systems Performance Index—High Pressure Injection Systems

a. Inspection Scope

The inspectors sampled licensee submittals for the Unit 1 and 2 MSPI - High Pressure Injection Systems PI for the period from the fourth quarter of 2016 through the third quarter of 2017. The inspectors used guidance contained in NEI 99–02, “Regulatory Assessment Performance Indicator Guideline,” Revision 7, dated August 31, 2013, to determine the accuracy of the PI data reported during those periods. The inspectors reviewed the licensee’s operator narrative logs, issue reports, MSPI derivation reports, event reports and NRC Integrated Inspection Reports for the period of October 2016 through September 2017 to validate the accuracy of the submittals. The inspectors reviewed the MSPI component risk coefficient to determine if it had changed by more than 25 percent in value since the previous inspection, and if so, whether the change was in accordance with applicable NEI guidance. The inspectors also reviewed the licensee’s issue report database to determine if any problems had been identified with the PI data collected or transmitted for this indicator.

This activity constituted two MSPI high pressure injection system samples as defined in IP 71151–05.

b. Findings

No findings were identified.

.3 Mitigating Systems Performance Index—Residual Heat Removal System

a. Inspection Scope

The inspectors sampled licensee submittals for the Unit 1 and 2 MSPI - Residual Heat Removal System PI for the period from the fourth quarter of 2016 through the third quarter of 2017. The inspectors used guidance contained in NEI 99–02, “Regulatory Assessment Performance Indicator Guideline,” Revision 7, dated August 31, 2013, to determine the accuracy of the PI data reported during those periods. The inspectors reviewed the licensee’s operator narrative logs, issue reports, MSPI derivation reports, event reports and NRC Integrated Inspection Reports for the period of October 2016 through September 2017 to validate the accuracy of the submittals. The inspectors reviewed the MSPI component risk coefficient to determine if it had changed by more than 25 percent in value since the previous inspection, and if so, whether the change was in accordance with applicable NEI guidance. The inspectors also reviewed the licensee’s issue report database to determine if any problems had been identified with the PI data collected or transmitted for this indicator.

This activity constituted two MSPI residual heat removal system samples as defined in IP 71151–05.

b. Findings

No findings were identified.

.4 Occupational Exposure Control Effectiveness

a. Inspection Scope

The inspectors sampled licensee submittals for the Occupational Exposure Control Effectiveness PI for the period from the second quarter of 2016 through the second quarter of 2017. The inspectors used guidance contained in NEI 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, 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, but also considered the results of the daily inspector CAP item screening discussed in Section 4OA2.1 above, licensee trending efforts, and licensee human performance results. The inspectors' review nominally considered the 6-month period of June 2017 through November 2017, although some examples expanded beyond those dates where the scope of the trend warranted.

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, open engineering department action items, 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 activity constituted one semi-annual trend review inspection sample as defined in IP 71152.

### b. Observations and Assessments

During the Unit 2 refueling outage in October 2017, the licensee identified an adverse trends in human performance across multiple departments with respect to maintenance and surveillance performance at the site and entered the issue into their CAP as IR 04067780 and IR 04072073. During the refueling outage, the following four wrong train/wrong component errors were documented in the licensee's CAP:

- IR 04059007; Wrong Component;
- IR 04060790; Workers Identified Field Conditions Not As Expected;
- IR 04061191; Work Performed on Wrong Component; and
- IR 04064859; Incorrect SX Pump Start.

These issues were individually screened by the NRC inspectors as minor procedure violations that occurred because of poor use of Human Performance (HU) tools (component verification, procedure placekeeping, self-check, peer check and communications). The licensee's causal evaluation concluded that experienced workers performing core activities rationalized taking shortcuts with respect to HU tool application based on low risk perception. Workers involved knew the requirements, but became complacent based on past successful performance and perceived low personal risk. In addition to reinforcing accountability with the individuals involved in each event, the licensee's actions in response to the adverse trend included management interviews with every employee on the expectations for nuclear professional behaviors, increased management oversight of "low risk" maintenance activities, and increased management observations in the field for "low risk" activities to verify standards were being met.

c. Findings

No findings were identified.

40A5 Other Activities

.1 Institute of Nuclear Power Operations Plant Assessment Report Review

a. Inspection Scope

The inspectors reviewed the final report for the Institute of Nuclear Power Operations (INPO) plant evaluation conducted June 5–12, 2017. The resident staff was briefed by the licensee during the evaluation as issues were developed and at the conclusion of the evaluation. The inspectors reviewed the final report to ensure that issues identified were consistent with previous briefings and with the NRC's perspectives of licensee performance. In addition, the inspectors verified that no significant safety issues were identified that had not been previously evaluated by the NRC and required further NRC follow-up.

b. Findings

No findings were identified.

40A6 Management Meetings

.1 Exit Meeting Summary

On January 10, 2017, the inspectors presented the inspection results to Mr. T. Chalmers, Site Vice President (Acting), and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

.2 Interim Exit Meetings

Interim exits were conducted for:

- The inspection results in the Radiation Safety Program area with Mr. T. Chalmers, Site Vice President (Acting) and other members of the licensee staff on October 13, 2017;
- The inspection results in the Inservice Inspection area with Mr. T. Chalmers, Site Vice President (Acting) and other members of the licensee staff on October 13, 2017; and
- The inspection results in the Annual Operator Requalification Examination area with Mr. R. Lawlor, Operations Training Manager, on December 11, 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. The licensee acknowledged the issues presented.

ATTACHMENT: SUPPLEMENTAL INFORMATION

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### Licensee

T. Chalmers, Site Vice President (Acting)  
P. Boyle, Acting Plant Manager  
H. Welt, Operations Director  
D. Spitzer, Regulatory Assurance Manager  
G. Armstrong, Organizational Effectiveness Manager  
T. Faley, Maintenance Director  
Z. Cox, Regulatory Assurance  
C. Keller, Engineering Director  
K. McGuire, Senior Manager, Plant Engineering  
G. Wilhelmsen, Senior Manager – Design Engineering  
J. Miller, NDE Services  
Z. Cox, Regulatory Assurance Manager  
D. Merkle, Engineering Programs Manager  
B. Barton, Radiation Protection Manager  
R. Lawlor, Operations Training Manager  
R. Lloyd, Emergency Preparedness Manager

#### U.S. Nuclear Regulatory Commission

E. Duncan, Chief, Reactor Projects Branch 3

#### Illinois Emergency Management Agency

C. Thompson, Illinois Emergency Management Agency (IEMA) Resident Inspector  
C. Settles, IEMA  
L. Torres, IEMA

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

05000455/2017004-01    NCV    Fire Barrier Impaired without Authorization [Section 1R05]

### Closed

05000455/2017004-01    NCV    Fire Barrier Impaired without Authorization [Section 1R05]

### Discussed

None.

## LIST OF DOCUMENTS REVIEWED

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

### 1R01 Adverse Weather Protection

- BOP XFT-1, Revision 8; Cold Weather Operations
- WC-AA-107, Revision 18; Seasonal Readiness
- IR 04083170; Ops Rollup of Plant Freeze Protection Issues
- BOP-CW-25, Revision 35; Natural Draft Cooling Tower Operation
- BOP-CW-25T1, Revision 1; NDCT Cold Weather Temperature Control Checklist

### 1R04 Equipment Alignment

- M-96, Sheet 1, Diagram of Control Room HVAC System
- IR 04068924; 0B VC Chiller Oil Level is at Rounds Minimum
- IR 04070813; GTE: Protected Equipment Walkdown Prior to Work Window Start
- EC 383934, Revision 015; SX Safety Related Make-Up to the CC System – Unit 2
- WO 01818694; 2CC201A Did Not Meet Acceptance Criteria of 2 BOSR CC-6A
- IR 02719325; 2SX280B Not Functional-2BOSR CC-5B Cannot Be Performed
- IR 04045279; Actual Component Cooling Flows Require Evaluation
- IR 02707185; Adverse Trend: Frequency of U1/U2 CC Surge Tank Auto Makeup
- IR 04032202; 0 CC Breaker Was Unable To Be Racked Into Bus 242 Local Cub
- IR 02679492; 0B GW Comp Hx Outlet HDR RLF VLV 0CC9425B
- M-66, Sheet 3A; Diagram of Component Cooling

### 1R05 Fire Protection

- Pre-Fire Plan, Fire Zone 18.3-2, Revision 3; Miscellaneous Area 377'-0" Elevation, Unit 2 Main Steam & Auxiliary Feedwater Pip Tunnel
- Pre-Fire Plan, Fire Zone 5.1-1, Revision 3; Division 12 ESF Switchgear Room, 426' Elevation
- Pre-Fire Plan, Fire Zone 5.2-1, Revision 4; Division 11 ESF Switchgear Room, 426' Elevation
- Pre-Fire Plan, Fire Zone 11.3-1, Revision 2; Aux. Bldg. 364'-0" Elev. Unit 1 Containment Pipe Penetration Area
- Pre-Fire Plan, Fire Zone 11.3F-1, Revision 2; Aux. Bldg. 364'-0" Elev. 1B Safety Injection Pump Room/RWST Tunnel
- Pre-Fire Plan, Fire Zone 11.3-2, Revision 3; Aux. Bldg. 364'-0" Elev. Unit 2 Containment Pipe Penetration Area
- Pre-Fire Plan, Fire Zone 11.3F-2, Revision 2; Aux. Bldg. 364'-0" Elev. 2B Safety Injection Pump Room/RWST Tunnel
- Pre-Fire Plan, Fire Zone 3.1-2, Revision 2; Auxiliary Building 414'-0" Elev. Unit 2 Cable Tunnel
- IR 04059911; Fire Door 0DSD474 Improperly Impaired – Tape Over Latch
- IR 04059628; Door 0DSD474 Knob Bad Inside RD Room
- OP-MW-201-007, Revision 7; Fire Protection System Impairment Control
- BAP 1100-3A3, Revision 41; Pre-evaluated Plant Barrier Matrix

## 1R08 Inservice Inspection Activities

- AR 00212270; 2A Steam Generator Waterbox Foreign Objects; March 31, 2004
- AR 04062092; NRC ID – Cleaning of U2 FC Pump; October 12, 2017
- AR 02685746; U2 FC Pump 2FC01P Leaking at Casing Bolting; June 25, 2017
- AR 02558105; U2 FC Pump Leaking at Casing Bolting; September 21, 2017
- AR 02659198; NRC ID – Puddle in U-2 VCT Isle, Leak from 2CV8548A; April 21, 1917
- AR 02657121; Inactive Leak (2RC8037C) – Remove Insulation; April 18, 2017
- AR 02661963; B2R19 M4: Linear Indication Found During ISI Examination; April 27, 2016
- AR 02663493; U-2 CNMT Liner Plate Thickness Exams; April 30, 2016
- AR 02716155; Recordable Indications for Unit-1 IWL Concrete Surveillance; September 15, 2016
- AR 02716120; Recordable Indications for Unit-1 IWL Concrete Surveillance; September 15, 2016
- AR 03984436; FME-Identified Foreign Material in SFP; March 13, 2017
- AR 04026433; FC Piping Thickness Less than Mill Tolerance; June 28, 2017
- AR 04034192; 0SX02PA Screw Missing on Intake; July 21, 2017
- AR 04062607; B2R20 M4 2C SG Waterbox Piece Found in SG Pre-Heater; October, 13, 2017
- AREVA 51-9276009-000, Byron Unit 2 RVCH Penetration Inspection Plan and Coverage Assessment for Fall 2017 (B2R20) Outage; August 30, 2017
- ASME Weld Maps; Steam Generator Bowl Drain, Welds 1 and 2, WO 01492481-01; April 29, 2016
- CN-CECO-17-004; Evaluation of Foreign Objects in Secondary side Byron Unit 2 Steam Generator 2C-Fall 2017 Outage 2BR20; October 2017
- EC 0000619170; B2R20 Degradation Assessment; September 29, 2017
- EC 0000398736; B2R18 Pre-Mode 4 Final Condition Monitoring and Operational Assessment; October 21, 2017
- ECR 0000423419; Evaluate Maximum Depth of Removal to Perform Surface Prep for NDE Examination on 2MS01211R; April 28, 2016
- EPRI PDQS-717; Procedure 54-ISI-604-011; September 17, 2015
- EPRI PDQS-682; Procedure 54-ISI-603-005; August 19, 2014
- EPRI PDQS-859; Procedure PDI-UT-2; July 20, 2016
- ISI Isometric 2SI-1-ISI; Revision B
- ISI Isometric 2RC-1-ISI; Revision A
- Procedure ER-AA-335-014-2008; VT-1 Visual Examination in Accordance with ASME 2007 Edition, 2008 Addenda; Revision 0
- Procedure ER-AA-335-015-2008; VT-2 Visual Examination in Accordance with ASME 2007 Edition, 2008 Addenda; Revision 2
- Procedure ER-AA-335-031; Ultrasonic Examination of Austenitic Piping Welds; Revision 8
- Procedure ER-AA-335-002; Liquid Penetrant Examination; Revision 9
- Procedure ER-AP-335-001; Bare Metal Visual Examination for Nickel Alloy Materials; Revision 6
- Procedure ER-AP-331-1001; BACC Inspections, Implementation and Inspection Guidelines; Revision 9
- Procedure ER-AP-331-1002; BACC Program Identification, Screening and Evaluation; Revision 9
- Procedure ER-AP-420-0051; Conduct of Steam Generator Management Program Activities; Revision 22
- Procedure ER-AP-420-002; Byron/Braidwood Unit 2: Steam Generator Eddy Current Activities; Revision 55
- Procedure 54-ISI-604-014; AREVA Automated UT Examination of Open Tube RPV Closure Head Penetrations; Revision 14

- Procedure 54-ISI-603-009; AREVA Automated UT Examination of RPV Closure Head Penetrations Containing Thermal Sleeves; Revision 9
- Procedure PDI-UT-2; Generic Procedure for the Ultrasonic Examination of Austenitic Pipe Welds; Revision G
- Procedure EXE-PDI-UT-2; Ultrasonic Examination of Austenitic Pipe Welds; Revision 8
- Procedure EXE-PDI-UT-5; Straight Beam Ultrasonic Examination of Austenitic Pipe Welds; Revision 2
- PQR 677; PCI Energy Services; April 9, 2001
- PQR 761; PCI Energy Services; Revision 0
- Report B2R20-PT-001; Liquid Penetrant Examination, 2SI08JA-1.5/W-16, Closure Plate; October 2, 2017
- Report 2017-PT-062; Liquid Penetrant Examination Data Sheet – Reactor Head Nozzle 68; October 7, 2017
- Report 2017-PT-063; Liquid Penetrant Examination Data Sheet – Reactor Head Nozzle 6; October 7, 2017
- Report PT-909081-A-01; SG A Channel Head Drain, Base Metal and Seal Weld; April 27, 2016
- Report PT-909081-A-02; SG A Channel Head Drain, 1<sup>st</sup> layer; April 27, 2016
- Report PT-909081-A-03; SG A Channel Head Drain, Completed 1<sup>st</sup> Layer; April 27, 2016
- Report PT-909081-A-04; SG A Channel Head Drain, 1<sup>st</sup> 3/16” layer; April 27, 2016
- Report PT-909081-A-08; SG A Channel Head Drain, Final; April 27, 2016
- Report B2R20-UT-002; UT Calibration/Examination-2RC-01-R/S01-S18; October 6, 2017
- Report B2R20-UT-004; UT Calibration/Examination-2RC21AA-8/J07; October 4, 2017
- Report B2R20-UT-005; UT Calibration/Examination-2RC21AA-8/J08; October 4, 2017
- Report B2R20-UT-006; UT Calibration/Examination-2RC21AA-8/J09; October 4, 2017
- Report B2R20-UT-007; UT Calibration/Examination-2RC21AA-8/J10; October 4, 2017
- Report B2R20-UT-008; UT Calibration/Examination-2SI09AD-10/C14; October 5, 2017
- Report B2R20-UT-009; UT Calibration/Examination-2SI09BA-10/J03; October 5, 2017
- Report B2R20-VT-002; Visual Examination of Pressure Retaining Bolting (VT-1); October 6, 2017
- Report B2R20-VT-090; Visual Examination of Pressure Retaining Bolting (VT-1); October 6, 2017
- Report B2R19-MT-002; Magnetic Particle Examination – 2MS07AD-28/E-2; April 27, 2016
- Report B2R19-MT-003; Magnetic Particle Examination – 2MS07AD-28/E-2; April 29, 2016
- Report B2R20-VEN-001; Visual Examination 2RC01R/RPV Head Surface; October 10, 2017
- SG-SGMMP-14-03; Byron Unit 2 B2R18 Steam Generator Condition Monitoring and Operational Assessment; Revision 0
- SG-SGMP-17-25; Foreign Object Limit Analysis for the Byron Unit 2 and Braidwood Unit 2 Steam Generators; Revision 0
- SG-SGMP-17-30; Byron Unit 2 B2R20 Steam Generator Condition Monitoring and Operational Assessment; Revision 0
- WO 01781329; Craft Support for ISI Exams in the MSIV Rooms (2MS07AD-28”); April 29, 2016
- WO 01746092; IWL Visual Exam of Concrete (Class CC) CNMT Structures; November 4, 2016
- WPS 843/52 MN GTAW; PCI Energy Services; Revision 9
- WPS 143/52 MN GTAW/SMAW-1; PCI Energy Services; Revision 0
- LTR-SGDA-05-109; Final Design Review for Pre-Heater Waterbox Cap Plate at Byron Unit 2 Steam Generator A; Revision 0
- LTR-CECO-17-023; Tube Plugging and Stabilization Recommendations for Byron Unit 2 Steam Generator C Waterbox Potential Loose Parts; Revision 0

- LTR-CECO-17-022; Engineering Assessment of As-Found Condition of Byron Unit 2 Steam Generator 2C Waterbox Cap Plate during the 2BR20 Outage; October 15, 2017
- LTR-SGDA-04-87; Tubes Contacted by Potential Loose Part in Byron Unit 2 Steam Generator A, April 2004

#### 1R11 Licensed Operator Requalification Program

- 2BGP 100-1, Revision 60; Plant Heatup
- 2BGP 100-2, Revision 48; Plant Startup
- 2BGP 100-3, Revision 96; Power Ascension
- 2BGP 100-4, Revision 51; Power Descension
- 2BGP 100-5, Revision 65; Plant Shutdown and Cooldown
- 2BGP 100-6, Revision 54; Refueling Outage
- Byron Station Licensed Operator Requalification Guide for Operator Requalification on November 1, 2017
- TQ-AA-150-F25; LORT Annual Exam Status Report; Revision 6

#### 1R12 Maintenance Effectiveness

- IR 04065404; 2PT-524A Failed to Zero
- Maintenance Rule (a)(2) Evaluation Summary for Function FW-17, Post Accident Monitoring Instrumentation as Defined by Tech Specs and Required By Reg Guide; dated November 2017
- WO 04701978; 2PT-524A Failed to Zero

#### 1R13 Maintenance Risk Assessments and Emergent Work Control

- 2BOSR 4.12.4-1, Revision 2; Reactor Coolant System Overpressure Protection Systems Operability Non-Routine Surveillance
- OP-AA-108-117, Revision 4; Protected Equipment Program

#### 1R15 Operability Evaluations

- BY-Mode-018, Revision 2; TS 3.0.4.b Evaluation – Entry into Modes 4, 3, 2, and 1 with 2PR11J, DC Charger 212, AF Auto Actuation Relays Inoperable and Entry into Modes 4, 3, and 2 with 2AF014G, 2AF01PB, and 2AF013A-H Inoperable
- BY-Mode-018, Revision 3; TS 3.0.4.b Evaluation – Entry into Modes 4, 3, 2, and 1 with 2PR11J, DC Charger 212, AF Auto Actuation Relays Inoperable, and Turbine Overspeed Protection Inoperable and Entry into Modes 4, 3, and 2 with 2AF014G, 2AF01PB, and 2AF013A-H Inoperable
- IR 0403641; Review of 10 CFR Part 21 Notification on Grayboot Connectors
- IR 04051633; Update for 10 CFR Part 21 on Grayboot Connectors
- BHP 4200-91, Revision 6; EGS Grayboot (GB-1) Connector Installation
- IR 04077945; Multiple Leaks on 2B DG
- BYR96-126, Revision 7, Diesel Oil Storage Tank Level Setpoints
- IR 04083000; 2SX01AA Heat Exchanger Failed GL 89-13 Inspection
- IR 02735109; 2SX01AA Failed GL 89-13 Acceptance Criteria
- EC 617320, Revision 0; Reportability Evaluation for 2A SX Pump Oil Cooler Silting
- IR 04084103; Dry Boric Acid Identified on FC Discharge Piping
- EC 0000622466, Revision 0; Functionality Eval for Through Wall Leak on 0FC03B-14” per N-513-4
- M-63, Sheet 1C; Diagram of Fuel Pool Cooling and Clean-up

### 1R18 Plant Modifications

- IR 04064084; 2FW009C Abnormality During Final WHPS Testing
- EC 617266; Provide Capability to Disable Water Hammer Prevention System (WHPS) Feedwater (FW) Isolation Signals During Normal Power Operations & Change WHPS SG Low Pressure/Level Control Relay Operation From Actuate on De-energized to Actuate on Energized
- WO 0-4631585; Change Water Hammer Prevention Control EC 617266
- IR 04062009; Issues Found During WO 4631585-12 (EC 617266)
- IR 04064452; Issues During FVIV Testing (2BOSR 3.2.9-3)
- 2BOSR 3.2.9-3, Revision 16; Unit Two Feedwater Isolation Valve Stroke on Simulated SI Signal
- EC 406564; Design Consideration Summary (DCS)
- WO 01952003; Install New Isolation Valve Downstream of 2CV8350
- IR 02669711; Unit 2 RCDT Pressurization and Unusual Event

### 1R19 Post Maintenance Testing

- IR 04036567; 2D RCFC High Speed Fan Start Aborted Due to Amps
- WO 04668523; 2D RCFC High Speed Fan Start Aborted Due to Amps
- WO 01927735; Ops Perform 2BOSR 4.14.1-3A With RCS Pressure 350# to 400#
- 2BOSR 4.14.1-3A, Revision1; Unit Two Reactor Coolant System Pressure Isolation Valve and Cold Leg Injection Isolation Valve Leakage (350-400 PSIG) Surveillance
- WO 01155006; 12 Year PM for AF Diesel
- WO 01915180; Rebuild/Replace Power Assemblies
- WO 01894388; Replace Flexible Hoses
- IR 04063637; Water in 2B AF Pump Crankcase
- IR 04064142; 2B AF Pump Oil Leak on Engine
- WO 04664969; 2AF01PB Group B IST Requirements for Diesel Driven AF Pump
- 2BOSR 5.5.8.AF.5-2B, Revision 8; Unit Two Group B Inservice Testing (IST) Requirements for Diesel Driven Auxiliary Feedwater Pump 2AF01PB
- IR 04064175; Actuator Upper End Cover Hydraulic Leak
- WO 04700554; Write New Work Request for 2B MSIV Hydraulic Actuator EQ Inspect & Overhaul Leaking Cylinder
- BMP 3114-2, Revision 21; Main Steam Isolation Valve Actuator – Draining and Charging
- BMP 3114-4, Revision 18 Main Steam Isolation Valve Actuator Inspection and Repair
- WO 01931650; 2MS001A-D Full Stroke Test
- 2BOSR 7.2.1-1, Revision 15; Unit Two Main Steam Isolation Valve Operability

### 1R20 Refueling and Other Outage Activities

- IR 04058099; 2BOA SEC-6 Entered During Unit 2 Shutdown
- IR 04059007; Wrong Component Near Miss
- IR 04061191; Work Performed on Wrong Component – Near Miss
- IR 04061684; CROP Overflowed to Woodland Creek
- IR 04060784; Unplanned TRM LCOAR FHB Ventilation Systems
- IR 04060790; Workers Identified Field Conditions For Work Not as Expected – Near Miss
- IR 04061894; Untagged Grounds Applied to Bus 233Z
- WO 01151719; Upgrade of 2B CV Pump Shaft

## 1R22 Surveillance Testing

- WO 04664970; 1RH01PB Group A IST Requirements for Residual Heat Removal Pump
- 1BOSR 5.5.8.RH.5-2a, Rev. 8; Group A Inservice Testing (IST) Requirements For Residual Heat Removal Pump 1RH01PB
- UFSAR Sections 5.4.7, 6.3, and Table 14.2-17
- Drawing M-61; Diagram of Safety Injection
- 2BOSR XII-1, Revision 3; Gaseous Leak Testing of the 2RH01SA/B Valve Containment Assemblies
- WO 0194550; Perform As Found Leak Test on 2RH01SA per 2BOSR XII-1
- WO 0194551; Perform As Found Leak Test on 2RH01SB per 2BOSR XII-1
- IR 04066674; Unit 2 RCS Leak Rate Exceeded Action Levels
- IR 04074994; Unit 2 RCS Leak Rate Exceeded ACMP Values
- IR 04075257; Active Leak on 2PS9350B
- IR 04075305; Leak By on 2CV8514 Packing
- IR 04075647; 2PS9365B is Leaking
- IR 04075627; Unit 2 RCS Leak Rate Exceeded Deviation Action Levels
- 2BOSR 4.13.1-1, Revision 22; Unit 2 Reactor Coolant System Water Inventory Balance Surveillance Computer Calculation
- 2BOSR AF-1, Revision 7; Verification of Unit Two Diesel Driven Auxiliary Feedwater Pump Remote Start Capability
- IR 04085264; 2B AF Pump Local Light Indication Trouble

## 1EP6 Drill Evaluation

- Byron Training Drill Scenario Guide

## 2RS3 In-Plant Airborne Radioactivity Control and Mitigation

- RP-AA-13; Respiratory Protection Program Description; Revision 0
- RP-AA-440; Respiratory Protection Program; Revision 13
- RP-AA-441; Evaluation and Selection Process For Radiological Respiratory Respirator Use; Revision 6
- RP-AA-443; Quantitative Respirator Fit Testing; Revision 14
- RP-AA-825; Maintenance, Care and Inspection of Respiratory Protective Equipment; Revision 8
- RP-AA-825-1020; Operation and Use of Air Line Supplied Respirators; Revision 1
- RP-AA-825-1035; Issue and Control of Respirators; Revision 2
- RP-AA-870-1001; Set-Up and Operation of Portable Air Filtration Equipment; Revision 7
- RP-AA-870-1003; Testing Portable HEPA Filter Units; Revision 5
- RP-AA-825-1037; Use and Maintenance of MSA Custom Air V Escape SCBA; Revision 6
- RWP BY-2-17-00705; S/G Eddy Current Testing and Tube Repairs, Task 1; Revision 00
- RWP BY-2-17-00704; S/G Install/Remove Nozzle Covers and Dams, Task 1; Revision 00
- ALARA Plan Number BY-02-17-00705; S/G Eddy Current Testing and Tube Repairs; Revision 22
- ALARA Plan Number BY-02-17-00704; S/G Install/Remove Covers and Dams; Revision 22
- MSA Posi3 USB Test Results; Face Piece Test, MSA Ultra Elite, Exelon Byron; dated July 21, 2017
- MSA Posi3 USB Test Results; Airline Apparatus Test, MMR/Firehawk PremAire, Exelon Byron; dated July 20, 2017
- MSA Posi3 USB Test Results; Complete SCBA Test, Firehawk M7 Air Mask, 4500 PR14, Exelon Byron; dated July 21, 2017

- Professional Service Industries; Quarterly Service Air and Self Contained Breathing Apparatus Performed 9.6.17; dated September 6, 2017
- RP-BY-825-1003; Emergency SCBA Storage Locations; dated July 21, 2017
- IR 03989411; Lack of Respirator Quals; dated March 25, 2017
- IR 02666754; Removed Charcoal and All Associated Filters for 2VP01SA/B; dated May 7, 2016
- IR 02575852; NRC ID Potential Finding: Grade D Breathing Air Requirements; dated October 22, 2015
- IR 04050203; Discrepancies Identified In Process for Respirator Mask Fit; dated September 7, 2017
- IR 02643005; Ineffective Respirator 2 Training Identified; dated March 15, 2016

#### 2RS4 Occupational Dose Assessment

- RP-AA-203; Exposure Control and Authorization; Revision 5
- RP-AA-203-1001; Personnel Exposure Investigations; Revision 9
- RP-AA-210; Dosimetry Issue, Usage, and Control; Revision 27
- RP-AA-210-1001; Dosimetry Logs and Forms; Revision 10
- RP-AA-211; Personnel Dosimetry Performance Verification; Revision 13
- RP-AA-222; Methods for Estimating Internal Exposure from In-Vivo and In-Vitro Bioassay Data; Revision 5
- RWP BY-2-17-00705; S/G Eddy Current Testing and Tube Repairs, Task 1; Revision 00
- RWP BY-2-17-00704; S/G Install/Remove Nozzle Covers and Dams, Task 1; Revision 00
- ALARA Plan Number BY-02-17-00705; S/G Eddy Current Testing and Tube Repairs; Revision 22
- ALARA Plan Number BY-02-17-00704; S/G Install/Remove Covers and Dams; Revision 22
- RP-AA-210-1001 EDEX Location Verification; EID# C188474; dated October 8, 2017
- RP-AA-210-1001 EDEX Location Verification; EID# C243567; dated October 7, 2017
- RP-AA-210-1001 EDEX Location Verification; EID# C164535; dated October 6, 2017
- Survey Map #304; Steam Generator Channel Head Radiation Levels; Survey #2017-2823; dated October 5, 2017
- Survey Map #304; Steam Generator Channel Head Radiation Levels; Survey #2017-2822; dated October 5, 2017
- Survey Map #304; Steam Generator Channel Head Radiation Levels; Survey #2017-2828; dated October 6, 2017
- ABACOS-Plus; Fastscan B2, Whole-Body Count, Byron; dated February 7, 2017
- IR 02637888; Sentinel Dosimetry Issuance Over-Exposure Possible; dated March 7, 2016
- IR 02729929; RP Check-In Deficiency Identified; dated October 16, 2016
- IR 02618532; Lic ID NCV – Control of Electronic Dosimeter; dated January 28, 2016
- IR 03983308; Work Group Exceeded Dose Goal; dated March 9, 2017
- IR 02657537; B2R19 LL: Dose Not Identified; dated April 18, 2016
- IR 02579284; WBC1 Failed Calibration; dated July 30, 2015

#### 4OA1 Performance Indicator Verification

- PI Summary; Occupational Exposure Control Effectiveness; Second Quarter of 2016 through Second Quarter of 2017
- MSPI Derivation Reports for Emergency AC Power for the Period of October 2016 through September 2017
- MSPI Derivation Reports for High Pressure Injection for the Period of October 2016 through September 2017

- MSPI Derivation Reports for Residual Heat Removal for the Period of October 2016 through September 2017
- BY-MSPI-001, Revision 19; Reactor Oversight Program MSPI Basis Document Byron Nuclear Generating Station

#### 40A2 Problem Identification and Resolution

- IR 04049570; Interval Between Consecutive Inspections Exceeded 75 Minutes
- IR 04050204; Potential Trend in Missed Surv/Actions Identified
- IR 04056059; Hot Work Not Signed in Causes Unplanned LCOAR
- IR 04056247; Corporate Identifies Negative Trend in Fire Protection
- IR 04059007; Wrong Component
- IR 04060790; Workers Identified Field Conditions Not As Expected
- IR 04061191; Work Performed on Wrong Component
- IR 04064859; Incorrect SX Pump Start
- IR 04067780; Trend in Wrong Train/Component Events During B2R20
- IR 04067780; Trend Requires Additional Causal Analysis
- Engineering Open Action Backlog List dated December 27, 2017

## LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access Management System
AF	Auxiliary Feedwater
ALARA	As-Low-As-Reasonably-Achievable
ASME	American Society of Mechanical Engineers
CAP	Corrective Action Program
CFR	<i>Code of Federal Regulations</i>
CV	Centrifugal Charging
DC	Direct Current
DRP	Division of Reactor Projects
EPRI	Electric Power Research Institute
ET	Eddy Current
FPR	Fire Protection Report
FW	Feedwater
HELB	High Energy Line Break
HU	Human Performance
IMC	Inspection Manual Chapter
INPO	Institute of Nuclear Power Operations
IP	Inspection Procedure
IR	Inspection Report
IR	Issue Report
ISI	Inservice Inspection
IST	Inservice Testing
MEER	Miscellaneous Electrical Equipment Room
MSIV	Main Steam Isolation Valve
NCV	Non-Cited Violation
NDE	Non-Destructive Examination
NEI	Nuclear Energy Institute
NIOSH/MSHA	National Institute for Occupational Safety and Health/Mine Safety and Health Administration
NRC	U.S. Nuclear Regulatory Commission
PI	Performance Indicator
PM	Planned or Preventative Maintenance
PMT	Post-Maintenance Testing
RCFC	Reactor Containment Fan Cooler
RCS	Reactor Coolant System
RFO	Refueling Outage
RWST	Refueling Water Storage Tank
SCBA	Self-Contained Breathing Apparatus
SG	Steam Generator
SI	Safety Injection System
SSMP	Safe Shutdown Management Plan
SX	Service Water
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
UT	Ultrasonic Examination
VAC	Volts Alternating Current
WHPS	Water Hammer Prevention System
WO	Work Order