



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION III  
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January 24, 2017

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

SUBJECT: BYRON STATION, UNITS 1 AND 2—NRC INTEGRATED INSPECTION REPORT  
05000454/2016004; 05000455/2016004; 07200068/2016001 AND EMERGENCY  
PREPAREDNESS ANNUAL INSPECTION REPORT 05000454/2016501;  
05000455/2016501

Dear Mr. Hanson:

On December 31, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Byron Station, Units 1 and 2. On January 18, 2016, the NRC inspectors discussed the results of this inspection with Mr. T. Chalmers and other members of your staff. The inspectors documented the results of this inspection in the enclosed inspection report. The NRC also completed its annual inspection of the Emergency Preparedness Program. This inspection began on January 1, 2016, and the issuance of this letter closes Inspection Report 05000454/2016501; 05000455/2016501.

The NRC inspectors did not identify any findings or violations of more than minor significance during this inspection.

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC's Public Document Room or from

B. Hanson

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Sincerely,

*/RA/*

Eric Duncan, Chief  
Branch 3  
Division of Reactor Projects

Docket Nos. 50-454; 50-455; 72-068  
License Nos. NPF-37; NPF-66  
Enclosure:  
IR 05000454/2016004; 05000455/2016004;  
07200068/2016001; 05000454/2016501;  
05000455/2016501

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 50-454; 50-455; 72-068  
License Nos: NPF-37; NPF-66

Report No: 05000454/2016004; 05000455/2016004;  
07200068/2016001; 05000454/2016501;  
05000455/2016501

Licensee: Exelon Generation Company, LLC

Facility: Byron Station, Units 1 and 2

Location: Byron, IL

Dates: October 1 through December 31, 2016

Inspectors: J. McGhee, Senior Resident Inspector  
J. Draper, Resident Inspector  
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Approved by: E. Duncan, Chief  
Branch 3  
Division of Reactor Projects

Enclosure

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## **SUMMARY**

Inspection Report 05000454/2016004, 05000455/2016004, 07200068/2016001; 05000454/2016501, 05000455/2016501; 10/01/2016 – 12/31/2016; Byron Station, Units 1 and 2; Routine Integrated Inspection Report and Annual Emergency Preparedness Summary Report.

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 and a review of the Independent Spent Fuel Storage Installation (ISFSI) operation. No findings of significance were identified by the inspectors. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," dated February 2014.

## REPORT DETAILS

### Summary of Plant Status

During this inspection period, both Unit 1 and 2 at Byron Station were periodically scheduled to vary electrical output by the grid operator to ramp down 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 began the period at full power and operated at scheduled power levels for the entire inspection period.

Unit 2 began the period at full power, and was manually tripped on October 12, 2016, when operators recognized lowering water levels in the Unit 2, 'B' and 'C' steam generators due to the unexpected closure of the associated feedwater isolation valves. The plant and operator response to the event are discussed further in Section 4OA3 of this report. Unit 2 was restarted on October 13, 2016, and operated at scheduled power levels for the remainder of the inspection period.

### **1. REACTOR SAFETY**

#### **Cornerstones: Initiating Events, Mitigating Systems, 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 identified adverse weather issues at an appropriate threshold and entered them into the CAP. The inspectors' reviews focused specifically on the following plant systems due to their risk significance or susceptibility to cold weather issues:

- Safety Injection – Refueling Water Storage Tank; and
- Fire Protection

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

b. Findings

No findings were identified.

.2 Readiness for Impending Adverse Weather Condition—Thunderstorms

a. Inspection Scope

Since thunderstorms were forecast in the vicinity of the facility for November 2, 2016, the inspectors reviewed the licensee's overall preparations/protection for the expected weather conditions. On November 2, 2016, the inspectors walked down the essential service water (SX) cooling towers and the condensate storage tanks, in addition to the licensee's emergency alternating current (AC) power systems, because their safety-related functions could be affected or required as a result of high winds or tornado-generated missiles or the loss of offsite power. The inspectors compared licensee staff preparations to site procedures. During the inspection, the inspectors focused on plant-specific design features and the licensee's procedures used to respond to specified adverse weather conditions. The inspectors also toured the plant grounds to look for any loose debris that could become missiles during a tornado. The inspectors evaluated operator staffing and accessibility of controls and indications for those systems required to control the plant. Additionally, the inspectors reviewed the UFSAR and performance requirements for systems selected for inspection, and verified that operator actions were appropriate as specified by plant-specific procedures. The inspectors also reviewed a sample of CAP items to verify that the licensee identified adverse weather issues at an appropriate threshold and dispositioned them through the CAP in accordance with station corrective action procedures.

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

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04)

.1 Quarterly Partial System Walkdowns

a. Inspection Scope

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

- Unit 2 Train B (2B) containment spray (CS) subsystem while the 2A CS subsystem was out-of-service for planned maintenance;
- Unit 2 Train A (2A) residual heat removal (RH) pump and heat exchanger before the 2B RH pump and heat exchanger were removed from service for planned maintenance;
- Unit 1 Train A (1A) SX subsystem while the 1B SX subsystem was out-of-service for planned maintenance; and
- Unit 2 Train A (2A) auxiliary feedwater (AF) pump while the 2B AF pump was out-of-service for planned maintenance.

The inspectors selected these systems based on their risk significance relative to the Reactor Safety Cornerstones at the time they were inspected. The inspectors attempted to identify any discrepancies that could impact the function of the system and, therefore, potentially increase risk. The inspectors reviewed applicable operating procedures, system diagrams, the UFSAR, Technical Specification (TS) requirements, outstanding work orders (WOs), issue reports, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have rendered the systems incapable of performing their intended functions. The inspectors also walked down accessible portions of the systems to verify system components and support equipment were aligned correctly and operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no obvious deficiencies. The inspectors also verified that the licensee had properly identified and resolved equipment alignment problems that could cause initiating events or impact the capability of mitigating systems or barriers and entered them into the CAP with the appropriate significance characterization.

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

b. Findings

No findings were identified.

.2 Semi-Annual Complete System Walkdown

a. Inspection Scope

On November 8, 2016, the inspectors performed a complete system alignment inspection of the Unit 2 Feedwater System to verify the functional capability of the system. This system was selected because it was considered both safety significant and risk significant in the licensee's probabilistic risk assessment. The inspectors walked down the system to review mechanical and electrical equipment lineups; electrical power availability; system pressure and temperature indications, component labeling, component and equipment cooling, hangers and supports; operability of support systems; and to ensure that ancillary equipment or debris did not interfere with equipment operation. A review of a sample of past and outstanding WOs was performed to determine whether any deficiencies significantly affected the system function. In addition, the inspectors reviewed the CAP database to ensure that system equipment alignment problems were being identified and appropriately resolved.

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 the condition of firefighting equipment in the following risk-significant plant areas:

- Auxiliary building 426' elevation general area (Fire Zone (FZ) 11.6–0);
- Motor-operated valve room - auxiliary building 426' elevation (FZ 11.6C–0);
- Auxiliary building 401' elevation general area (FZ 11.5–0);
- Division 11 engineered safety feature (ESF) switchgear room (Fire Zone 5.1 – 1 ); and
- Division 12 ESF switchgear room (Fire Zone 5.1–2).

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 the analyzed limits; and fire doors, dampers, and penetration seals appeared to be in satisfactory condition. The inspectors also verified that minor issues identified during the inspection were entered into the licensee's CAP.

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

b. Findings

No findings were identified.

.2 Annual Fire Protection Drill Observation (71111.05A)

a. Inspection Scope

On November 26, 2016, the inspectors observed a fire brigade activation drill for a simulated fire in the Division 11 ESF switchgear room. Based on this observation, the inspectors evaluated the readiness of the plant fire brigade to fight fires. The inspectors verified that the licensee staff identified deficiencies, openly discussed them in a self-critical manner at the drill debrief, and took appropriate corrective actions. Specific attributes evaluated were:

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

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

b. Findings

No findings were identified.

1R06 Flooding (71111.06)

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

1R07 Heat Sink Performance (71111.07T)

.1 Triennial Review of Heat Sink Performance

a. Inspection Scope

The inspectors reviewed operability determinations, completed surveillances, vendor manual information, associated calculations, and inspection results associated with the diesel driven auxiliary feedwater (DDAFW) pump lube oil cooler (1AF01AB) and DDAFW pump gear oil cooler (1AF02A). These heat exchangers/coolers were chosen based on their risk-significance in the licensee’s probabilistic safety analysis and their important safety-related mitigating system support functions, their operating history, and their relatively low performance margins.

The inspectors assessed the adequacy of the testing, inspection, maintenance, and monitoring of biotic fouling and macrofouling programs to ensure proper heat transfer of the heat exchangers/coolers. The inspectors reviewed whether: (1) the methods used to inspect and clean the heat exchangers were consistent with as-found conditions identified, expected degradation trends, and industry standards; (2) the licensee’s inspection and cleaning activities had established acceptance criteria consistent with industry standards; and (3) the as-found results were recorded, evaluated, and appropriately dispositioned such that the as-left condition was acceptable.

In addition, the inspectors reviewed the condition and operation of the heat exchangers/coolers to verify consistency with design assumptions in heat transfer calculations and as described in the UFSAR. This included verification that the number of plugged tubes was within pre-established limits based on capacity and heat transfer

assumptions. In addition, the inspectors reviewed eddy current test reports and visual inspection records to determine the structural integrity of the heat exchanger.

The inspectors reviewed the performance of the ultimate heat sink (UHS) and safety-related service water systems and their subcomponents such as piping, intake screens, pumps, valves, cooling towers, etc. by tests or other equivalent methods to ensure availability and accessibility to the in-plant cooling water systems. Specifically, the inspectors reviewed the UHS in accordance with IP 71111.07, "Heat Sink Performance," Section 02.02, Sub-sections d.4 and d.7.

The inspectors reviewed the licensee's operation of the service water systems and UHS. This included a review of procedures for a loss of the service water systems and UHS, and a review of the availability and functionality of instrumentation that was relied upon for decision-making. In addition, the inspectors assessed whether macrofouling was adequately monitored, trended, and controlled by the licensee to prevent clogging. The inspectors reviewed whether the licensee's biocide treatments for biotic control were adequately conducted and the results monitored, trended, and evaluated. In addition, the inspectors reviewed design changes to the service water systems and the UHS to verify they were not adversely impacted by the changes.

The inspectors performed a system walkdown of the river screen house intake structure and essential service water cooling tower (SXCT) to assess its structural integrity and component functionality. This included observations of the structural integrity of component mounts and an assessment of the functionality of the traveling screens and strainers. The inspectors reviewed licensee activities, which monitor, trend, and maintain river screen house and SXCT bay silt accumulation at acceptable levels, and those which monitor and ensure proper functioning of cooling tower water level instruments. The inspectors also reviewed the licensee's ability to ensure functionality of the intake structure during adverse weather conditions.

In addition, the inspectors reviewed corrective action documents related to the heat exchangers/coolers and heat sink performance issues to verify that the licensee had an appropriate threshold for identifying issues and to evaluate the effectiveness of their corrective actions.

These inspection activities constituted three heat sink inspection samples as defined in IP 71111.07–05.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program (71111.11)

.1 Biennial Written and Annual Operating Test Results (71111.11A)

a. Inspection Scope

The inspectors reviewed the overall pass/fail results of the Biennial Written Examination, and the Annual Operating Test, administered by the licensee from October 10, 2016, through November 18, 2016, as required by Title 10 of the *Code of Federal Regulations* (10 CFR) 55.59(a). The results were compared to the thresholds established in

Inspection Manual Chapter 0609, Appendix I, "Licensed Operator Requalification Significance Determination Process," to assess the overall adequacy of the licensee's Licensed Operator Requalification Training (LORT) program to meet the requirements of 10 CFR 55.59. (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.

.2 Biennial Review (71111.11B)

a. Inspection Scope

The following inspection activities were conducted during the week of November 14, 2016, to assess: (1) the effectiveness and adequacy of the facility licensee's implementation and maintenance of its systems approach to training (SAT) based LORT program, put into effect to satisfy the requirements of 10 CFR 55.59; (2) conformance with the requirements of 10 CFR 55.46 for use of a plant-referenced simulator to conduct operator licensing examinations and for satisfying experience requirements; and (3) conformance with the operator license conditions specified in 10 CFR 55.53.

- Licensee Requalification Examinations (10 CFR 55.59(c); SAT element 4 as defined in 10 CFR 55.4): The inspectors reviewed the licensee's program for development and administration of the LORT biennial written examination and annual operating tests to assess the licensee's ability to develop and administer examinations that are acceptable for meeting the requirements of 10 CFR 55.59(a).
  - The inspectors conducted a detailed review of one biennial requalification written examination version to assess content, level of difficulty, and quality of the written examination materials. (02.03)
  - The inspectors conducted a detailed review of ten job performance measures (JPMs) and four simulator scenarios to assess content, level of difficulty, and quality of the operating test materials. (02.04)
  - The inspectors observed the administration of the annual operating test and biennial written examination to assess the licensee's effectiveness in conducting the examinations, including the conduct of pre-examination briefings, evaluations of individual operator and crew performance, and post-examination analysis. The inspectors evaluated the performance of one shift crew split into two operating crews in parallel with the facility evaluators during four dynamic simulator scenarios, and evaluated various licensed crew members concurrently with facility evaluators during the administration of several JPMs. (02.05)
  - The inspectors assessed the adequacy and effectiveness of the remedial training conducted since the last requalification examination and the training

planned for the current examination cycle to ensure that they addressed weaknesses in licensed operator or crew performance identified during training and plant operations. The inspectors reviewed remedial training procedures and individual remedial training plans. (02.07)

- **Conformance with Examination Security Requirements (10 CFR 55.49):** The inspectors conducted an assessment of the licensee's processes related to examination physical security and integrity (e.g., predictability and bias) to verify compliance with 10 CFR 55.49, "Integrity of Examinations and Tests." The inspectors reviewed the facility licensee's examination security procedure, and observed the implementation of physical security controls (e.g., access restrictions and simulator input/output (I/O) controls) and integrity measures (e.g., security agreements, sampling criteria, bank use, and test item repetition) throughout the inspection period. (02.06)
- **Conformance with Operator License Conditions (10 CFR 55.53):** The inspectors reviewed the facility licensee's program for maintaining active operator licenses and to assess compliance with 10 CFR 55.53(e) and (f). The inspectors reviewed the procedural guidance and the process for tracking on-shift hours for licensed operators, and which control room positions were granted watch-standing credit for maintaining active operator licenses. Additionally, medical records for eight licensed operators were reviewed for compliance with 10 CFR 55.53(l). (02.08)
- **Conformance with Simulator Requirements Specified in 10 CFR 55.46:** The inspectors assessed the adequacy of the licensee's simulation facility (simulator) for use in operator licensing examinations and for satisfying experience requirements. The inspectors reviewed a sample of simulator performance test records (e.g., transient tests, malfunction tests, scenario-based tests, post-event tests, steady state tests, and core performance tests), simulator discrepancies, and the process for ensuring continued assurance of simulator fidelity in accordance with 10 CFR 55.46. The inspectors reviewed and evaluated the discrepancy corrective action process to ensure that simulator fidelity was being maintained. Open simulator discrepancies were reviewed for importance relative to the impact on 10 CFR 55.45 and 55.59 operator actions as well as on nuclear and thermal hydraulic operating characteristics. (02.09)
- **Problem Identification and Resolution (P&IR) (10 CFR 55.59(c); SAT element 5 as defined in 10 CFR 55.4):** The inspectors assessed the licensee's ability to identify, evaluate, and resolve problems associated with licensed operator performance (a measure of the effectiveness of its LORT program and their ability to implement appropriate corrective actions to maintain its LORT Program up to date). The inspectors reviewed documents related to licensed operator performance issues (e.g., recent examination and inspection reports including cited and non-cited violations; U.S. Nuclear Regulatory Commission (NRC)

End-of-Cycle and Mid-Cycle reports; NRC Plant Issue Matrix (PIM); licensee event reports; licensee condition/problem identification reports including documentation of plant events and review of industry operating experience). The inspectors also sampled the licensee's quality assurance oversight activities, including licensee training department self-assessment reports. (02.10)

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

b. Findings

No findings were identified.

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

a. Inspection Scope

On November 8, 2016, the inspectors observed a crew of licensed operators in the plant's simulator during evaluation of operating crew "A". The inspectors observed the administration of the dynamic scenario portion of the annual operating test to assess the licensee's effectiveness in conducting the examination, including the conduct of pre-examination briefings, evaluations of individual operator and crew performance, and post-examination analysis. 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 requalification program simulator sample as defined in IP 71111.11-05.

b. Findings

No findings were identified.

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

a. Inspection Scope

On October 13, 2016, the inspectors observed reactor operator activities in the control room during a reactor startup following forced outage B2F29. This was an activity that required heightened awareness or was related to increased risk. The inspectors evaluated the following areas:

- licensed operator performance;
- crew's clarity and formality of communications;
- ability to take timely actions in the conservative direction;
- prioritization, interpretation, and verification of annunciator alarms;
- 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 inspection constituted one quarterly licensed operator heightened activity/risk sample as defined in IP 71111.11-05.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

.1 Routine Quarterly Evaluations

a. Inspection Scope

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

- Processing solid state protection system (SSPS), engineered safeguards features actuation system (ESFAS) and reactor protection systems (RPS) signals (Function EF-1); and
- Unit 2 Feedwater System (all functions)

The inspectors reviewed system failures or equipment-related events 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;
- verifying appropriate performance criteria for structures, systems, and components (SSCs)/functions classified as (a)(2).

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

b. Findings

No findings were identified.

.2 Quality Control

a. Inspection Scope

The inspectors reviewed a sample of activities under the licensee's commercial-grade dedication program to verify the program satisfied the requirements of Appendix B to 10 CFR 50 with regard to the procurement and acceptance of commercial-grade items for use as basic components in safety-related applications in accordance with 10 CFR 21 to provide reasonable assurance the commercial-grade items will perform their intended safety functions. The inspectors performed the following to assess whether the licensee's procedures for dedication activities were adequately planned and implemented:

- interviewed procurement engineering staff;
- reviewed station procedures for the dedication of commercial-grade items;
- reviewed selected technical evaluations and equivalent replacement evaluations of commercial-grade items; and
- reviewed selected test reports for acceptance of commercial-grade items.

In addition, the inspectors verified problems involving commercial-grade dedication of items were entered into the licensee's CAP with the appropriate characterization and significance. Selected issue reports were reviewed to verify corrective actions were appropriate and implemented as scheduled.

This inspection constituted one quality control maintenance effectiveness inspection 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:

- Unit common Train B (0B) non-essential service water (WS) pump out-of-service for replacement, switchyard bus 7 out-of-service for planned maintenance, and potential inoperability of 2A CS subsystem during the week of October 3, 2016;
- Switchyard bus tie breaker 3–4 unavailable for emergent repair, 2A CS subsystem out-of-service for planned maintenance, 0B WS pump out-of-service for replacement, and mode change risk evaluation for Unit 2 startup during the week of October 11, 2016;
- 1B SX subsystem out-of-service for planned maintenance, 1B AF subsystem unavailable during flow loop calibration, and 0B WS pump out-of-service for replacement during the week of October 24, 2016; and
- 1B AF out-of-service for combustion air supply modification and pump lube oil flush with auxiliary building ventilation out-of-service for planned maintenance, 2B AF pump out-of-service for a planned work window, and 0B SX makeup pump out-of-service for planned maintenance during the week of November 14, 2016.

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

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

b. Findings

No findings were identified.

1R15 Operability Determinations and Functional Assessments (71111.15)

.1 Operability Evaluations

a. Inspection Scope

The inspectors reviewed the following issues:

- Unit 2 refueling water storage tank (RWST) pump did not cycle on when expected;
- Unit 1 CS actuation relay failure;
- High oil pressure in 0A SX makeup pump gear box;
- Low crankcase oil level in 1B diesel generator;
- Non-conservatism in 3DFAC (3-dimensional Final Acceptance Criteria) analysis; and
- Unit 2 AF flow indicators failed low.

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

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

b. Findings

No findings were identified.

.2 Annual Sample: Review of Operator Workarounds

a. Inspection Scope

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

The inspectors reviewed both current and historical operational challenge records to determine whether the licensee was identifying operator challenges at an appropriate threshold, had entered them into their CAP and proposed or implemented appropriate and timely corrective actions which addressed each issue. Reviews were conducted to determine if any operator challenge could increase the possibility of an Initiating Event, if the challenge was contrary to training, required a change from long-standing operational practices, or created the potential for inappropriate compensatory actions. Additionally, all temporary modifications were reviewed to identify any potential effect on the functionality of Mitigating Systems, impaired access to equipment, or required equipment

uses for which the equipment was not designed. Daily plant and equipment status logs, control room deficiencies, open operability evaluations for degraded equipment, and actions being used to compensate for material deficiencies were also assessed to identify any potential sources of unidentified operator workarounds.

This review constituted one operator workaround annual inspection sample as defined in IP 71111.15-02.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18)

.1 Plant Modifications

a. Inspection Scope

The inspectors reviewed the following modifications:

- Engineering Change (EC) 406220/406221, Unit 1 & Unit 2 AF Diesel Combustion Air Intake Modification; and
- EC 406958, Temporarily Defeat Water Hammer Prevention System (WHPS) Feedwater Isolation Signals During Normal Power Operation for Steam Generators 2A/2B/2C/2D.

The inspectors reviewed the configuration changes and associated 10 CFR 50.59 safety evaluation screening against the design basis, the UFSAR, and the TSs, as applicable, to verify that the modification did not affect the operability or availability of the affected systems. Both issues were followed by the inspectors from identification of the degraded condition through work order implementation. The inspectors observed ongoing and completed work activities to ensure that the modifications were installed as directed and consistent with the design control and operability guidance 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. 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.

Additional discussion of the condition generating the WHPS temporary modification is included in Section 4OA3.1 of this report. This inspection constituted two 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 (PM) activities to verify that procedures and test activities were adequate to ensure system operability and functional capability:

- 0B non-essential service water pump following replacement;
- Realignment of the combustion air supply for 1B diesel-driven AF pump; and
- Repair of 2B AF diesel fuel oil leak.

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; and test documentation was properly evaluated. The inspectors evaluated the activities against TSs, the UFSAR, 10 CFR Part 50 requirements, and licensee procedures 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 inspection constituted three post-maintenance testing samples as defined in IP 71111.19-05.

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 3.2.8-644A; Unit One ESFAS Instrument Slave Relay Surveillance (Train "A" Automatic Containment Spray – K644) (routine);
- 2BOSR 8.1.20-1; Unit Two 10 Year Simultaneous Diesel Generator Start Surveillance (routine);

- 2BOSR 5.5.8.RH.5–1a; Unit Two Group A Inservice Testing Requirements for Residual Heat Removal Pump 2RH01PA (IST);
- 2BOSR 3.1.5–2; Unit Two Train B Solid State Protection Surveillance (routine); and
- 1BOSR 5.5.8.CS.5–1C; Unit One Comprehensive Inservice Testing Requirements for Containment Spray Pump 1CS01PA (IST).

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;
- where applicable, were test results not meeting acceptance criteria addressed with an adequate operability evaluation or was the system or component declared inoperable;
- where applicable for safety-related instrument control surveillance tests, 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 function following testing;
- were problems identified during the testing appropriately documented and dispositioned in the licensee's CAP;
- where applicable, were annunciators and other alarms demonstrated to be functional and were setpoints consistent with design requirements; and
- where applicable, were alarm response procedure entry points and actions consistent with the plant design and licensing documents.

This inspection constituted three routine surveillance testing samples and two in-service test samples, as defined in IP 71111.22, Sections–02 and–05. In addition, the

inspectors did not identify any performance degradation in the RCS leakage for the entire cycle; therefore, the reactor coolant system leak detection inspection sample was not performed as defined in IP 71111.22, Section-02.

b. Findings

No findings were identified.

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

.1 Emergency Response Organization Staffing and Augmentation System

a. Inspection Scope

In Byron Station, Units 1 and 2, U.S. Nuclear Regulatory Commission (NRC) Integrated Inspection Report 05000454/2016003 and 05000455/2016003 (ADAMS Accession Number ML16313A499), NRC inspectors documented the completion of a partial sample for IP 71114.03, "Emergency Response Organization (ERO) Staffing and Augmentation System," and committed to completing the full sample by the end of calendar year (CY) 2016. This inspection procedure was completed through an in-office review of the licensee's procedures and correctives actions associated with the site's backup method of ERO activation and augmentation.

The completion of this ERO Augmentation Testing Inspection constituted one sample as defined in IP 71114.03.

b. Findings

No findings were identified.

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

a. Inspection Scope

The regional inspectors performed an in-office review of the latest revisions to the Emergency Plan and Emergency Action Levels (EALs).

The licensee transmitted the Emergency Plan and EAL revisions to the NRC pursuant to the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix E, Section V, "Implementing Procedures." The NRC review was not documented in a Safety Evaluation Report and did not constitute approval of licensee-generated changes; therefore, this revision is subject to future inspection.

This EAL and Emergency Plan Changes inspection constituted one sample as defined in IP 71114.04.

b. Findings

No findings were identified.

## 2. RADIATION SAFETY

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

#### .1 Radiological Work Planning (02.02)

##### a. Inspection Scope

The inspectors selected three to five work activities of the highest exposure significance or that involved work in high dose rate areas.

The inspectors reviewed the radiological work planning as-low-as-reasonably-achievable (ALARA) evaluations, initial and revised exposure estimates, and exposure mitigation requirements. The inspectors determined if the licensee had reasonably grouped the radiological work into work activities.

The inspectors assessed whether the licensee's planning identified appropriate dose reduction techniques; appropriately considered alternate dose reduction features; and defined reasonable dose goals. The inspectors evaluated whether the licensee's ALARA assessment had taken into account decreased worker efficiency from use of respiratory protective devices and/or heat stress mitigation equipment. The inspectors determined if the licensee's work planning considered the use of remote technologies and dose reduction insights from industry and plant-specific operating experience. The inspectors assessed whether these ALARA requirements were integrated into work procedure and/or radiation work permit (RWP) documents.

The inspectors compared the results achieved with the intended dose established in the ALARA planning. The inspectors compared the person-hour estimates provided by work groups to the radiation protection group with the actual work activity time results, and evaluated the accuracy of these time estimates. The inspectors evaluated the reasons for any inconsistencies between intended and actual work activity doses.

The inspectors evaluated whether post-job reviews were conducted to identify lessons learned and entered into the licensee's CAP.

These inspection activities supplemented those documented in NRC Inspection Report 05000454/2016002; 05000455/2016002 and constituted one complete sample as defined in IP 71124.02-05.

##### b. Findings

No findings were identified.

#### .2 Verification of Dose Estimates and Exposure Tracking Systems (02.03)

##### a. Inspection Scope

The inspectors assessed whether the assumptions and basis for the current annual collective exposure estimate were reasonably accurate. The inspectors assessed source term reduction effectiveness and reviewed applicable procedures for estimating exposures from specific work activities.

The inspectors reviewed the assumptions and bases in ALARA work planning documents for selected activities and verified that the licensee has established measures to track, trend, and, if necessary, to reduce, occupational doses for ongoing work activities.

The inspectors determined whether a dose threshold criteria was established to prompt additional reviews and/or additional ALARA planning and controls and evaluated the licensee's method of adjusting exposure estimates, or re-planning work, when unexpected changes in scope or emergent work were encountered. The inspectors determined if adjustments to exposure estimates were based on sound radiation protection and ALARA principles or if they are simply adjusted to account for failures to control the work. The inspectors evaluated whether there was sufficient station management review and approval of adjustments to exposure estimates and whether the reasons for the adjustments were justifiable.

The inspectors reviewed selected occasions with inconsistent or incongruent results from the licensee's intended radiological outcomes to determine whether the cause was attributed to a failure to adequately plan work activities, or the failure to provide sufficient management oversight of in-plant work activities, or the failure to conduct the work activity without significant rework, or the failure to implement radiological controls as planned.

These inspection activities supplemented those documented in NRC Inspection Report 05000454/2016002; 05000455/2016002 and constituted one complete sample as defined in IP 71124.02-05.

b. Findings

No findings were identified.

4. **OTHER ACTIVITIES**

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

4OA1 Performance Indicator Verification (71151)

.1 Mitigating Systems Performance Index—Emergency AC Power System

a. Inspection Scope

The inspectors sampled licensee submittals for Mitigating Systems Performance Index (MSPI) - Emergency Alternating Current (AC) Power System performance indicator (PI) for Byron, Units 1 and 2, for the period from the fourth quarter of 2015, through the third quarter of 2016. The inspectors used the 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 operator narrative logs, issue reports, MSPI derivation reports, event reports and NRC Integrated Inspection Reports for the period of October 2015 through September 2016 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 inspection 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 MSPI - High Pressure Injection Systems PI for Byron, Units 1 and 2, for the period from the fourth quarter of 2015, through the third quarter of 2016. The inspectors used the 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 operator narrative logs, issue reports, MSPI derivation reports, event reports and NRC Integrated Inspection Reports for the period of October 2015 through September 2016 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 inspection 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 MSPI - Residual Heat Removal System PI for Byron, Units 1 and 2, for the period from the fourth quarter of 2015, through the third quarter of 2016. The inspectors used the 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 operator narrative logs, issue reports, MSPI derivation reports, event reports and NRC Integrated Inspection Reports for the period of October 2015 through September 2016 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 inspection constituted two MSPI residual heat removal system samples as defined in IP 71151-05.

b. Findings

No findings were identified.

.4 Reactor Coolant System Specific Activity

a. Inspection Scope

The inspectors sampled licensee submittals for the reactor coolant system specific activity PI for Byron Station, Units 1 and 2, for the period from the third quarter of 2015 through the second quarter of 2016. The inspectors used the 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 reactor coolant system chemistry samples, technical specification requirements, issue reports, event reports and NRC inspection reports to validate the accuracy of the submittals. The inspectors also reviewed the licensee's issue report database to determine if any problems had been identified with the PI data collected or transmitted for this indicator. In addition to record reviews, the inspectors observed a chemistry technician obtain and analyze a reactor coolant system sample.

This inspection constituted two reactor coolant system specific activity samples as defined in IP 71151-05.

b. Findings

No findings were identified.

.5 Occupational Exposure Control Effectiveness

a. Inspection Scope

The inspectors sampled licensee submittals for the Occupational Exposure Control Effectiveness PI for the period from the third quarter of 2015, through the second quarter of 2016. The inspectors used the guidance contained in the 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 the 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 walk-downs of numerous locked high and very high radiation area entrances to determine the adequacy of the controls in place for these areas.

This inspection constituted one occupational exposure control effectiveness sample as defined in IP 71151-05.

b. Findings

No findings were identified.

.6 Radiological Effluent Technical Specification/Offsite Dose Calculation Manual  
Radiological Effluent Occurrences

a. Inspection Scope

The inspectors sampled licensee submittals for the radiological effluent Technical Specification/Offsite Dose Calculation Manual radiological effluent occurrences PI for the period from the third quarter of 2015, through the second quarter of 2016. The inspectors used the guidance contained in the 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 issue report database and selected individual reports generated since this indicator was last reviewed to identify any potential occurrences such as unmonitored, uncontrolled, or improperly calculated effluent releases that may have impacted offsite dose. The inspectors reviewed gaseous effluent summary data and the results of associated offsite dose calculations for selected dates to determine if indicator results were accurately reported. The inspectors also reviewed the licensee's methods for quantifying gaseous and liquid effluents and determining effluent dose.

This inspection constituted one Radiological Effluent Technical Specification/Offsite Dose Calculation Manual radiological effluent occurrences 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.

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 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 2016 through November 2016, 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, and Maintenance Rule assessments. The inspectors compared and contrasted their results with the results contained in the licensee's CAP trending reports. Corrective actions associated with a sample of the issues identified in the licensee's trending reports were reviewed for adequacy.

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

b. Findings

No findings were identified.

4OA3 Follow-Up of Events and Notices of Enforcement Discretion (71153)

.1 Unit 2 Manual Reactor Trip Following Partial Feedwater Isolation

a. Inspection Scope

The inspectors reviewed the plant's response to a manual reactor trip of Unit 2 following a feedwater isolation to two of the four steam generators. At 1:38 p.m. on October 12, 2016, control room operators received an alarm that indicated that the feed breaker to motor control center (MCC) 234V4 tripped. Immediately following this alarm, the control room operators noticed that the feedwater isolation valves associated with the 'B' and 'C' steam generators were closing, causing a reduction in feedwater flow and the lowering of level of water in the associated steam generators. The control room operators identified the degrading trend and manually tripped the Unit 2 reactor before the water level reached the low water level automatic reactor trip setpoint. The inspectors responded to the control room to observe both the plant response and operator response to the event. Following the reactor trip, both Unit 2 AF pumps automatically started due to low water level in the steam generators. The inspectors observed the control room operators manually adjust flow from the AF pumps to the steam generators to maintain level in the steam generators and stabilize the plant. No

safety relief valves actuated during the transient and all safety systems responded as designed. The inspectors did not identify any issues in the licensee's response to the transient. Unit 1 was unaffected by the events on Unit 2. The licensee reported this event to the NRC in Event Notification (EN) 52295 due to the actuation of the reactor protection system (RPS) and the valid automatic actuation of the AF system. The licensee documented the loss of power to MCC 234V4 in IR 02727378.

Following the reactor trip, the licensee identified that the loss of power to MCC 234V4 caused the closure of the feedwater isolation valves. The licensee had a Water Hammer Prevention System (WHPS) installed on Unit 2 to isolate the feedwater system to protect the steam generators from experiencing a water hammer event during certain transients and startup and low power conditions. This system required power to maintain the feedwater isolation valves open if the WHPS didn't require an isolation, so when power was lost to one train of the system, the valves associated with that train failed closed, isolating feedwater to the 'B' and 'C' steam generators. The licensee performed troubleshooting to identify the cause of the MCC 234V4 feed breaker trip, but did not identify any faults or abnormal conditions on the MCC or its loads. The licensee determined the event was likely caused by an issue with the feed breaker, so the licensee removed the breaker to perform testing on it and installed a replacement breaker. Following the troubleshooting and breaker replacement, the licensee restarted Unit 2 on October 13, 2016.

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

b. Findings

No findings were identified.

4OA5 Other Activities

.1 Operation of an Independent Spent Fuel Storage Installation at Operating Plants (60855.1)

a. Inspection Scope

The inspectors observed and evaluated select licensee transfer operations of the licensee's 2016 dry fuel storage campaign to verify compliance with the applicable Certificate of Compliance conditions, the associated TSs, and approved independent spent fuel storage installation (ISFSI) procedures. Specifically, the inspectors observed unrestrained vertical transfer operations of the multi-purpose canister (MPC) from the transfer cask (HI-TRAC) to the storage cask (HI-STORM). Engineering evaluations associated with the unrestrained transfer configuration were previously reviewed by the NRC and documented in Inspection Report 05000454/2015002; 05000455/2015002; and 07200068/2015001. The inspectors reviewed procedures used to perform ISFSI transfer activities.

b. Findings

No findings were identified.

.2 (Closed) Unresolved Item 05000454/2015008–01; 05000455/2015008–01: Question Regarding the Maximum Wet Bulb Temperature Value Assumed in the Emergency Service Water Cooling Tower Tornado Analysis

As discussed in NRC Inspection Report 05000454/2015008; 05000455/2015008, the inspectors documented an Unresolved Item (URI) associated with the maximum wet bulb temperature value assumed in the SXCT tornado analysis. Specifically, the inspectors noted the analysis used a value that was less restrictive than the highest 3-hour wet-bulb temperature recorded for the site as described in the UFSAR.

The licensee provided bases documents that reflect the acceptability of the two different wet bulb temperatures, 78 degrees Fahrenheit (°F) and 82°F, which applied to two separate events discussed in the licensing basis. As applicable to this URI, a wet bulb temperature of 78°F was accepted during original licensing for evaluating the effects of tornado missiles on the SXCT fans. Specifically, the Original Byron Safety Evaluation Report (SER), Section 3.5.2, “Structures, Systems, and Components to be Protected from Externally Generated Missiles,” stated:

The applicant has provided results of an analysis (T.R. Tramm Letter to Mr. Harold R. Denton, Byron Station, Units 1 and 2, Braidwood Station, Units 1 and 2, Advance FSAR Information, NRC Docket Nos 50–454/455/456/457, dated January 2, 1982), which shows that in the event of failure of all the essential service water cooling tower fans, the essential service water system temperature can be maintained within certain limits for proper operation of safety-related equipment served in both units with the towers functioning strictly in natural draft cooling mode and makeup available from the tornado missile protected on-site wells. The staff concurs that the applicant has satisfactorily demonstrated the availability of the essential service water system and ultimate heat sink in the event of postulated tornado missiles.

The inspectors reviewed the Tramm Letter and noted the letter specified the analysis assumed “no wind, 78°F wet bulb temperature, conservative plant cooling loads (normal shutdown loads for both units plus diesel cooling loads), and a maximum initial service water temperature.” Furthermore, the analysis stated that Regulatory Guide 1.27, “Ultimate Heat Sink for Nuclear Power Plants,” Position 2, applied to the most severe natural phenomena at the site and indicated “appropriate ambient conditions” apply. The inspectors again noted that these conditions were accepted under the Original Byron SER, Section 3.5.2, which applied a 78°F wet bulb temperature, based on less than extreme weather conditions expected during a tornado event.

The inspectors determined that the use of a 78°F wet bulb temperature was within the approved licensing basis for the plant. This issue is closed.

.3 (Closed) Unresolved Item 05000454/2015008–02; 05000455/2015008–02: Maximum Wet Bulb Temperature Value Assumed in Emergency Service Water Cooling Tower Analysis Was Not Monitored

As discussed in NRC Inspection Report 05000454/2015008; 05000455/2015008, the inspectors documented a URI associated with the lack of monitoring for the maximum wet-bulb temperature value assumed in SXCT analysis. Specifically, the inspectors noted the maximum wet bulb temperature value was a critical parameter for the SXCT

analyses, but the licensee had not established a testing program to verify actual values were bounded.

The inspectors reviewed surveillance procedures, operating history, and analysis and held further discussion with licensee and Office of Nuclear Reactor Regulation staff. In discussion with licensee staff, the licensee position was that environmental conditions were bounded by analysis, and that procedures ensure required plant equipment was maintained Operable and in the required operating configuration, or the plant was taken to a lower mode of operation.

The inspectors reviewed procedure 0BOSR 0.1–0, “Unit Common, All Modes/All Times Shiftly and Daily Operating Surveillance,” Revision 56, and noted Step 12 verified whether, “All electrical divisions (11, 12, 21, 22) capable of providing power to at least one operable SXCT fan?” The inspectors noted that if this question is answered ‘No’, the licensee would be required to record outside air temperature until the condition no longer applied. If temperature were to exceed 74°F, with any electrical division not capable of providing power to at least one OPERABLE SXCT fan, the licensee would be required, per Step 12.c, to record wet bulb temperature at least once per each of the three daily shifts. This procedure was modified by notes that prompted additional monitoring and prevented intentionally degrading SXCT capability, by stating:

Note 3: To prevent inadvertently exceeding a limit, more frequent monitoring may be required as outside air temperature approaches 74°F.

Note 4: Do not intentionally remove two SXCT fans from the same electrical division from service when outside air wet bulb temperature exceeds 74°F.

The inspectors reviewed calculation BYR09–002, “UHS Capability with Loss of SX Fans Due to a Tornado Event,” and calculation UHS–01, “Ultimate Heat Sink Design Basis LOCA Single Failure Scenarios,” and noted these analyses bounded system capability by using approved worst case wet bulb temperatures, for each licensing basis event, as described in the UFSAR.

The inspectors noted that procedure 0BOSR 0.1–0 contained actions to assure the operability requirements of TS 3.7.9 were met for the SXCT based on the capability of electrical division (11, 12, 21, 22) to provide power to required equipment (SXCT fans), actual wet bulb temperatures, and actual SX cooling water temperatures. The inspectors noted that with all electrical divisions capable, licensee analyses bounded actual conditions up to 82°F wet bulb temperature. The inspectors noted also that when electrical divisions were lost, the SXCT capability was bounded by separate analysis, with associated TS Condition with Required Actions when Required Actions could not be met.

The inspectors determined the licensee TSs and procedures required that necessary actions be taken to ensure actual environmental conditions remain bounded by SXCT analyses. This URI is closed.

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

a. Inspection Scope

The objective of this performance based Temporary Instruction (TI) was to verify implementation of interim compensatory measures associated with an open phase condition (OPC) design vulnerability in electric power systems for operating reactors.

b. Findings and Observations

The inspectors determined the licensee implemented a permanent modification to address the technical issue. Therefore, no further inspection using this temporary instruction is necessary.

4OA6 Management Meetings

.1 Exit Meeting Summary

On January 18, 2017, the inspectors presented the inspection results to Mr. T. Chalmers, Plant Manager, and other members of the licensee staff. 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 for the Radiation Safety Program review with Mr. M. Kanavos, Site Vice President, on October 27, 2016;
- the inspection results for the Triennial Review of Heat Sink Performance with Mr. E. Hernandez, Operations Director, on October 28, 2016;
- the inspection results of the Biennial Review and Biennial Written and Annual Operating Test Results with Mr. M. Kanavos, Site Vice President on November 18, 2016; and
- the Annual Review of Emergency Action Level and Emergency Plan Changes with Mr. R. Lloyd, Emergency Preparedness Manager, on December 16, 2016.

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

ATTACHMENT: SUPPLEMENTAL INFORMATION

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### Licensee

M. Kavanos, Site Vice President  
T. Chalmers, Plant Manager  
R. Lawler, Operations Training Manager  
C. Cote, Shift Operations Supervisor  
K. Stanford, LORT Lead  
D. Spitzer, Manager Regulatory Assurance  
L. Zurawski, Regulatory Assurance  
C. Cote, Shift Operations Superintendent  
K. McGuire, Acting Senior Manager, Plant Engineering  
B. Barton, Radiation Protection Manager  
R. Lloyd, Emergency Preparedness Manager  
P. Boyle, Director of Work Management  
T. Faley, Maintenance Director  
Z. Cox, Regulatory Assurance  
S. Harvey, Chemistry Manager  
S. Kerr, Projects Manager

#### U.S. Nuclear Regulatory Commission

E. Duncan, Chief, Reactor Projects Branch 3

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

None

### Closed

05000454/2015008-01; 05000455/2015008-01	URI	Question Regarding the Maximum Wet Bulb Temperature Value Assumed in the SXCT Tornado Analysis (Section 4OA5.2)
05000454/2015008-02; 05000455/2015008-02	URI	Maximum Wet Bulb Temperature Value Assumed in SXCT Analysis Was Not Monitored (Section 4OA5.3)
TI 2515/192	TI	Inspection of the Licensee's Interim Compensatory Measures Associated with the Open Phase Condition Design Vulnerabilities in Electric Power Systems (Section 4OA5.4)

## 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

- 0BOA ENV-1, Revision 120; Adverse Weather Conditions Unit 0
- 1BOA ENV-1, Revision 101; Adverse Weather Conditions Unit 1
- 2BOA ENV-1, Revision 101; Adverse Weather Conditions Unit 2
- OP-AA-108-111-1001, Revision 15; Severe Weather and Natural Disaster Guidelines
- MA-AA-716-026, Revision 15; Station Housekeeping / Material Condition Program
- IR 03943801; ODO03T Biodiesel % at the Max of 0.1% per 0BOSR 8.3.2-1
- 0BOSR 8.3.2-1, Revision 11; Diesel Generator Diesel Oil Sample Surveillance
- IR 03949532; EOC of RWST Heater Issue
- IR 01024623; Heater Not Functioning Properly
- IR 01471977; Fan Is Not Rotating
- IR 02583964; Fan Motor Is Warm and the Fan Is Not Rotating

### 1R04 Equipment Alignment

- BOP CS-E2B, Revision 1; Containment Spray System Train "B" Electrical Lineup
- BOP CS-M2B, Revision 2; Containment Spray System Train "B" Valve Lineup
- M-129, Sheet 1A, Revision AK; Diagram of Containment Spray
- M-129, Sheet 1B, Revision AL; Byron – Unit 2 Diagram of Containment Spray
- M-129, Sheet 1C, Revision AH; Diagram of Containment Spray
- BOP SX-M1A, Revision 11; Train "A" Essential Service Water System Valve Lineup
- BOP SX-E1A, Revision 3; Essential Service Water Train "A" Electrical Lineup
- M-121, Sheet 1A, Revision AU; Diagram of Feedwater (Main) Loop 3
- M-121, Sheet 1B, Revision AR; Diagram of Feedwater (Main) Loop 1
- M-121, Sheet 1C, Revision AS; Diagram of Feedwater (Main) Loop 4
- M-121, Sheet 1D, Revision AQ; Diagram of Feedwater (Main) Loop 2
- M-121, Sheet 2, Revision AK; Diagram of Feedwater (Main)
- M-122, Revision EDSF; Diagram of Auxiliary Feedwater
- BOP FW-M1, Revision 23; Main Feedwater System Valve Lineup
- BOP FW-M2, Revision 24; Main Feedwater System Valve Lineup
- BOP FW-E1, Revision 06; Main Feedwater System Electrical Lineup
- BOP FW-E2, Revision 06; Main Feedwater System Electrical Lineup
- M-137, Sheet 1, Revision BH; Diagram of Residual Heat Removal

### 1R05 Fire Protection

- Fire in ESF Switchgear Room; Drill Scenario Number 16-07 dated 12/9/2015
- Pre-Fire Plan FZ 5.2-1; Auxiliary Building 426'-0" Elevation, Division 11 ESF Switchgear Room
- IR 03945745; 4.0 Critique of Crew C 4<sup>th</sup> Quarter Fire Drill
- Pre-Fire Plan FZ 11.6-0, Revision 5; Auxiliary Building 426'-0" Elevation, Auxiliary Building General Area - North
- Pre-Fire Plan FZ 11.6-0, 11.6C-0, Revision 5; Auxiliary Building 426'-0" Elevation, Auxiliary Building General Area – South & Mechanical Maintenance Motor Operated Valve Room

- Pre-Fire Plan FZ 11.6C-0, Revision 2; Auxiliary Building 426'-0" Elevation, Electrical Maintenance Motor Operated Valve Room
- Pre-Fire Plan FZ 11.6-0, 11.6D-0, 11.6E-0, Revision 4; Auxiliary Building 426'-0" Elevation, Auxiliary Building General Area – West & Old Men's Changing Room & Hot Shop
- Pre-Fire Plan FZ 11.5-0 West, Revision 3; Auxiliary Building 401'-0" Elevation General Area – West
- Pre-Fire Plan FZ 11.5A-0, Revision 1; Auxiliary Building 401'-0" Elevation Radiological Instrument Calibration Room
- Pre-Fire Plan FZ 11.5-0 South, Revision 2; Auxiliary Building 401'-0" Elevation General Area – South
- Pre-Fire Plan FZ 11.5-0 North, Revision 2; Auxiliary Building 401'-0" Elevation General Area – North

### 1R07 Heat Sink Performance

- "A" Intake Bay, North Side of River Screen House, Inspection Report; November 4, 2014, July 9, 2015, and December 1, 2015
- "B" Intake Bay, South Side of River Screen House, Inspection Report; May 28, 2014, September 28, 2014, and February 18, 2015
- 0BMSR SX-5; Inspection of River Screen House and Essential Service Water Cooling Tower Basins (CM-4); Revision 12
- 0BOA ENV-2; Rock River Abnormal Water Level; Revision 103
- 0BOA PRI-7; Loss of Ultimate Heat Sink, Unit 0; Revision 1
- 1BOA PRI-7; Essential Service Water Malfunction, Unit 1; Revision 108
- IR 1632980; 1AF01AB Failed GL 89-13 Acceptance Criteria
- IR 1676939; 0SX03CA-48" Pipe Indications of Less than Minimum Wall
- IR 2423892; 1B AF Pump Oil Cooler Outlet Temperature High
- IR 2554178; 1B AF Pump Oil Cooler Found Fouled
- IR 2557637; Tube Blockage During As-Found Inspection (1AF02A)
- IR 2648029; 1AF01AB Failed GL 89-13 Acceptance Criteria
- IR 2730584; 1AF01AB Failed GL 89-13 Acceptance Criteria
- IR 2733316; NRC ID: IR 2648029 on 1B AF Cooler Needs Revision
- IR 2733904; NRC ID – Need Additional Basis for Past Operability Eval
- BAR 0-37-A8; SX Cooling Tower Basin High Low; Revision 11
- BAR 0-37-B7; SX Makeup Pump Auto Start; Revision 7
- BAR 0-38-D11; Traveling Screen Control Panel Trouble; Revision 7
- BAR 1-2-A2; SX Discharge Header Pressure Low; Revision 2
- Bathymetric Survey for Exelon Corporation at Byron Generating Station; July 12, 2016
- BOP AF-7; Diesel Driven Auxiliary Feed Pump B Startup on Recirc; Revision 51
- BOP AF-7T1; Diesel Driven Auxiliary Feed Pump Operating Log; Revision 26
- BOP AF-7T1; Diesel Driven Auxiliary Feedwater Pump Operating Log; September 26, 2016
- BOP AF-7T1; Diesel Driven Auxiliary Feedwater Pump Operating Log; October 20, 2016
- BOP CW-12; Circulating Water Blowdown System Startup, Operation and Shutdown; Revision 45
- EC 339308; Develop the Tube Plugging Criteria for the 89-13 Heat Exchangers; February 6, 2003
- EC 345255; Provide the Tube Blockage Acceptance Criteria for 1/2AF01AB Heat Exchangers; February 2, 2004
- EC 345255; Provide Tube Blockage Acceptance Criteria for 1/2AF01AB Heat Exchangers; February 2, 2004

- EC 352392; Evaluation of Availability of 1AF01PA while 1SX101A was Potentially Isolated, from March 15, 2004 to June 29, 2004; Revision 1
- EC 397476; Tube Plugging for 1AF01AB in B1R19; March 26, 2014
- EC 407121; Reportability Evaluation for Diesel AF Pump Oil Cooler Silting; November 17, 2016
- Eddy Current Exam Final Report, 1B DD AF Gear Oil Cooler 1AF02A; March 21, 2014
- ER-AA-1002; Service Water Heat Exchanger Inspection Guide; Revision 6
- ER-AA-340; GL 89-13 Program Implementing Procedure; Revision 7
- SXCT OA North Cooling Tower Basin, Inspection Report; May 11, 2015, and December 10, 2015
- SXCT OB South Cooling Tower Basin, Inspection Report; November 1, 2014, and April 28, 2015
- UHS-03; Effects of 110 Degree F Service Water on Various Equipment; October 1, 1991
- WO 00843199; Open 1A SX Strainer for Inspection/Repair
- WO 01536066; Perform Calibration of SX Cooling Tower Loop 0SX-064
- WO 01719248; Perform Calibration of 0SX-064
- WO 01726640; 1AF02A – HX Inspection Per Generic Letter 89-13
- WO 01762541; Perform Calibration of ESS SW Cooling Tower Basin Level Switch
- WO 01854613; Perform Preventative Maintenance on Traveling Screen
- WO 01874944; 1AF01AB – HX Inspection Per Generic Letter 89-13
- WO 01914287; SX Makeup Pump Operability Surveillance

#### 1R11 Licensed Operator Requalification Program

- TQ-AA-150; Operator Training Programs; Revision 14
- TQ-AA-155; Conduct of Simulator Training and Evaluation; Revision 6
- TQ-AA-155-J050; Revision 00; Evaluated Scenario Grading Flowchart Job Aid
- TQ-AA-155-F106; Revision 000; Simulator Evaluation – Shift Manager Competency Standards
- TQ-AA-155-F108; Revision 000; Simulator Evaluation – Individual Competency Standards
- TQ-AA-155-F109; Revision 000; Simulator Evaluation – Crew Competency Standards
- TQ-AA-201; Examination Security and Administration; Revision 17
- Cycle 16-2 Byron Station Licensed Operator Requalification Simulator Scenario Guide; 16-2-3, Ramp, DLA – Video Review; Dated February 19, 2016
- (2) Scenarios Administered during week of November 7, 2016
- (2) Scenarios Administered during week of November 14, 2016
- (5) JPMs Administered during week of November 7, 2016
- (5) JPMs Administered during week of November 14, 2016
- Written Examination administered during week of November 7, 2016
- Remediation Training Notification & Action on Failure Packages (4); November 2015 and 2016
- License Reactivation Packages; (various), 2015 & 2016
- NRC Active License Tracking Pre-Define; 1<sup>st</sup> quarter 2016
- NRC Active License Tracking Pre-Define; 2<sup>nd</sup> quarter 2016
- Byron Simulator & Plant Differences, Revision 0; Dated September 2, 2016
- Simulator Review Board Agenda/Minutes; (Various)
- Byron Simulator Testing Report; Dated February 4, 2016
- Core Performance Test; Dated October 26, 2016
- RT-01; Simulator Real Time Test; Dated February 16, 2016
- SS-01; Simulator Steady State Test, Low Power Level; Dated January 25, 2016
- SS-02; Simulator Steady State Test, Mid-Range Power Level; Dated January 25, 2016
- SS-03; Simulator Steady State Test, Full Power Level; Dated January 25, 2016
- TR-1; Simulator Transient Test, Manual Reactor Trip, Dated January 25, 2016

- TR-5; Simulator Transient Test, Trip of Single RCP; Dated January 15, 2016
- TR-8; Simulator Transient Test, Maximum Size LOCA with LOOP; Dated January 16, 2015
- Individual JPM Results Sheets for Crew E; Dated November 17, 2016
- Simulator Evaluation Forms – Individuals, Crew E; Dated November 16, 2016
- Simulator Evaluation Forms – Crew, Crew E; Dated November 16, 2016
- Training and Staffing Audit Report, NOSA-BYR-16-07; May 2016
- Focused Area Self-Assessment, Pre-NRC 71111.11 Inspection; Dated November 12, 2016
- IR 02567216; Received High Alarm for 1B DOST Sump
- IR 02575960; Gap in Precise Control – Reactivity Management
- IR 02669711; Reactor Vessel Fing Leakoff Temp High
- IR 02563847; Mode 3 Entered with K640 Leads Lifted
- List of Open and Closed Simulator Work Requests; Dated November 15, 2016

#### 1R12 Maintenance Effectiveness

- a(2) Determination for System EF-01 (Processing of the SSPS/ESFAS/RPS signals) dated 10/12/2016
- IR 02388711, SARA Sequencer Failed Testing – B2R18M4
- Evaluation 00094081; Draincock for Detroit Diesel 16V149TI, Byron S/N0016E0004808 and 001 (AF and SX Makeup Pump Diesels)
- Evaluation 00092924; Bracket, Mounting, Adapter Plate to Mount A Type 81 Relay in Place of a Type KF Relay
- Evaluation 00092458; Carrier Bearing, Service Assembly
- Evaluation 00091301; Valve, Check, 1” FNPT, Inline, Cast Bronze NO. C84400
- Evaluation 00086160; Circuit Board, Annunciator, Monitor Isolator, Plug In Type, Gold Plate
- a(2) Determination for System FW (All functions) dated
- IR 012559638; 1B Turbine Driven Steam Generator Feedwater Pump Emergency Oil Pump Motor

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

- IR 02723597; Possible Leakage of 2A CS Pp Discharge Line
- Revision 2 of Week 10/03/16 Online Risk Assessment
- OP-AA-108-117, Revision 4; Protected Equipment Program
- Revision 2 of Week 10/10/16 Online Risk Assessment
- BY-MODE-014, Revision 2; TS 3.0.4.b Evaluation – Modes 2 and 1 Entry with 2PR11J, 2CS01PA, 2CS019A, 2RC014B, and 2RC014D Inoperable
- IR 02732222; OLR Required Updating for 1FW-0505
- Revision 1 of Week 10/24/16 Online Risk Assessment
- Revision 2 of Week 11/14/16 Online Risk Assessment
- IR 02741297; AF Availability Question
- IR 02741378; Ops Focus HULL [Human Performance Lessons Learned]

#### 1R15 Operability Determinations and Functional Assessments

- OP-AA-102-103, Revision 4; Operator Work-around Program
- OP-AA-102-103-1001, Revision 7; Operator Burden/Degraded Equipment Aggregate Assessment
- Work-Around Board Meeting Minutes for 2015 3rd Quarter dated 12/8/15
- Operator Burden/Degraded Equipment Aggregate Assessment dated 11/24/15
- Work-Around Board Meeting Minutes for 2015 4<sup>th</sup> Quarter dated 2/12/16
- First Quarter 2016 Operability Evaluation Aggregate Review dated April 8, 2016

- Operator Burden/Degraded Equipment Aggregate Assessment dated 1/7/16
- Operator Burden/Degraded Equipment Aggregate Assessment dated 6/8/16
- Second Quarter 2016 Operability Evaluation Aggregate Review dated July 14, 2016
- Work-Around Board Meeting Minutes dated 6/17/16
- Operator Burden/Degraded Equipment Aggregate Assessment dated 9/6/16
- Work-Around Board Meeting Minutes
- IR 03948260; Unit 2 RWST Heater Failed to Cycle on When Expected
- TS 3.5.4, "Refueling Water Storage Tank (RWST)" and Associated Bases
- IR 03948260; Unit 2 RWST Heater Failed to Cycle on When Expected
- IR 03949532; Extent of Condition for RWST Heater Issue
- IR 039252525; Train A Containment Spray Actuation Relay Failure
- 6E-1-4030CS01, Revision EDSF; Schematic Diagram Containment Spray Pump 1A 1CS01PA
- 6E-1-4030CS05, Revision H; Byron – Unit 1 Schematic Diagram Containment Spray Pumps 1A & 1B Header Isolation Valves 1CS007A & B
- 6E-1-4030EF09, Revision P; Schematic Diagram Reactor Protection System Master & Slave Relays Testing Circuit Train "A"
- 6E-1-4030EF11, Revision AB; Schematic Diagram Reactor Protection System Output Relays Development Train "A"
- NF-CB-16-143; Non-conservatism in Treatment of Over-Temperature Delta-Temperature (OTDT) Plat Trip in the 3DFAC Analysis for Byron/Braidwood; October 21, 2016
- IR 02731065; Non-conservatism in 3DFAC Analysis at Byron/Braidwood
- IR 02731096; Non-conservatism in 3DFAC Analysis at Byron/Braidwood
- IR 02731087; Non-conservatism in 3DFAC Analysis at Byron/Braidwood
- Unit 1/2 standing Order 16-031; PDMS Methodology Error; October 21, 2016
- IR 02355506; Aux Feed Flow Indicator Failed Low
- M-2122, Sheet 1, Revision N; P&ID / C&I Diagram Aux. Feedwater System—AF

#### 1R18 Plant Modifications

- EC 406220, Revision 000 and Revision 1; Reroute AF Diesel Combustion Air Intake to 364' General Area, Unit 1
- EC 406221 Revision 000 and Revision 1; Reroute AF Diesel Combustion Air Intake to 364' General Area, Unit 2
- WO 01916022; Resolve Unit 1 AF Diesel Engine Intake per EC 406220
- IR 02740013; Interference Inside AF Exhaust Insulation
- EC 406958, Revision 0; Temporarily Defeat Water Hammer Prevention System (WHPS) Feedwater Isolation Signals During Normal Power Operation for Steam Generators 2A/2B/2C/2D
- 2BGP 100-4, Revision 50; Power Descension
- 2BGP 100-4T4, Revision 7; Post Trip Post Response Guideline
- 2BGP 100-1, Revision 58; Plant Heatup
- 2BGP 100-3, Revision 93; Power Ascension
- Section 10.4.5, "Condensate and Feedwater System"; NUREG-0876, February 1982; Safety Evaluation Report related to the operation of Byron Station, Units 1 and 2
- UFSAR Section 10.4.7.3, "Water Hammer Prevention Features (Unit 2 Only)
- WO 04571546; Install TCCP to Defeat WHPS per EC 406958
- LS-AA-104-1000, Revision 10; 50.59 Resource Manual

### 1R19 Post Maintenance Testing

- WO 01953816; Possible 0B WS Pump Shaft Shear
- BVP 800-19, Revision 15; Non-essential Service Water Pumps Performance Evaluation
- EC 406750, Revision 000; Alternate Bowl Assembly for WS Pump
- EC 406787; Revision 000; Hydraulic Evaluation to Support the Replacement of the OB WS Pump
- MA-AA-716-230-1002, Revision 4; Vibration Analysis/Acceptance Guideline
- WO 01916022; Resolve Unit 1 AF Diesel Engine Intake Per EC 406220
- 1BOSR 7.5.4-2, Revision 21; Unit One Diesel Driven Auxiliary Feedwater Pump Monthly Surveillance
- WO 01945883; Fuel Oil Leak on 2B AF Diesel
- 2BOSR 7.5.4-2, Revision 22; Unit Two Diesel Driven Auxiliary Feedwater Pump Monthly Surveillance

### 1R22 Surveillance Testing

- 2BOSR 8.1.20-1; Unit Two 10 Year Simultaneous Diesel Generator Start Surveillance
- BOP DG-11T1; Diesel Generator Start/Stop Log
- 2BOSR 5.5.8.RH.5-1a; Unit Two Group A Inservice Testing (IST) Requirements for Residual Heat Removal Pump 2RH01PA
- BOP RH-5; RH System Startup for Recirculation
- BOP RH-2; Securing the RH System from Recirculation
- 1BOSR 3.2.8-644A; Unit One ESFAS Instrument Slave Relay Surveillance (Train "A" Automatic Containment Spray – K644)
- 1BOSR 5.5.8.CS.5-1C; Unit One Comprehensive Inservice Testing Requirements for Containment Spray Pump 1CS01PA
- IR 039252525; Train A Containment Spray Actuation Relay Failure
- 2BOSR 3.1.5-2 Unit Two Train B Solid State Protection Surveillance

### 1EP4 Emergency Action Level and Emergency Plan Changes

- EP-AA-1000; Exelon Nuclear Standardized Radiological Emergency Plan; Revision 28
- EP-AA-120; Emergency Plan Administration; Revision 19
- EP-AA-120-1001; 10CFR50.54(q) Change Evaluation; Revision 8
- EP-AA-1002; Exelon Nuclear Radiological Emergency Plan Annex for Byron Station; Revision 34
- EP-AA-1002 Addendum 1; Byron Station On-Shift Staffing Technical Basis; Revision 1
- EP-AA-1002 Addendum 2; Evacuation Time Estimates for Byron Generating Station Plume Exposure Pathway Emergency Planning Zone; Revision 1
- EP-AA-1002 Addendum 3; Emergency Action Levels for Byron Station; Revisions 0 and 1
- 50.54(q) Evaluation No. 16-017; EP-AA-1002, Addendum 3, "Emergency Action Levels for Byron Station" (Revision 1) Evaluation and Effectiveness Review; February 5, 2016

### 2RS2 Occupational ALARA Planning and Controls

- RWP BY-2-16-00616; RCP Seal Maintenance and Support Activities; Revision 00
- RWP BY-2-16-00616; RCP Seal Maintenance and Support Activities; Revision 01
- RWP BY-2-16-00616; RCP Seal Maintenance and Support Activities; Revision 02
- RWP BY-2-16-00616; RCP Seal Maintenance and Support Activities; Revision 03
- RWP BY-2-16-00677; RX Head Peening; Revision 00
- RWP BY-2-16-00677; Setup/Demob Activities; Revision 00; Task 1
- RWP BY-2-16-00677; RX Head Peening; Revision 00; Task 2

- RWP BY-2-16-00677; RP/Decon Support; Revision 00; Task 3
- RWP BY-2-16-00677; Core Exit Thermocouples; Revision 00; Task 4
- RWP BY-2-16-00681; Steam Generator Bowl Drain Replacement; Revision 00
- RWP BY-2-16-00681; Steam Generator Bowl Drain Replacement; Revision 01
- RWP BY-2-16-00681; Steam Generator Bowl Drain Replacement; Revision 02
- RWP BY-2-16-00681; Steam Generator Bowl Drain Replacement; Revision 03
- RP-AA-401; Operational ALARA Planning and Controls; Revision 021
- RP-AA-401; Operational ALARA Planning and Controls, Attachment 2, Combined ALARA Plan/Micro-ALARA Plan, RCP Seal Maintenance and Support Activities; Revision 21
- RP-AA-401; Operational ALARA Planning and Controls, Attachment 2, Combined ALARA Plan/Micro-ALARA Plan, B2R19 S/G Bowl Drain Replacement (Tasks 1, 2, 5); Revision 21
- RP-AA-401; Attachment 4, ALARA Post-Job Review, B2R19: Steam Generator Bowl Drain Replacement Project; Revision 21
- RP-AA-401; Operational ALARA Planning and Controls, Attachment 6, ALARA Work-In-Progress Review, RCP Seal Maintenance Activities; Revision 21
- RP-AA-401; Operational ALARA Planning and Controls, Attachment 6, ALARA Work-In-Progress Review, B2R19: S/G Bowl Drain Replacement; Revision 21
- RP-AA-401; Operational ALARA Planning and Controls, Attachment 2, Combined ALARA Plan/Micro-ALARA Plan, B2R19 Rx Head Peening-No Under Head Work-Task 2, B2R19 Rx Head Peening RP and Decon Support-Task 3; Revision 21
- RP-AA-441; Evaluation and Selection Process for Radiological Respirator Use; Revision 006
- RP-AA-441; Evaluation and Selection Process for Radiological Respirator Use, Attachment 1, Methodology for Estimating Airborne Radioactivity Based Upon Contamination Levels and Work Activities, SG Bowl Drain Replacement (100K); Revision 006
- RP-AA-441; Evaluation and Selection Process for Radiological Respirator Use, Attachment 1, Methodology for Estimating Airborne Radioactivity Based Upon Contamination Levels and Work Activities, SG Bowl Drain Replacement (1000 mrad) Drain Line; Revision 006
- Survey Map #241; RX2-377 U2 377 D/A IMB, Survey 2016-1255; Revision 4
- Survey Map #243; RX2-390 C/B Steam Gen Platform, Survey 2016-937; Revision 4
- Survey Map #244; RX2-390 U-2 A/D Steam Gen Platform, Survey 2016-939; Revision 4
- Survey Map #245; U-2 390 IMB All Inclusive, Survey 2016-1233; Revision 4
- Survey Map #268; RX0-401 Reactor Coolant Pump, Survey #2016-1097; Revision 4
- Survey Map #268; RX0-401 Reactor Coolant Pump, Survey #2016-1152; Revision 4
- Survey Map #278; RX2-XXX U-2 Containment Blank, Survey #2016-1185; Revision 4

#### 40A1 Performance Indicator Verification

- PI Summary; Reactor Coolant System Activity (RCSA); October 2015 through October 2016
- PI Summary; RETS/ODCM Radiological Effluent; October 2015 through October 2016
- PI Summary; Occupational Exposure Control Effectiveness; October 2015 through October 2016
- PI Summary; MSPI Emergency AC Power System Unavailability Index October 2015 through October 2016
- PI Summary; MSPI Emergency AC Power System Unreliability Index October 2015 through October 2016
- BY-MSPI-001, Revision 16; Reactor Oversight Program MSPI Basis Document Byron Nuclear Generating Station
- BY-MSPI-001, Revision 18; Reactor Oversight Program MSPI Basis Document Byron Nuclear Generating Station

#### 4OA2 Problem Identification and Resolution

- IR 02607576; Fleet Appendix J Scope Reduction – Byron
- EC 404972, Revision; Appendix J Scope Reduction as a Result of True North Engineering Report Commissioned by Corporate Engineering

#### 4OA3 Event Followup and Notices of Enforcement Discretion

- IR 02732275; Maint. Rule Plant Level Criteria for AP-04 Function Exceeded
- IR 02729119; As Found Breaker (Amptector) Conditions
- OP-AA-108-114, Revision 12; Post Transient Review
- OP-AA-108-108, Revision 19; Unit Restart Review
- IR 02727945; 4.0 Critique – U2 Manual Rx Trip from Loss of Feedwater
- Unit 2 Sequence of Events Recorder Printout from 10/12/2016
- Event Notification 52295; Manual Reactor Trip Due to Spurious Feedwater Isolation
- IR 02727378; MCC 234V4 Not Energized
- IR 02727797; Appendix R Lights Not Working Properly After 234V4 Outage
- Standing Order 16-029; Water Hammer Prevention System (WHPS)
- MA-AA-725-562, Revision 9; Preventative Maintenance on Westinghouse Type DS 480V Circuit Breakers

#### 4OA5 Other Activities

- BFP FH-69; HI-TRAC Movement within the Fuel Building; Revision 22
- BYR 09-002; UHS Capability with Loss of SX Fans due to a Tornado Event; Revision 6
- BYR11-071; Validation of Wet Bulb Temperature Equation; Revision 0
- IR 2532068; NRC URI Question Regarding the Maximum Wet Bulb Temperature
- IR 2532070; NRC URI Max Wet Bulb Temp Value Assumed in SXCT Analysis
- 0BOSR 0.1-0, Unit Common; All Modes/All Times Shiftly and Daily Operating Surveillance; Revision 56

## LIST OF ACRONYMS USED

AC	Alternating Current
ADAMS	Agencywide Document Access Management System
AF	Auxiliary Feedwater
ALARA	As-Low-As-Is-Reasonably-Achievable
CAP	Corrective Action Program
CFR	<i>Code of Federal Regulations</i>
CS	Containment Spray
DDAFW	Diesel Driven Auxiliary Feedwater
DRP	Division of Reactor Projects
EAL	Emergency Action Level
EN	Event Notification
EPRI	Electric Power Research Institute
ERO	Emergency Response Organization
ESFAS	Engineered Safeguards Features Actuation System
°F	Degrees Fahrenheit
HI-STORM	Storage Cask
HI-TRAC	Transfer Cask
IEMA	Illinois Emergency Management Agency
IP	Inspection Procedure
IR	Inspection Report
ISFSI	Independent Spent Fuel Storage Installation
JPM	Job Performance Measure
LER	Licensee Event Report
LORT	Licensed Operator Requalification Training
MCC	Motor Control Center
MPC	Multi-Purpose Canister
MSPI	Mitigating Systems Performance Index
NCV	Non-Cited Violation
NEI	Nuclear Energy Institute
NRC	U.S. Nuclear Regulatory Commission
OWA	Operator Workaround
PI	Performance Indicator
PI&R	Problem Identification and Resolution
PM	Post-Maintenance
RH	Residual Heat Removal
RPS	Reactor Protection Systems
RWST	Refueling Water Storage Tank
RX	Reactor
SAT	Systems Approach to Training
SG or S/G	Steam Generator
SSPS	Solid State Protection System
SX	Emergency Service Water
SXCT	Essential Service Water Cooling Tower
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
UHS	Ultimate Heat Sink
URI	Unresolved Item
WHPS	Water Hammer Prevention System
WO	Work Order

B. Hanson

- 3 -

Letter to Bryan C. Hanson from Eric Duncan dated

SUBJECT: BYRON STATION, UNITS 1 AND 2—NRC INTEGRATED INSPECTION REPORT  
05000454/2016004; 05000455/2016004; 07200068/2016001 AND EMERGENCY  
PREPAREDNESS ANNUAL INSPECTION REPORT 05000454/2016501;  
05000455/2016501

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