



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION III
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LISLE, IL 60532-4352

May 11, 2016

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

SUBJECT: BRAIDWOOD STATION, UNITS 1 AND 2—NRC INTEGRATED INSPECTION
REPORT 05000456/2016001; 05000457/2016001

Dear Mr. Hanson:

On March 31, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Braidwood Station, Units 1 and 2. On April 14, 2016, the NRC inspectors discussed the results of this inspection with Ms. M. Marchionda, Site Vice President and other members of your staff. The inspectors documented the results of this inspection in the enclosed inspection report.

Based on the results of this inspection, two NRC identified and two self-revealed findings of very low safety significance (Green) were identified. These findings were determined to involve violations of NRC requirements. However, because of their very low safety significance, and because the issues were entered into your Corrective Action Program, the NRC is treating these violations as Non-Cited Violations (NCVs), in accordance with Section 2.3.2 of the NRC's Enforcement Policy.

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

In addition, if you disagree with the cross-cutting aspect assigned to any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region III, and the NRC Resident Inspector at the Braidwood Station.

B. Hanson

-2-

In accordance with Title 10 of the *Code of Federal Regulations* (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 the Publicly Available Records System (PARS) component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

Eric Duncan, Chief
Branch 3
Division of Reactor Projects

Docket Nos. 50-456 and 50-457
License Nos. NPF-72 and NPF-77

Enclosure:
IR 05000456/2016001; 05000457/2016001

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 50-456; 50-457
License Nos: NPF-72; NPF-77

Report No: 05000456/2016001; 05000457/2016001

Licensee: Exelon Generation Company, LLC

Facility: Braidwood Station, Units 1 and 2

Location: Braceville, IL

Dates: January 1 through March 31, 2016

Inspectors: J. Benjamin, Senior Resident Inspector
D. Betancourt, Resident Inspector
M. Doyle, Acting Resident Inspector
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Approved by: E. Duncan, Chief
Branch 3
Division of Reactor Projects

Enclosure

TABLE OF CONTENTS

SUMMARY	2
REPORT DETAILS	5
Summary of Plant Status.....	5
1. REACTOR SAFETY	5
1R01 Adverse Weather Protection (71111.01).....	5
1R04 Equipment Alignment (71111.04)	5
1R05 Fire Protection (71111.05)	7
1R06 Flooding (71111.06).....	11
1R11 Licensed Operator Requalification Program (71111.11).....	12
1R12 Maintenance Effectiveness (71111.12).....	13
1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13)	14
1R15 Operability Determinations and Functional Assessments (71111.15)	20
1R19 Post-Maintenance Testing (71111.19).....	21
1R22 Surveillance Testing (71111.22)	22
2. RADIATION SAFETY	25
2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01)	25
2RS2 Occupational As-Low-As-Reasonably-Achievable Planning And Controls (71124.02).....	26
4. OTHER ACTIVITIES	26
4OA1 Performance Indicator Verification (71151)	26
4OA2 Identification and Resolution of Problems (71152)	28
4OA5 Other Activities	30
4OA6 Management Meetings	34
SUPPLEMENTAL INFORMATION	1
Key Points of Contact.....	1
List of Items Opened, Closed, and Discussed.....	2
List of Documents Reviewed	3
List of Acronyms Used	10

SUMMARY

Inspection Report 05000456/2016001; 05000457/2016001; 01/01/2016 – 03/31/2016; Braidwood Station, Units 1 and 2; Fire Protection; Maintenance Risk Assessments and Emergent Work Control; Other Activities.

This report covers a 3-month period of inspection by resident inspectors and announced baseline inspections by regional inspectors. Two Green findings were identified by the inspectors and two Green findings were self-revealed. The findings were considered Non-Cited Violations (NCVs) of NRC regulations. The significance of inspection findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP), dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within the Cross-Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated February 4, 2015. 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.

Cornerstone: Initiating Events

- Green. The inspectors identified a finding of very low safety significance and an associated NCV of License Condition 2.E when licensee personnel failed to follow the requirements of the Fire Prevention for Hot Work procedure on two separate occasions. Specifically, (Issue 1) on February 2, 2016, a very small fire occurred during a planned hot work activity that involved pipe grinding on a small waste gas decay tank pressure line because the licensee failed to recognize the potential for hydrogen within the line. Additionally, (Issue 2) on February 25, 2016, the inspectors identified that a hot work permit was inadequate prior to the licensee performing a piping weld repair activity associated with the Unit 2 main generator stator cooling water system because the permit referenced the wrong work location and did not require appropriate controls. These issues were entered into the licensee's Corrective Action Program (CAP) as Issue Reports (IRs) 2620772 and 2632182.

The inspectors determined that the performance deficiency was more than minor because it was associated with the Human Performance attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective of limiting the likelihood of events that upset plant stability and challenge critical safety functions during shutdown and power operations. Specifically, for Issue 1, the performance deficiency resulted in the occurrence of a small hydrogen fire in the auxiliary building. For Issue 2, the performance deficiency increased the likelihood of a fire occurring during an emergent weld repair in the turbine building. The inspectors determined that this finding was of very low safety significance (Green) because the fire (Issue 1) and increased likelihood of a fire occurring (Issue 2) was limited to equipment which was not important to safety. The inspectors determined that the finding had a Work Management cross-cutting aspect in the Human Performance area. Specifically, a significant contributor to the performance deficiency was related to the organization not implementing a process for planning, controlling, and executing work activities such that nuclear safety is the overriding priority (H.5). Section (1R05.2)

- Green. A finding of very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was

self-revealed on February 1, 2016, when licensee personnel failed to have appropriate work instructions for performing planned motor-operated valve (MOV) 2SI8807A diagnostic testing. Specifically, the work order (WO) used did not provide appropriate instructions to ensure that the proper equipment line-up for the test was established prior to stroking the valve. Ultimately, this led to an unplanned transfer of about 304 gallons of water from the volume control tank (VCT) to the refueling water storage tank (RWST). This issue was entered into the licensee's CAP as IR 2620523.

The inspectors determined that the performance deficiency was more than minor because it was associated with the Equipment Performance attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective of limiting the likelihood of events that upset plant stability and challenge critical functions during shutdown and power operations. Specifically, the failure to have an appropriate procedure for a maintenance activity led to 304 gallons of inventory being diverted to the RWST. The finding screened as having very low safety significance (Green) because it was determined that the reactor coolant system (RCS) leak rate for a small loss of coolant accident was not exceeded, and it did not result in a loss of a mitigating system's ability to perform an intended safety function. The inspectors determined that the finding had a Work Management cross-cutting aspect in the Human Performance area because the licensee did not implement a process of planning, controlling and executing work activities such that nuclear safety is an overriding priority. Specifically, proper work planning and coordination between maintenance and operations would have ensured that the WO being utilized established the proper system line-up prior to the start of the maintenance (H.5). (Section 1R13.2)

Cornerstone: Mitigating Systems

- Green. A finding of very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," was self-revealed when the licensee failed to ensure that a condition adverse to quality was promptly identified and corrected. Specifically, on October 8, 2015, valve 2RH606 failed to open and caused a loss of one train of shutdown cooling in Mode 6 and an unplanned orange risk condition. The reason for the failure was improper use of a lower strength carbon steel valve key instead of the specified high strength hardened steel valve key, which had been the subject of a vendor Part 21, "Reports of Defects and Non Compliance," Report. This issue was entered into the licensee's CAP as IR 2567811.

The inspectors determined that the performance deficiency was more than minor because it was associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to correct a condition adverse to quality in the form of the improper use of a lower strength carbon steel key instead of the specified high strength hardened steel key in a safety-related valve ultimately led to a loss of one train of shutdown cooling in Mode 6. The inspectors determined that the finding was of very low safety significance based upon a detailed risk evaluation. The inspectors did not identify a cross-cutting aspect associated with this finding because the performance deficiency was greater than three years old and therefore was not indicative of current performance. (Section 1R13.3)

- Green. The inspectors identified a finding of very low safety significance when licensee personnel failed to ensure that the Unit 2 startup feedwater pump (SUFWP) was available during an 18 month operating cycle. Specifically, the licensee had failed to ensure that the pump oil pressure regulator was properly adjusted, and had failed to perform a post-maintenance test following on-line work in a manner to ensure that no new deficiency was introduced. The licensee entered this issue into their CAP as IR 2565442. Corrective actions consisted of updating the station SUFWP model work orders (WOs) to ensure that interlock continuity checks were performed as a part of the post-maintenance testing when necessary, and to include procedural steps to verify lube oil pressure when starting a SUFWP.

The inspectors determined that the performance deficiency was more than minor because the issue was associated with the Procedural Quality attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the Unit 2 SUFWP is a backup method of decay heat removal following a reactor trip, and is utilized in plant startup and shutdown procedures. A detail risk evaluation was performed and the performance deficiency was determined to be of very low safety significance based upon an evaluation bounding the risk to a Delta Core Damage Frequency (Δ CDF) of $2.9E-7$ /year. No cross-cutting aspect was identified because the cause of the failure were probable causes and not confirmed to be the actual cause. (Section 4OA5)

REPORT DETAILS

Summary of Plant Status

Unit 1 operated at or near full power for the entire inspection period.

Unit 2 operated at or near full power for the entire inspection period.

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01)

.1 Readiness for Impending Adverse Weather Condition—Extreme Cold Conditions

a. Inspection Scope

Since extreme cold conditions were forecast in the vicinity of the facility for January 16, 2016, the inspectors reviewed the licensee's overall preparations/protection for the expected weather conditions. On January 16, 2016, the inspectors walked down the lake screen house, seismic monitoring instrumentation, the robust diverse flexible mitigation capability (FLEX) building, and the commercial FLEX and B.5.b building systems because their functions could be affected or required as a result of the extreme cold conditions forecast for the facility. The inspectors inspected insulation, heat trace circuits, space heater operation, and weatherized enclosures to ensure the operability of affected systems. The inspectors reviewed licensee procedures and discussed potential compensatory measures with control room personnel. The inspectors focused on plant management's actions for implementing the station's procedures for ensuring adequate personnel for safe plant operation and emergency response would be available. Documents reviewed are listed in the Attachment.

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

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04)

.1 Quarterly Partial System Walkdowns

a. Inspection Scope

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

- Unit 1 and Unit 2 spent fuel pool cooling system;
- 2A residual heat removal (RHR) system while the 2B RHR pump was out-of-service for planned maintenance;
- 2B safety injection (SI) system while the 2A SI pump was out-of-service for planned maintenance; and

- 2B RHR system while the 2A RHR 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 systems and, therefore, potentially increase risk. The inspectors reviewed applicable operating procedures, system diagrams, the Updated Final Safety Analysis Report (UFSAR), Technical Specification (TS) requirements, outstanding work orders (WOs), issue reports (IRs), and the impact of ongoing work activities on redundant trains of equipment to identify conditions that could have rendered the systems incapable of performing their intended functions. The inspectors also walked down accessible portions of the systems to verify system components and support equipment were aligned correctly and operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no obvious deficiencies. The inspectors also verified that the licensee had properly identified and resolved equipment alignment problems that could cause initiating events or impact the capability of mitigating systems or barriers and entered them into the CAP with the appropriate significance characterization. Documents reviewed are listed in the Attachment.

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 January 5, 2016, the inspectors performed a complete system alignment inspection of the Unit 2 essential service water system to verify the functional capability of the system. This system was selected because it was considered both safety significant and risk significant in the licensee's probabilistic risk assessment. The inspectors walked down the system to review mechanical and electrical equipment lineups; electrical power availability; system pressure and temperature indications, as appropriate; component labeling; component lubrication; component and equipment cooling; hangers and supports; support system operability; 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 also performed. In addition, the inspectors reviewed the CAP database to ensure that system problems were being identified and appropriately resolved. Documents reviewed are listed in the Attachment.

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

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05)

.1 Routine Resident Inspector Tours (71111.05Q)

a. Inspection Scope

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

- 1B diesel driven auxiliary feedwater pump room;
- division 22 engineered safety feature electrical equipment room;
- diesel driven fire pump area and lake house;
- 2A centrifugal charging pump room;
- Unit 2 451' elevation main generator area;
- Unit 1 auxiliary electrical equipment room; and
- 2B RHR pump room.

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, their potential to impact equipment which could initiate or mitigate a plant transient, or their impact on the plant's ability to respond to a security event. Using the documents listed in the Attachment, the inspectors verified that fire hoses and extinguishers were in their designated locations and available for immediate use; that fire detectors and sprinklers were unobstructed; that transient material loading was within the analyzed limits; and fire doors, dampers, and penetration seals appeared to be in satisfactory condition. The inspectors also verified that minor issues identified during the inspection were entered into the licensee's CAP.

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

b. Findings

No findings were identified.

.2 Failure to Follow Fire Prevention for Hot Work Procedure

Introduction: The inspectors identified a finding of very low safety significance (Green) and an associated NCV of License Condition 2.E when licensee personnel failed to follow the requirements of the Fire Prevention for Hot Work procedure on two separate occasions. Specifically, (Issue 1) on February 2, 2016 a very small fire occurred during a planned hot work activity that involved pipe grinding on a small waste gas decay tank pressure sensing line because the licensee failed to recognize the potential for hydrogen within the line. Additionally, (Issue 2) on February 25, 2016, the inspectors identified that a hot work permit was inadequate prior to the licensee performing a piping weld

repair activity associated with the Unit 2 main generator stator cooling water system because the permit referenced the wrong work location and did not require appropriate controls.

Description:

Issue 1: Small Hydrogen Fire Occurred During Planned Waste Gas Pressure Line Hot Work

On February 2, 2016, a very small hydrogen fire occurred during a maintenance activity when a plant worker started to cut a waste gas pressure line. The planned hot work activity was within the established clearance boundary, and the fire was observed coming out of an opened section of the pipe within the hot work area. The worker immediately stopped cutting the pipe and promptly extinguished the fire by placing his gloved hands over the open end of the pipe. The licensee subsequently tested for hydrogen at the end of the opened pipe and identified that approximately 250 parts per million of hydrogen was present. The licensee promptly capped the pipe to eliminate the hazard.

The licensee performed a causal evaluation and identified the apparent cause to be that the clearance order instructions did not specifically identify hydrogen as a potential hazard, nor did the clearance order instructions provide specific direction to perform hydrogen sampling prior to the start of the hot work activity. The licensee determined that a contributing cause to the event was that the work packages involved were inadequate because hydrogen was not taken into consideration due to the lack of system knowledge.

The inspectors reviewed the licensee's Fire Prevention for Hot Work procedure. The purpose of this procedure was to positively control hot work via a permit system to protect against losses, protect personnel, and to minimize the fire hazards to structures, systems, and components important to safety (Reference OP-AA-201-004, Revision 12, Fire Prevention for Hot Work). This procedure was part of the station's Fire Protection Program and was required to be followed. The inspectors determined that a number of procedural requirements were not followed, which prevented the licensee from establishing the positive controls necessary to prevent this fire from occurring. Specific requirements that were not followed included:

- 3.1.2: Advise supervisors and individuals performing hot work of special precautions for flammable materials, hazardous conditions, High Risk Fire Areas, and provisions of this procedure.
- 4.1.16: If hot work is being conducted near any flammable or combustible gas systems, then the work area shall be sampled with a multi-gas meter prior to starting hot work operations. If any indications of flammable or combustible gases are detected, then hot work may not be started.

Issue 2: Inadequate Fire Permit for Emergency Weld Repair Activity

On February 25, 2016, the inspectors reviewed the approved hot work permit associated with the emergent repair on a cracked weld on the Unit 2 main generator stator cooling water piping. This hot work activity was performed in an area where hydrogen could be present in the atmosphere as a result of main generator hydrogen cooling leakage. The

inspectors reviewed the hot work permit and identified the following issues and corresponding section of the licensee's Fire Prevention for Hot Work procedure that was not followed:

- The hot work permit that was approved and issued authorized the work to be performed in the wrong area of the turbine building and Section 4.3.1 of the procedure required that an authorized hot work permit must be properly filled out; including the correct identification of the location of the work.
- The hot work permit that was approved and issued did not require total hot work confinement or other means to prevent slag or sparks from falling down through an open area below the hot work site although the open area led to spaces below that contained combustible material. Based upon an inspector field walk down and follow up discussion with the site Fire Marshal just prior to the hot work activity starting, the inspector notified the licensee that the requirements in Section 4.1.3 of the procedure that required that open grating, opening or cracks in the walls, floors, or ducts within 35 feet of the site be covered tightly to prevent the passage of sparks to adjacent areas if 100 percent containment cannot be obtained was not met.

In addition, the inspectors identified that the license had failed to enter the NRC identified issue (Issue 2) into the CAP until the inspectors notified the licensee of the deficiency. Both of these two issues described were subsequently entered into the licensee's CAP as IRs 2620772 and 2632182. Corrective actions for Issue 1 included performing a causal evaluation, extent of condition review, training, and an assignment to identify all systems that had the potential to contain combustible gas. Corrective actions for Issue 2 consisted of correcting the hot work permit and providing a tight cover to act as a catch barrier prior to the activity starting.

Analysis: The inspectors determined that the failure to follow the requirements of the Fire Prevention for Hot Work procedure was a performance deficiency. Specifically, the standards in the procedure were clear, but were not followed based upon inadequate knowledge, verification, and oversight.

The inspectors determined that the performance deficiency was more than minor in accordance with IMC 0612, Appendix B, "Issue Screening," dated September 7, 2012, because it was associated with the Human Performance attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective of limiting the likelihood of events that upset plant stability and challenge critical safety functions. Specifically, for Issue 1, the performance deficiency resulted in the occurrence of a small hydrogen fire in the auxiliary building. For Issue 2, the performance deficiency increased the likelihood of a fire occurring during an emergent weld repair in the turbine building.

The inspectors determined that the finding could be evaluated using the SDP in accordance with IMC 0609.04, "Initial Characterization of Findings," and IMC 0609, Appendix F, "Fire Protection Significance Determination Process." The inspectors determined that this finding was of very low safety significance (Green) because these issues were limited to equipment which was not important to safety (Reference Task 1.4.1, Fire Prevention and Administrative Controls).

The inspectors determined that the finding had a Work Management cross-cutting aspect in the Human Performance area. Specifically, a significant contributor to the

performance deficiency was related to the organization not implementing a process of planning, controlling, and executing work activities such that nuclear safety is the overriding priority (H.5).

Enforcement: License Condition 2.e requires that the licensee shall implement and maintain in affect all provisions of the Approved Fire Protection Program as described in the UFSAR, as supplemented and amended, and as approved in the Safety Evaluation Report, dated November 1983, and its supplements.

The licensee's Approved Fire Protection Program, Section 4.8.1, lists the Fire Prevention for Hot Work procedure, OP-AA-201-004, Revision 12, as an aspect to the program. OP-AA-201-004, Revision 12, includes the following:

- Section 3.1.2: "Advise supervisors and individuals performing hot work of special precautions for flammable materials, hazardous conditions, High Risk Fire Areas, and provisions of this procedure." and
- Section 4.1.16: "If hot work is being conducted near any flammable or combustible has systems, then the work area shall be sampled with a multi-gas meter prior to starting hot work operations. If any indications of flammable or combustible gases are detected, then hot work may not be started."
- Section 4.3.1: "An authorized hot work permit is required before any hot work operation is started within the protected area. . . The permit must be properly filled out. . . ."; and
- Section 4.1.3: "Cover open grating, opening or cracks in the walls, floors, or ducts within 35 feet of the site tightly to prevent the passage of sparks to adjacent areas if 100 percent containment cannot be obtained."

Contrary to the above:

Issue 1: On February 2, 2016, the licensee failed to implement Sections 3.1.2 and 4.1.16 of the required Fire Prevention for Hot Work procedure, OP-AA-201-004, Revision 12.

Issue 2: On February 26, 2016, the licensee failed to implement Sections 4.3.1 and 4.1.3 of the required Fire Prevention for Hot Work procedure, OP-AA-201-004, Revision 12.

Because this violation was of very low safety significance and it was entered into the licensee's CAP as IRs 2620772 and 2632182, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy.

(NCV05000456/2016001-01; 05000457/2016001-01; Failure to Follow Fire Prevention for Hot Work Procedure.)

.3 Annual Fire Protection Drill Observation (71111.05A)

a. Inspection Scope

On February 18, 2016, the inspectors observed an unannounced fire brigade drill at the Unit 1 side within the turbine building at ground level. 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:

- 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;
- smoke removal operations;
- utilization of pre-planned strategies;
- adherence to the pre-planned drill scenario; and
- drill objectives.

Documents reviewed are listed in the Attachment.

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)

.1 Internal Flooding

a. Inspection Scope

The inspectors reviewed selected risk-important plant design features and licensee procedures intended to protect the plant and its safety-related equipment from internal flooding events. The inspectors reviewed flood analyses and design documents, including the UFSAR, engineering calculations, and abnormal operating procedures to identify licensee commitments and understand the plant. The specific documents reviewed are listed in the Attachment. In addition, the inspectors reviewed licensee drawings to identify areas and equipment that may be affected by internal flooding caused by the failure or misalignment of nearby sources of water, such as the fire suppression or the circulating water systems. The inspectors also reviewed the licensee's corrective action documents with respect to past flood-related items identified in the CAP to verify the adequacy of the corrective actions. The inspectors performed a walkdown of the following plant areas to assess the adequacy of watertight doors and verify drains and sumps were clear of debris and were operable, and that the licensee complied with its commitments:

- essential service water pump rooms; and the
- auxiliary building equipment drain tank rooms.

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

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program (71111.11)

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

a. Inspection Scope

On January 26, 2016, the inspectors observed a crew of licensed operators in the plant's simulator during licensed operator requalification training. The inspectors verified that operator performance was adequate, evaluators were identifying and documenting crew performance problems, and that training was being conducted in accordance with licensee procedures. The inspectors evaluated the following areas:

- licensed operator performance;
- crew 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 normal, abnormal and emergency procedures;
- control board manipulations;
- oversight and direction from supervisors; and
- ability to identify and implement appropriate TS actions and Emergency Plan actions and notifications.

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

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

b. Findings

No findings were identified.

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

a. Inspection Scope

On February 23, 2016, the inspectors observed control room operators perform a Unit 1 movable control rod assembly surveillance. Additionally, on March 16, 2016, there was a fire outside of the protected area, but within the owner controlled area for which the fire brigade was activated. These were activities that required heightened awareness or were related to increased risk. The inspectors evaluated the following areas:

- licensed operator performance;
- crew 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 and equipment manipulations;
- oversight and direction from supervisors; and
- ability to identify and implement appropriate TS actions and Emergency Plan actions and notifications.

The performance in these areas was compared to pre-established operator action expectations, procedural compliance and task completion requirements. Documents reviewed are listed in the Attachment.

This inspection constituted two quarterly licensed operator heightened activity/risk samples 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:

- auxiliary building heating, ventilation, and air conditioning system; and
- Unit 1 startup feedwater pump.

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

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

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

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

b. Findings

No findings were identified.

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

.1 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

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

- 2B residual heat removal maintenance window, Planned Yellow;
- 2B containment spray pump testing, Planned Yellow;
- Unit 2 safety injection (SI) motor-operated valve – Unplanned Yellow;
- Unit 2 reactor containment fan cooler testing – Planned Yellow;
- 2A auxiliary feedwater maintenance window – Planned Yellow; and
- 2B essential service water maintenance window – Planned Yellow.

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

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

b. Findings

No findings were identified.

.2 Failure to Have Adequate Work Instructions and Procedures Leads to a Loss of Inventory From the Volume Control Tank

Introduction: A finding of very low safety significance (Green) and an associated NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was self-revealed on February 1, 2016, when licensee personnel failed to have appropriate work instructions for performing planned MOV 2SI8807A diagnostic testing. This valve is the Unit 2 SI and charging pumps suction header crosstie. Specifically, the WO used did not provide appropriate instructions to ensure that the proper equipment line-up for the test was established prior to stroking the valve. Ultimately, this led to a transfer of

about 304 gallons of water from the volume control tank (VCT) to the refueling water storage tank (RWST).

Description: On February 1, 2016, during routine panel walkdowns, an operator in the control room identified that the Unit 2 VCT level had dropped unexpectedly and was still lowering. Additionally, operators identified that level in the Unit 2 RWST was showing an upward trend. Based on this information, the control room operators determined that an open flow path existed for diversion of inventory from the VCT to the RWST. Upon identification of the inventory loss, operations personnel proceeded to terminate the event by closing valve 2SI8924, the SI and charging pumps suction header crosstie valve.

Upon further investigation, the licensee discovered that the inadvertent transfer had occurred due to maintenance technicians opening valve 2SI8807A as part of diagnostic testing that was being performed during the ongoing 2A SI train work window. This work had been briefed in the control room; however, there was no coordination between maintenance and the operators to ensure that the plant was in the proper lineup to support the work before the evolution started. Following the event it was estimated that the flow diversion occurred for approximately 38 minutes and led to a total of 304 gallons of inventory being diverted to the RWST at a rate of approximately 8 gallons per minute (gpm).

At the time of the event the licensee reviewed the impact of the flow diversion in order to determine if it affected the ability of the SI system to perform its safety function. The licensee concluded that there was no impact to the 2A SI train since it was already inoperable due to the ongoing work window, and that the 2B SI train was still capable of providing the required volume to the reactor during a design basis event with 8 gpm being diverted. Additionally, the diverted flow did not exceed the TS limit of 10 gpm for identified leakage.

The inspectors reviewed the licensee's evaluation for this event and did not identify any additional concerns regarding the ability of the 2B train of the SI system to perform its safety function during the 38 minute span the flow diversion occurred. However, the inspectors were concerned that when the event was terminated by closing the valve, a single point vulnerability was introduced. Specifically, by closing the valve, a single failure could render both trains inoperable and it was not clear why it was acceptable to declare the "A" emergency core cooling system (ECCS) train inoperable when the 2SI8924 MOV was powered by a "B" train power supply. This issue is further discussed in Section 1R15.

As part of their corrective actions, the licensee planned to revise the maintenance diagnostic procedure to require that maintenance personnel communicate with operations to ensure that the system being worked on is in a proper alignment prior to performing the work.

Analysis: The inspectors determined that the licensee's failure to have appropriate work instructions for performing diagnostic MOV 2SI8807A testing was contrary to the requirements of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," and was a performance deficiency.

The performance deficiency was determined to be more than minor because it was associated with the Equipment Performance attribute of the Initiating Events cornerstone

and adversely affected the cornerstone objective of limiting the likelihood of events that upset plant stability and challenge critical functions during shutdown as well as power operations. Specifically, the failure to have an appropriate procedure for a maintenance activity led to 304 gallons of inventory being diverted to the RWST.

The inspectors determined that the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings." Because the finding impacted the Initiating Events cornerstone, the inspectors screened the finding through IMC 0609, Appendix A, "The SDP for Findings At-Power," using Exhibit 1, "Initiating Event Screening Questions." The finding screened as having very low safety significance (Green) because it was determined that the reactor coolant system (RCS) leak rate for a small loss of coolant accident was not exceeded, and it did not result in a loss of a mitigating system's ability to perform an intended safety function.

The inspectors determined that this finding had a Work Management cross-cutting aspect in the Human Performance area because the licensee did not implement a process of planning, controlling and executing work activities such that nuclear safety is an overriding priority. Specifically, proper work planning and coordination between maintenance and operations would have led to ensuring that the WO being utilized for the maintenance established the proper system line-up prior to the start of the maintenance (H.5).

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances, and shall be accomplished in accordance with these instructions, procedures, or drawings.

Contrary to the above, on February 1, 2016, the licensee failed to have work instructions that were appropriate for the circumstances when performing planned diagnostic 2SI8807A MOV testing, an activity affecting quality. Specifically, the work instructions used by the licensee failed to ensure that the proper equipment line-up was established prior to stroking the valve. This failure ultimately led to the unplanned transfer of approximately 304 gallons of water from the VCT to the RWST in a span of 38 minutes.

Corrective actions for this issue included a planned action to revise the maintenance MOV diagnostic procedure to require maintenance personnel to communicate with operations in order to ensure that the system being worked on is in a proper alignment prior to performing the work. Because this violation was of very low safety significance and it was entered into the licensee's CAP as IR 2620523, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000457/2016001-02; Failure to Have Adequate Work Instructions and Procedures Leads to a Loss of Inventory from the Volume Control Tank)**

.3 Closed URI 05000457/2015004-01: Loss of Shutdown Cooling Train During Refueling Cavity Fill and Associated Reduced Inventory Operations

Introduction: A finding of very low safety significance (Green), and an associated NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," was self-revealed on October 8, 2016, due to the licensee's failure to ensure that a condition adverse to quality was promptly identified and corrected. Specifically, on October 8, 2015,

valve 2RH606, which is the RHR heat exchanger flow control valve, failed to open and caused a loss of one train of shutdown cooling in Mode 6, and an unplanned Orange risk path. The reason for the failure was improper use of a lower strength carbon steel valve key instead of the specified high strength hardened steel valve key. In 1993, the valve vendor had supplied a report under 10 CFR Part 21, "Reports of Defects and Non Compliance," which applied to the specified valve, stating that low strength carbon steel keys might have been supplied instead of the specified high strength hardened steel. However, at the time of the report, the site did not evaluate or correct the identified condition adverse to quality.

Description: In Inspection Report 0500456/2015004; 05000457/2015004, the inspectors documented URI 05000457/2015004-01 regarding the failure of valve 2RH606 on October 8, 2015. On that day, valve 2RH606 became mechanically bound while in the process of filling the Unit 2 reactor cavity to greater than 23 feet. This was identified when operators attempted to open the valve from the control room. The valve's failure to open caused shutdown risk on Unit 2 to change from a planned Yellow to an unplanned Orange condition. Additionally, the licensee entered LCO 3.9.6, "Residual Heat Removal and Coolant Recirculation-Low Water Level," Condition A, for one train of RHR cooling inoperable. This action required the licensee to initiate actions immediately to either restore the affected RHR loop to operable status or to initiate actions to establish greater than or equal to 23 feet of water above the reactor vessel flange. The licensee accomplished this action by promptly raising water level in the cavity to greater than 23 feet. At the end of the inspection period the licensee's investigation on the cause of the failure was still ongoing. The URI was open pending the inspector's review of the licensee's completed investigation report to determine whether a performance deficiency existed.

During this inspection period the inspectors reviewed the completed apparent cause evaluation that documented the results of the failure analysis on the failed component. The results showed that the valve key failed due to crushing deformation originating from an improper use of a lower strength carbon steel key instead of the specified high strength hardened steel key. Additionally, the results showed that the sheared key only had approximately 65 percent of the specified tensile strength.

The apparent cause evaluation also identified that the manufacturer (Fisher Controls) of the valve released an Information Notice (IN 93-01) as part of a Part 21 report stating, in part, that during inspection of their key inventory they found low strength carbon steel keys mixed with the high strength alloy steel keys. The valve series corresponding to valve 2RH606 was one of the models listed as affected. A search of the work history of the valve found no evidence of the key being replaced since original installation. Furthermore, the review found no evidence of the information notice being reviewed or of the affected stem keys being replaced. Based on this information, the apparent cause evaluation determined that one of the apparent causes was that "the site had not responded to the Information Notice; therefore, the 2RH606 valve stem key was not replaced with the high strength alloy steel material." The second apparent cause was that "a loose setscrew allowed the lever arm to become misaligned." The misalignment created an uneven compressive force on the key, which when combined with a weaker key material, allowed for crushing deformation.

The licensee's long-term corrective actions included replacing the failed sheared key. Additionally, an action was taken to replace other affected valve keys on both units

during the upcoming Unit 1 fall outage and the Unit 2 2017 spring outage. Additionally, the work history of the affected valves was reviewed and did not identify any performance issues.

Analysis: The inspectors determined that the failure to correct a known condition adverse to quality, in the form of the improper material being used in a safety-related valve, was a performance deficiency.

The performance deficiency was determined to be more than minor because it was associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to correct a condition adverse to quality in the form of improper use of a lower strength carbon steel key instead of the specified high strength hardened steel key in a safety-related valve ultimately led to a loss of one train of shutdown cooling in Mode 6.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings."

Because the finding was associated with a degraded condition while the plant was shut down and in Mode 6 at the time of the loss of a shutdown cooling train, a senior risk analyst assessed the finding using IMC 0609, Appendix G, "Shutdown Operations Significance Determination Process." The inspectors reviewed the criteria for "Losses of Control" (i.e., loss of level for pressurized water reactors) in Appendix G, Attachment 1. Since none of the criteria for loss of level were met, the inspectors continued the risk evaluation using the Mitigating Systems Screening Questions of Exhibit 3 of IMC 0609, Appendix G, Attachment 1, "Phase 1, Initial Screening and Characterization of Findings."

The inspectors answered "Yes" to Question 3 of Exhibit 3, "Does the finding represent an actual loss of function of at least a single Train for greater than the TS Allowed Outage Time..." The finding's significance was then assessed using Appendix G, Attachment 2, "Phase 2 Significance Determination for Pressurized Water Reactor During Shutdown." This finding was a Condition Finding as defined in Appendix G, Attachment 2. The Plant Operating State (POS) was POS 2 (reduced inventory operations) as defined in Appendix G, Attachment 2. Using Table 5, "Initiating Event Likelihood (IEL) for Condition Findings – PWRs," the IEL was a "3" for a loss of RHR for a duration of less than 3 days.

The mitigating functions for this initiator were evaluated using Worksheet 9, "SDP for a Westinghouse 4-Loop Plant – Loss of RHR in POS 2 RCS Vented)." In Worksheet 9, all of the core damage sequences were solved. The top event function "RHR-S", involving recovery of decay heat removal before the RCS is assumed to boil to the flange level "if vessel head is removed," was given a credit of zero (i.e., function is failed), since the time to boil was less than 20 minutes.

Using Table 8, "Definitions and Characteristics of Time Windows from the Shutdown PRA [Probable Risk Assessment] (NUREG/CR-6144 Table 5.4-20) assuming a vented RCS (RCS temperature initially 140F)," the time to core damage was estimated at 219 minutes. Therefore, the top event function "FEED," involving operators initiating RCS injection before core damage, was given a credit of "4." The top event functions

“RHR-R,” involving recovery of decay heat removal before RWST depletion, and RWST makeup, involving inventory makeup to the RWST before core damage, were given credits of “2” each. For RHR-R, the time to RWST depletion was greater than 10 hours. For RWST makeup, the time to RWST depletion and core damage was assumed to be greater than 13 hours.

Result of Internal Events Analysis

The total risk result of the internal event analysis is the sum of the individual results from the initiators multiplied by 3.3, which is an approximation of the geometric average of one order of magnitude. This factor is used to justify that three sequences of the same color are equivalent to one sequence of a higher significance color (e.g., three CDF white sequences are equivalent to one yellow sequence). Both core damage sequences in Worksheet 9 were each a “7.” Therefore, the total change in risk (Δ CDF) for this performance deficiency was estimated to be $6.6E-07/\text{yr}$: $\Delta\text{CDF} = (2) * (3.3E-07/\text{yr}) = 6.6E-07/\text{yr}$.

Large Early Release Frequency

The potential risk contribution due to large early release frequency (LERF) was considered using IMC 0609, Appendix H, “Containment Integrity Significance Determination Process.” Braidwood is a Westinghouse pressurized water reactor plant with a large dry containment. Section 5.2, Step 2, “Accident Sequence Screening,” indicated that this issue required further evaluation since the finding occurred during POS 2 within the first eight days after shutdown. The Senior Reactor Analyst (SRA) used Appendix H, Table 5.4, “Phase 2 Assessment Factors – Type A Findings at Shutdown,” to determine an appropriate LERF factor. Based on information from the inspectors, the licensee was capable of re-closing the containment prior to boiling the RCS inventory. The licensee’s plans for containment closure appropriately considered the potential loss of offsite power and a loss of all vital alternating current power. The SRA concluded that the risk contribution of this finding due to LERF was negligible.

Based on the above, this finding was determined to be of very low risk significance (i.e., Green).

The inspectors did not identify a cross-cutting aspect associated with this finding because it was not confirmed to reflect current performance due to the age of the performance deficiency. Specifically, the Fisher Information Notice was released in 1993.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” states, in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances, are promptly identified and corrected.

Contrary to the above, from 1993 to October 8, 2015, the licensee failed to correct a condition adverse to quality in the form of the improper material being used in safety-related valve RH606, the RHR heat exchanger flow control valve. Specifically, in 1993 the licensee received an Information Notice from a valve manufacturer as part of a 10 CFR Part 21, “Reports of Defects and Non Compliance,” which identified the potential that low strength carbon steel keys could have been installed instead of the high strength alloy steel keys. The valve series corresponding to valve 2RH606 was one of

the models listed in the Information Notice as affected. However, even though the valve was identified as being susceptible to having defective material the licensee had not corrected this condition adverse to quality.

The licensee's long-term corrective actions included replacing the failed sheared key. Additionally, an action was taken to replace other affected valve keys in both Units during the upcoming Unit 1 2016 fall outage and Unit 2 2017 spring outage.

Because this violation was of very low safety significance and was entered into the licensee's CAP as IR 2567811, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000456/2016001-03; 05000457/2016001-03, Failure to Correct a Condition Adverse to Quality Leads to Loss of One Train of Shutdown Cooling in Mode 6).**

1R15 Operability Determinations and Functional Assessments (71111.15)

.1 Operability Evaluations

a. Inspection Scope

The inspectors reviewed the following issues:

- 2B diesel generator incomplete sequence trip following surveillance testing (IR 2606476);
- Part 21, weld rod recall (IR 2609819);
- TS implications of closure of 1/2SI8924 (IR 2620523);
- loss of 345kV bus 09 due to fault in LaSalle line (IR 2634290);
- Inoperability of 1B and 2B auxiliary feedwater pump due to high energy line break vulnerability (IR 2635702); and
- gas void along line 2SI03BA (IR 2640751).

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

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

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18)

.1 Plant Modifications

a. Inspection Scope

The inspectors reviewed the following modification:

- Air intake location change for the Unit 1 and Unit 2 auxiliary feedwater diesel generator from the turbine building to the auxiliary feedwater diesel generator rooms (EC 404988).

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 modifications did not affect the operability or availability of the affected system. The inspectors, as applicable, observed ongoing and completed work activities to ensure that the modifications were installed as directed and consistent with the design control documents; the modifications operated as expected; post-modification testing adequately demonstrated continued system operability, availability, and reliability; and that operation of the modifications did not impact the operability of any interfacing systems. As applicable, the inspectors verified that relevant procedure, design, and licensing documents were properly updated. Lastly, the inspectors discussed the plant modifications with operations, engineering, and training personnel to ensure that the individuals were aware of how the operation with the plant modifications in place could impact overall plant performance. Documents reviewed are listed in the Attachment.

This inspection constituted one plant modification sample 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:

- 2B diesel generator start following work on the electrical start circuit;
- 2A SI pump run following oil cooler and motor-operated valve work;
- Unit 2 RHR pump run following planned maintenance;
- 2SI8807 MOV diagnostic testing; and
- 1B auxiliary feedwater pump testing following a modification to the combustion air intake location.

These activities were selected based upon the structure, system, or component's ability to impact risk. The inspectors evaluated these activities for the following (as applicable): the effect of testing on the plant had been adequately addressed; testing was adequate

for the maintenance performed; acceptance criteria were clear and demonstrated operational readiness; test instrumentation was appropriate; tests were performed as written in accordance with properly reviewed and approved procedures; equipment was returned to its operational status following testing (temporary modifications or jumpers required for test performance were properly removed after test completion); and test documentation was properly evaluated. The inspectors evaluated the activities against TSs, the UFSAR, 10 CFR Part 50 requirements, licensee procedures, and various NRC generic communications to ensure that the test results adequately ensured that the equipment met the licensing basis and design requirements. In addition, the inspectors reviewed corrective action documents associated with post-maintenance tests to determine whether the licensee was identifying problems and entering them in the CAP and that the problems were being corrected commensurate with their importance to safety. Documents reviewed are listed in the Attachment.

This inspection constituted five 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:

- 2B diesel generator monthly run (Routine);
- Unit 1 movable control rod assemblies surveillance (Routine);
- ECCS and containment spray venting and valve alignment/ultrasonic testing (UT) verification surveillance (Routine); and
- 1A essential service water pump (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 inservice testing activities, was testing performed in accordance with the applicable version of Section XI of the American Society of Mechanical Engineers (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 all 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 annunciator and alarm setpoints consistent with design documents; and
- where applicable, were alarm response procedure entry points and actions consistent with the plant design and licensing documents.

Documents reviewed are listed in the Attachment.

This inspection constituted three routine surveillance testing samples and one in-service test (IST) sample as defined in IP 71111.22, Sections–02 and–05.

b. Findings

No findings were identified.

.2 Unresolved Item: Questions Regarding the Implementation of the Gas Accumulation Program

Introduction: The inspectors identified an URI regarding the implementation of the Gas Accumulation Program at Braidwood. Specifically, the inspectors were concerned with whether a number of surveillance frequencies that were contained in the Surveillance Frequency Program meet the requirements as specified in procedure ER–AA–2009, “Managing Gas Accumulation.” Additionally, the inspectors were concerned with the basis for not increasing the frequency of the UT examinations following the discovery of a void on October 20, 2015. At the end of the inspection period, the licensee’s investigation on the cause of an unexpected void growth, and the potential surveillance

frequency discrepancies was ongoing. Resolution of this issue will be based on the inspector's review of the licensee's completed investigation.

Description: On March 15, 2016, while performing a semi-annual gas monitoring surveillance on Unit 2 under 2BwOSR 3.2.2-2, "ECCS and Containment Spray Venting and Valve Alignment/UT Verification Surveillance," a gas void was found along line 2SI03BA, which is a SI line that feeds the A and D SI hot leg injection lines. The ultrasonic examination revealed that a 0.960 cubic foot void was present. A void had been previously identified in the same location on October 20, 2015, which had a volume of 0.25 cubic feet. Calculation BRW-15-0100-M was performed in October 2015 to justify operability of the SI system. The calculation produced a void size acceptance criteria of 0.389 cubic feet.

Upon identification of the void in March 2016, the licensee declared the 2A SI train inoperable due to the previously established acceptance criteria of 0.389 cubic feet not being met, and entered LCO 3.5.2, "ECCS Operating," Condition A, which required that the affected train be restored to an operable status within 7 days. The licensee exited the LCO on March 16, 2016 upon completion of a revision to calculation BRW-15-0100-M, which documented a revised acceptance criteria of 1.5 cubic feet.

During this inspection period, the inspectors reviewed the licensee's revision to the aforementioned calculation, and the requirements contained in procedure ER-AA-2009. Based on their review, the inspectors questioned the basis for not increasing the frequency of the UT examinations following the discovery of the void on October 20, 2015. Additionally, the inspectors were concerned with the frequency of inspection of a number of locations outside the missile barrier (17 for Unit 1 and 19 for Unit 2), which appeared to conflict with what was specified in the procedure. Specifically, the locations in question were examined at an 18 month frequency, although the procedure stated that "frequency of once per refueling outage shall be used only for locations that are inaccessible due to actual (not just posted) high radiation conditions." Finally, the inspectors had a concern regarding the means by which gas accumulation was managed for locations inside the missile barrier, since the prescribed locations were only monitored once upon Mode ascension from an outage.

The licensee entered the inspectors concerns into their CAP as IR 2644532 and IR 2640751. At the conclusion of the inspection, two work group evaluations were in progress to: 1) address the void growth observed since October 2015, and 2) evaluate the compliance with the program document procedure, ER-AA-2009.

This URI will remain open until the evaluations are completed and the inspectors review the evaluations to determine whether a performance deficiency exists. **(URI 05000456/201601-04; 05000457/2016001-04; Questions Regarding the Implementation of the Gas Accumulation Program)**

2. RADIATION SAFETY

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01)

.1 Radiological Hazard Assessment (02.02)

a. Inspection Scope

The inspectors assessed whether changes to the station's radiological profile due to operating protocols, primary chemistry changes, and plant modifications were adequately addressed in the licensee's Radiation Protection Survey Program. The inspectors conducted walkdowns of various locations and reviewed surveys to evaluate radiological conditions.

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

b. Findings

No findings were identified.

.2 Instructions to Workers (02.03)

a. Inspection Scope

The inspectors assessed whether workers were adequately informed of radiological hazards present through radiation work permits, alarming dosimeter setpoints, area postings, and labelling of containers.

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

b. Findings

No findings were identified.

.3 Contamination and Radioactive Material Control (02.04)

a. Inspection Scope

The inspectors determined whether workers and materials were adequately assessed for radioactive contamination before leaving the radiologically controlled area(s). Additionally, the inspectors assessed whether sealed sources were adequately identified, stored, and did not leak.

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

b. Findings

No findings were identified.

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

.1 Radiological Work Planning (02.02)

a. Inspection Scope

The inspectors evaluated whether radiological work planning as-low-as-reasonably-achievable (ALARA) evaluations properly identified appropriate dose reduction techniques and whether these techniques were integrated into work procedure and/or radiation work permits.

The inspectors assessed whether the results achieved were aligned with the intended work activities. The inspectors also evaluated whether lessons learned from post-job reviews were identified and recorded.

These inspection activities constituted one 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 reviewed the effectiveness of source term reduction activities and the methodologies for estimating collective exposures. The inspectors reviewed various ALARA work planning documents to evaluate the assumptions and bases for the collective radiation exposure estimates. The inspectors assessed whether the methods for adjusting or re-planning work for changes in work scope were based upon sound radiation protection and ALARA principles

These inspection activities constituted one 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, Occupational and Public Radiation Safety, and Security

4OA1 Performance Indicator Verification (71151)

.1 Safety System Functional Failures

a. Inspection Scope

The inspectors sampled licensee submittals for the Safety System Functional Failures (MS05) PI for Braidwood Unit 1 and Unit 2 for the period from the first quarter 2015 through the fourth quarter 2015. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in Nuclear Energy Institute

(NEI) 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, dated August 31, 2013, and NUREG-1022, "Event Reporting Guidelines 10 CFR 50.72 and 50.73," definitions and guidance, were used. The inspectors reviewed the licensee's operator narrative logs, operability assessments, maintenance rule records, maintenance WOs, IRs, event reports and NRC Integrated Inspection Reports for the period of January 1 – December 31, 2015, to validate the accuracy of the submittals. The inspectors also reviewed the licensee's IR database to determine if any problems had been identified with the PI data collected or transmitted for this indicator. Documents reviewed are listed in the Attachment.

This inspection constituted two safety system functional failures samples as defined in IP 71151-05.

b. Findings

No findings were identified.

.2 Occupational Exposure Control Effectiveness

a. Inspection Scope

The inspectors sampled licensee submittals for the Occupational Exposure Control Effectiveness (OR01) PI for Braidwood Unit 1 and Unit 2 for the period from the first quarter 2015 through the fourth quarter 2015. The inspectors used PI definitions and guidance contained in NEI 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, dated August 31 2013, to determine the accuracy of the PI data reported during those periods. The inspectors reviewed the licensee's assessment of the PI for occupational radiation safety to determine if indicator related data was adequately assessed and reported. To assess the adequacy of the licensee's PI data collection and analyses, the inspectors discussed with radiation protection staff, the scope and breadth of its data review and the results of those reviews. The inspectors independently reviewed electronic personal dosimetry dose rate and accumulated dose alarms and dose reports and the dose assignments for any intakes that occurred during the time period reviewed to determine if there were potentially unrecognized occurrences. The inspectors also conducted walkdowns of numerous locked high and very-high radiation area entrances to determine the adequacy of the controls in place for these areas. Documents reviewed are listed in the Attachment.

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

b. Findings

No findings were identified.

4OA2 Identification and Resolution of Problems (71152)

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

a. Inspection Scope

As part of the various baseline inspection procedures discussed in previous sections of this report, the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify they were being entered into the licensee's CAP at an appropriate threshold, that adequate attention was being given to timely corrective actions, and that adverse trends were identified and addressed. Attributes reviewed included: identification of the problem was complete and accurate; timeliness was commensurate with the safety significance; evaluation and disposition of performance issues, generic implications, common causes, contributing factors, root causes, extent-of-condition reviews, and previous occurrences reviews were proper and adequate; and that the classification, prioritization, focus, and timeliness of corrective actions were commensurate with safety and sufficient to prevent recurrence of the issue. Issues entered into the licensee's CAP as a result of the inspectors' observations are included in the Attachment.

These routine reviews for the identification and resolution of problems did not constitute any additional inspection samples. Instead, by procedure they were considered an integral part of the inspections performed during the quarter and documented in Section 1 of this report.

b. Findings

No findings were identified.

.2 Daily Corrective Action Program Reviews

a. Inspection Scope

In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's CAP. This review was accomplished through inspection of the station's daily issue report packages.

These daily reviews were performed by procedure as part of the inspectors' daily plant status monitoring activities and, as such, did not constitute any separate inspection samples.

b. Findings

No findings were identified.

.3 Follow-Up Sample for In-Depth Review: Review of Enforcement Discretion Non-Cited Violations Identified During the Braidwood 2013 Cyber-Security Inspection 05000456/2013406; 05000457/2013406 and Associated Corrective Action Documents

This inspection constituted one biennial sample of the problem identification and resolution (PI&R) inspection as defined by IP 71152, "Problem Identification And Resolution." Documents reviewed were listed in the Attachment.

a. Inspection Scope

The inspector performed a review of the licensee's CAP and associated documents, specifically Action Request (AR) 01481288, "Cyber Security: PB LL For Portable/Media Devices;" AR 01481292, "Cyber Security: Peach Bottom LL on Scanning Kiosk;" AR 01493460, "Cyber: Digital Component Identification Questionnaires Not Completed;" and AR 01525867, "Scoping of Physical Security Digital Assets." The inspector interviewed personnel, performed walkdowns, verified the completion of and assessed the adequacy of the corrective actions taken in response to three NRC-identified NCVs and one licensee-identified NCV that was granted enforcement discretion.

The inspector's review and evaluation was focused on the NRC- and licensee-identified cyber-security NCVs to ensure corrective actions were: complete, accurate, and timely; considered extent of condition; provided appropriate classification and prioritization; provided identification of root and contributing causes; appropriately focused; action taken resulted in the correction of the identified problem; identified negative trends; operating experience was adequately evaluated for applicability; and applicable lessons learned were communicated to appropriate organizations.

This review constituted a single follow-up inspection sample for in-depth review as defined in IP 71152-05.

b. Background

In accordance with Title 10 CFR 73, Section 54, "Protection of Digital Computer and Communication Systems and Networks (i.e., the Cyber-Security Rule), each nuclear power plant licensee was required to submit to the NRC for review and approval a cyber-security plan and an associated implementation schedule by November 23, 2009. Temporary Instruction (TI) 2201/004, "Inspection of Implementation of Interim Cyber Security Milestones 1 – 7," was developed to evaluate and verify each nuclear power plant licensee's ability to meet the interim milestone requirements of the Cyber-Security Rule. On June 20, 2013, the NRC completed an inspection at the Braidwood Station, Units 1 and 2, which evaluated the interim cyber-security Milestones 1 – 7. During performance of the TI, four NCVs were identified and incorporated into the licensee's CAP. These four NCVs were subsequently given enforcement discretion following the Security Issues Forum Meeting conducted on May 22, 2013. During the week of February 8, 2016, the inspector reviewed the Cyber-Security Milestones 1 – 7 Inspection NCVs as a PI&R sample. The CAP documents were evaluated to determine the effectiveness of the licensee's corrective actions.

c. Observations

As discussed in the “Inspection Scope” section above, the inspector’s review was focused on the licensee’s actions to ensure the NCVs corrective actions were appropriately focused to correct the identified problems. In addition, during the inspector’s review of the cyber-security inspection’s corrective action documents the following observation was identified:

- The inspector’s review of AR 01500853, “Cyber Security: Milestone 3 Issues with Security Dig. Assets,” dated April 11, 2013, and AR 01525867, “Cyber Security: Scoping of Physical Security Digital Assets,” dated June 17, 2013, indicated that the status for both ARs was complete. However, Braidwood AR 01525867 was closed to the Byron AR 01522309, “Cyber Security: Scoping of Physical Security Digital Assets,” dated June 6, 2013, where the status shown was open. Since the status of this issue remained open, the inspector discussed the issue during a Security Issues Forum Meeting conducted on March 16, 2016, to determine the path forward. During the meeting discussions, the inspector became aware of ongoing interactions between the NRC headquarters staff, the NEI, and the industry to resolve generic issues associated with the Milestone 1 – 7 inspections. These issues include the access authorization process, Personnel Access Data System, access control for portable and mobile devices, one-way deterministic devices placed at the data diode boundary, maintenance and test equipment, hybrid communication pathways, and moving data or software between security levels. Since these issues are in the process of being resolved through the Security Frequently Asked Question process, the review and evaluation of the licensee’s corrective actions will be conducted during a subsequent PI&R sample or during the Milestone 8, full implementation inspection.

d. Findings

No findings were identified.

40A5 Other Activities

.1 (Closed) Unresolved Item 05000457/2015004–02, Failure of Startup Feedwater Pump to Start During Plant Shutdown

a. Inspection Scope

The inspectors documented URI 05000457/2015004–02 to determine if the reason the startup feedwater pump failed to start during a planned plant shutdown constituted a performance deficiency. The inspectors reviewed the licensee’s completed apparent cause analysis that identified two probable causes, both of which the inspector’s determined collectively represented a finding.

b. Findings

Failure to Ensure Unit 2 Startup Feedwater Pump Availability

Introduction: The inspectors identified a finding of very low safety significance (Green) when licensee personnel failed to ensure that the Unit 2 Startup Feedwater Pump (SUFWP) was available during an 18 month operating cycle. Specifically, the licensee

failed to ensure that the pump's oil pressure regulator was properly adjusted, and failed to perform a post-maintenance test following on-line work in a manner to ensure that no new deficiency was introduced.

Description: On October 4, 2015, operations attempted to start the Unit 2 SUFWP (2SUFWP) at low power operation during a plant shutdown to support a refueling outage.

The licensee performed an apparent cause evaluation and identified that the most probable cause was due to the 2SUFWP starting interlock not being met. Specifically, either pump oil pressure dropped below the required minimum value or one of the manual valve limit switch contacts was not made up. The licensee identified issues within station processes that could have eliminated both probable causes and would have ensured more reliable station SUFWP operation.

Post Maintenance Testing Inadequate following 2SUFWP Maintenance Window

The licensee reviewed the 2SUFWP work history which included a work window in September 2015. The scope of the work included breaker relay calibrations and trip checks, breaker inspections and swaps, 2SUFWP oil pressure switch calibrations, cooler inspections, mechanical seal replacements, and coupling inspections. The 2FW098 and 2CB133 valves were repositioned during this work window under a clearance order that could have introduced a new deficiency upon restoration since these valves have limit switches that sense valve position and provide a corresponding electrical signal to the 2SUFWP starting interlock.

The licensee determined that a probable cause of the 2SUFWP pump failing to start was due to the one of the manual valves' limit switches not being made up that were required to be closed to satisfy the pump starting interlock, potentially 2FW098 and/or 2CB133. The 2SUFWP operational test was delayed until the October 4, 2015, planned shutdown since the licensee performed the work on-line which did not support starting and running the pump. However, the licensee identified that a post-maintenance test could have been performed that would have ensured the necessary valve limit switches had adequate contact through a simple continuity check.

The inspectors reviewed the licensee's post maintenance procedure, MA-AA-716-012. The purpose of this procedure was to provide standard process guidance on the requirements and expectations to ensure that when any maintenance or configuration change is performed, that (1) the original deficiency is corrected, (2) no new deficiency has been created as a result of the maintenance activities or configuration change, and (3) equipment will perform its intended function when returned to service. The procedure required the licensee to perform a post-maintenance test following corrective maintenance to verify that plant equipment can perform its intended function following maintenance. Changing the position of 2FW098 and/or 2CB133 could have introduced a new deficiency if the valve limit switches did not make proper contact during system restoration.

The inspectors determined that the licensee failed to follow this procedure when performing the 2SUFWP maintenance described above prior to returning the system to service and expected use for the October 4, 2015, shutdown.

Insufficient SUFWP Oil Pressure

The SUFWP required greater than 7 pounds per square inch gauge (psig) oil pressure to satisfy interlock requirements. Plant procedure BwOP FW-5, "Operations of a Start-up Feedwater Pump," Step E.5.e, described normal lube oil pressure as 8–11 psig and described the steps necessary to adjust oil pressure. The 2SUFWP lube oil pressure had been observed to drift lower from 9 to 7 psig over the course of a day or so. The licensee identified that the low operating margin coupled with pressure drifting lower could have resulted in oil pressure below the pressure necessary to reset and maintain the oil pressure interlock.

The license entered both these issues into their CAP as IR 2565442 and assigned corrective actions to address the two probable causes described above. Corrective actions consisted of updating the station SUFWP model WOs to ensure that interlock continuity checks were performed as a part of the post-maintenance test when necessary, and to include procedural steps to verify lube oil pressure when starting a SUFWP.

No cross-cutting aspect was identified because the cause of the failure were probable causes, and were not confirmed to be the actual cause.

Analysis: The inspectors determined that the failure to ensure that the 2SUFWP was available when relied upon for safety was a performance deficiency. Specifically, following a 2SUFWP work window in September 2015, the licensee failed to perform an adequate post maintenance test as required by station procedures. Specifically, the 2SUFWP was returned to service for use without verifying that no new deficiency had been created (i.e., valve interlock switches not made up). Additionally, the station's procedure for starting the 2SUFWP did not ensure that the pump's oil pressure was greater than the required 7 psig prior to actually starting the pump.

The inspectors determined that the performance deficiency was more than minor in accordance with IMC 0612, Appendix B, "Issue Screening," because the issue was associated with the Procedural Quality attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that response to initiating events to prevent damaging the core. Specifically, the 2SUFWP is a backup method of decay heat removal following a reactor trip and is utilized in plant startup and shutdown procedures.

In accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and IMC 0609, Appendix A, "The Significance Determination for At-Power Findings," the inspectors determined that a detailed risk evaluation was required because the 2SUFWP is a risk-significant component that was out of service for potentially greater than 24 hours.

The SRA first determined the Exposure Time (ET) for the finding. The 2SUFWP was started on May 22, 2014, and the pump failed-to-start on October 4, 2015. This interval is about 500 days. Though there was a maintenance outage for the 2SUFWP during the week of September 21, 2015, this outage was conservatively neglected because the apparent cause evaluation did not confirm that the issue was introduced during the work window. In accordance with the Risk Assessment Standardization Project handbook guidance, when the time of failure of a component is not known, the ET would be assumed to be one-half the time interval between the last known time that the component was

available and the time when the component was known to be failed. This guidance is commonly known as "T/2." For the issue of the 2SUFWP, the result was an ET of about 250 days (500 days divided by 2). Using the Braidwood Standardized Plant Analysis Risk (SPAR) Model, Version 8.24 and Systems Analysis Programs for Hands-on Integrated Reliability Evaluations, Version 8.1.3, an Exposure Time of 250 days results in a Δ CDF of $1.3E-6$ /yr. The dominant core damage sequence is a Dual Unit Loss of Essential Service Water initiating event, with a failure of auxiliary feedwater, a failure of main feedwater, and a failure to recover essential service water.

Recovery of the 2SUFWP was considered in the analysis. The licensee's apparent cause evaluation (per IR 02565442) considered the most likely cause of the failure-to-start of the pump to be either the oil pressure of the pump drifting low such that the low oil pressure interlock prevented the 2SUFWP from starting or one of the manual valve limit switch contacts (for the suction, recirculation, or discharge valves) not made up. However, in an event in which there is a loss of all feedwater, emergency operating procedure (EOP) 2BwFR-H.1, "Response to Loss of Secondary Heat Sink," would be in effect. If the 2SUFWP failed-to-start while performing this EOP, the procedure contained a step to check that the starting interlocks for the pump are satisfied. The step includes checking oil pressure greater than 7 psig and verifying that the manual valves required for starting the pump are in the open position. If oil pressure is not greater than 7 psig, Braidwood procedure BwOP-FW-5, "Operation of a Startup Feedwater Pump," can be used by the operators to adjust the oil pressure regulator on the pump to a value of about 10 psig. Since oil pressure on the pump was observed to be varying with time, this risk evaluation will focus on low oil pressure as the most probable cause of the failure-to-start of the pump. However, the human error probability for recovery will be increased to account for uncertainties in the exact cause of failure.

The SPAR-H Human Reliability Analysis Method (per NUREG/CR-6883) was used to determine the human error probability (HEP) for the operator failing to diagnose the low oil pressure problem and to take action to correct the low oil pressure condition for the 2SUFWP. Using the SPAR-H method, for Diagnosis, the applicable performance shaping factors that influenced the HEP were determined to be high stress (since the operators would be in a high risk condition with no feedwater available) and procedures (available but poor). The procedures were determined to be "available but poor," although EOP 2Bw FR-H.1 checked the 2SUFWP oil pressure greater than 7 psig, the procedure did not allow adequate margin to ensure that the oil pressure interlock of 7 psig would be satisfied. Also, the procedure designator that would be used to correct a low oil pressure condition was not listed in the EOP. For Action, high stress, moderate complexity (since coordination with a local operator would be required to have the operator adjust the oil pressure regulator for the pump) and low experience were considered to be the influential performance shaping factors. The result was an HEP of 0.11. Since the exact cause of the failure-to-start of the 2SUFWP is not explicitly known, this HEP was multiplied by two, resulting in an HEP of 0.22.

The final Δ CDF (including recovery) is the product of the initial Δ CDF without recovery ($1.3E-6$ /yr) multiplied by the HEP for recovery (0.22) or $2.9E-7$ /yr.

Since the Δ CDF associated with internal events was greater than $1.0E-7$ /yr, an evaluation for external event delta risk contributions was required. The following external delta risk evaluation was performed:

- During fire scenarios, it was assumed that the 2SUFWP is lost.
- During a seismic event and during a tornado event, it was assumed that the 2SUFWP is lost (since offsite power is assumed lost).

Therefore, the delta risk contribution due to external events is negligible.

Also, since the total estimated change in core damage frequency was greater than $1.0E-7$ /yr, IMC 0609, Appendix H, "Containment Integrity Significance Determination Process," was used to determine the potential risk contribution due to LERF. Braidwood Station is a 4-loop Westinghouse pressurized water reactor with a large dry containment. Sequences important to LERF include steam generator tube rupture events and inter-system loss of coolant accident events. These were not the dominant core damage sequences for this finding.

Based on the detailed risk evaluation, the inspectors determined that the finding was of very low safety significance (Green).

Enforcement: This finding does not involve enforcement action because no violation of a regulatory requirement was identified. Because this finding does not involve a violation and is of very low safety significance, it is identified as a FIN.

(FIN 05000456/2016001-05; 05000457/2016001-05, Failure to Ensure Unit 2 Startup Feedwater Pump Availability)

.2 (Closed) Unresolved Item 05000456/2014007-01; 05000457/2014007-01, Incorporation of Westinghouse NSAL 99-95, "Reactor Coolant Pump Operation During Loss of Seal Injection," Into the Current Licensing Basis and Corrective Actions For 2B RCP Degraded Thermal Barrier

a. Inspection Scope

The inspectors documented this URI to determine pending inspector review of the licensee's incorporation of operating experience Westinghouse NSAL 99-95, "Reactor Coolant Pump Operation During Loss of Seal Injection," into the current licensing basis and to determine if the corrective actions to address a degraded 2B RCP Thermal Barrier to date were adequate.

b. Findings

No findings were identified

4OA6 Management Meetings

.1 Exit Meeting Summary

On April 14, 2016, the inspectors presented the inspection results to Ms. M. Marchionda, Site Vice President, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

.2 Interim Exit Meetings

Interim exits were conducted for:

- The inspection results for the areas of radiological hazard assessment and exposure controls; occupational ALARA planning and controls; and occupational exposure control effectiveness PI verification with Ms. A. Ferko, Plant Manager, on January 29, 2016.

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

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

M. Marchionda, Site Vice President
A. Ferko, Plant Manager
J. Bashor, Engineering Director
M. Brockman, Fire Marshal
J. Cady, Radiation Protection Manager
B. Casey, Inservice Inspection Program Owner
L. Cerier, Corporate Information Technology (IT)
K. Dovas, Training Director
N. Faith, Cyber-Security Manager, Corporate
B. Finlay, Security Manager
R. Hall, Chemistry Manager
J. Henry, Operation Support Director
C. Ingold, Work Management Director
W. Laudenschach, Corporate Nuclear Security
D. Lipscomb, Braidwood Cyber Engineering
S. Mahnke, Cyber-Security Technical Analyst (CSTA) IT
C. Neumann, Nuclear Cyber-Security Operations (NCSO) IT
F. Piriano, Design Engineering Manager
D. Poi, Emergency Preparedness Manager
P. Rausch, Operations Director
S. Reynolds, Regulatory Assurance Manager
D. Reidinger, Cyber-Security Program Manager
M. Sharma, Corporate Cyber-Security
M. Shue, Welding Administrator
R. Simonson, Technical Manager
M. Struck, Maintenance Program Manager
R. Schliessmann, NRC Coordinator

U.S. Nuclear Regulatory Commission

E. Duncan, Chief, Reactor Projects Branch 3

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

05000456/2016001-01; 05000457/2016001-01 05000457/2016001-02	NCV NCV	Failure to Follow Fire Prevention for Hot Work Procedure (Section 1R05.2) Failure to Have Adequate Work Instructions and Procedures Leads to a Loss of Inventory From the Volume Control Tank (Section 1R13.2)
05000456/2016001-03; 05000457/2016001-03	NCV	Failure to Correct a Condition Adverse to Quality Leads to Loss of One Train of Shutdown Cooling in Mode 6 (Section 1R13.3)
05000456/2016001-04; 05000457/2016001-04	URI	Questions Regarding the Implementation of the Gas Accumulation Program (Section 1R22.2)
05000457/2016001-05	FIN	Failure to Ensure Unit 2 Startup Feedwater Pump Availability (Section 4OA5.1)

Closed

05000456/2016001-01; 05000457/2016001-01 05000457/2016001-02	NCV NCV	Failure to Follow Fire Prevention for Hot Work Procedure (Section 1R05.2) Failure to Have Adequate Work Instructions and Procedures Leads to a Loss of Inventory From the Volume Control Tank (Section 1R13.2)
05000456/2016001-03; 05000457/2016001-03	NCV	Failure to Correct a Condition Adverse to Quality Leads to Loss of One Train of Shutdown Cooling in Mode 6 (Section 1R13.3)
05000457/2016001-05	FIN	Failure to Ensure Unit 2 Startup Feedwater Pump Availability (Section 4OA5.1)
05000457/2015004-01	URI	Loss of Shutdown Cooling Train During Refueling Cavity Fill and Associated Reduced Inventory Operations (Section 1R13.3)
05000457/2015004-02	URI	Failure of the Startup Feedwater Pump to Start During a Plant Shutdown (Section 4OA5.1)
05000456/2014007-001; 05000457/2014007-001	URI	Incorporation of Westinghouse NSAL 99-05, Reactor Coolant Pump Operation During Loss of Seal Injection (Section 4OA5.2)

Discussed

None

LIST OF DOCUMENTS REVIEWED

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

1R01 Adverse Weather Protection

- IR 2657941; 0VH02AH Will Not Turn On; September 21, 2015
- 0BwOS XFT–A4; Freezing Temperature Equipment Protection Inside Surveillance; Revision 8
- 0BwOAS XFT–A5; Freezing Temperature Equipment Protection Out Building Surveillance; Revision 25
- 2BwOSR 0.1–1,2,3; Modes 1, 2, and 3 Shiftly and Daily Operating Surveillance Data Sheet; Revision 83

1R04 Equipment Alignment

- BwOP FC–1; Fuel Pool Cooling System Startup; Revision 26
- BwOP FC–E1; Electric Lineup – Unit 1; Revision 1
- BwOP FC–M1; Operating Mechanical Lineup – Unit 1; Revision 9
- BwOP RH–E2; Electrical Lineup – Unit 2 Operating; Revision 8
- BwOP RH–M3; Operating Mechanical Lineup 2A RH Train; Revision 10
- BwOP RH–M4; Operating Mechanical Lineup Unit 2B Train; Revision 8
- BwOP SI–E2; Electrical Lineup – Unit 2 Operating; Revision 10
- BwOP SI–M2; Operating Mechanical Lineup Unit 2; Revision 24
- BwOP SX–E2; Electrical Lineup – Unit 2 Essential Service Water System; Revision 13
- BwOP SX–M2; Operating Mechanical Lineup Unit 2; Revision 35
- 2BwOSR 3.6.6.3–1; SX System Flow Balance Surveillance; Revision 14
- 2BwOSR 3.7.8.1; Essential Service Water System Surveillance; Revision 19
- 2BwOS XLE–R1; Locked Equipment Surveillance; Revision 24
- Schematic 2A3462; 346' Aux. Bldg. U2 RHR/Cs Pump Complex; October 22, 2015
- Schematic 1A3641; U1 Aux. Building 364' Curved Wall Area; January 12, 2016
- Schematic 364' Aux. Bldg. U2 Curved Wall Area; October 27, 2015
- WC–AA–111–F–01; SX System Flow Balance; Revision 0
- WO 01740804 01; Unit 2 Locked Equip. 18 Monthly Surveillance (Prior to Startup); October 21, 2015
- WO 01885317 01; U2 Essential Service Watery System Monthly Surveillance; January 16, 2016

1R05 Fire Protection

- IR 2613230; D–379 in Division 22 ESF Switchgear Room is Warped; January 15, 2016
- IR 2619066; NRC Concern w/D–419; January 29, 2016
- IR 2619076; NRC Concern w/D–428; January 29, 2016
- IR 2620772; Reportable Fire; February 2, 2016
- IR 2622936; NRC Identified Door Issue; February 7, 2016
- IR 2622937; NRC Identified Duct Tape in Pens. Between 2B DS/RH Rooms; February 7, 2016
- IR 2632182; NRC Identified Discrepancies on Hot Work Permit for GC Weld; February 26, 2016
- BwAP 1110–1; Fire Rated Assemblies; Revision 37

- BwAP 1100-16; Fire/Hazardous Materials Spill and/or Injury Response; Revision 31
- BwMS 3350-002A4; Work Performance Checklist for Door # D-379; Revision 5
- CC-AA-211; Fire Protection Program; Revision 6
- OP-AA-201-004; Fire Prevention Hot Work; Revision 12
- MA-AA-716-012; Post Maintenance Test; Revision 20
- OP-MW-201-007; Fire Watch Inspection Log (WO 01562391-04); Unit 2 Cable Tunnel (2S-47); Revision 7
- Braidwood Pre-Fire Plan #42; SWGA 426' Division 22 ESF Switchgear Room; FZ 5.1-2
- Braidwood Pre-Fire Plan #137; AB 383' Unit 1 Auxiliary Feedwater Pump Diesel; FZ 11.4A-1
- Braidwood Pre-Fire Plan 225; LSH 602' Diesel Driven Fire Pump Cubicle; FZ 18.13-0
- Drawing S-696; Auxiliary Building Floor Framinc Plan E. 401'-0", Area 2 Units 1 and 2
- Braidwood Pre-Fire Plan #49; SWGA 451' Unit 1, Aux. Electrical Equip. Room
- Braidwood Pre-Fire Plan #110; AB 346' RHR Pump 2B Room (Fire Zone 11.2D-2)
- UFSAR 2.3.5.2; Division 22 ESF Switchgear Room (Fire Zone 5.1-21); December 2014
- UFSAR 2.3.5.9; Unit 1 Auxiliary Electrical Equipment Room (Fire Area 5.5.11); December 2010
- UFSAR 2.3.11.11; Residual Heat Removal Pump 2B Room (Fire Zone 11.20-2); December 2010
- UFSAR 2.3.11.31; Unit 1 Auxiliary Feedwater Diesel Driven Pump Room Fire Zone 11.4A-1; December 2014
- UFSAR 2.4.2.39; Unit 1 Auxiliary Electrical Equipment Room (Fire Zone 5.5-1); December 2014

1R06 Flood Protection Measures

- BwAP 1110-3; Plant Barrier Impairment Program; Revision 36
- BwMS 3350-004; Quarterly Watertight Door Surveillance; Revision 8
- CC-AA-201; Plant Barrier Control Program; Revision 11
- WO 01745201 01; MM EWP Quarterly Inspection of Watertight Doors; July 21, 2015
- WO 01807258 01; MM-SD-4 Quarterly Inspection of Watertight Doors; July 17, 2015
- WO 01807259 01; MM-SD-3 Quarterly Inspection of Watertight Doors; July 17, 2015
- WO 01807260 01; MM-SD-2 Quarterly Inspection of Watertight Doors; July 17, 2015
- WO 01807261 01; MM-SD-1 Quarterly Inspection of Watertight Doors; July 17, 2015
- WO 01807266 01; MM-SC-157 Quarterly Inspection of Watertight Doors; July 30, 2015
- WO 01807267 01; MM-SD-156 Quarterly Inspection of Watertight Doors; July 30, 2015

1R11 Licensed Operator Regualification Program

- 1BwOSR 3.1.4.2; Movable Control Assemblies Surveillance

1R12 Maintenance Effectiveness

- IR 1121512; Startup Feedwater Discharge Valve Packing Leakage; October 4, 2010
- IR 1169225; Elevated Water in 2FW02P Pump Lube Oil; January 31, 2011
- IR 1177806; 1SUFWP Discharge Flow Reads 2000 gpm; February 21, 2011
- IR 1221266; 1FW01P did not Start when Tested; May 26, 2011
- IR 1366368; SUFWP Lube Oil Pressure Low; May 14, 2012
- IR 1643902; 2FW035A Limit Switch did not Make-up During Surveillance; April 7, 2014
- IR 01643904; 0PDS-VA374 Aux Building Non-Access Areas Exhaust Filters D/P Switch; April 7, 2014
- IR 01645230; 0VA052YB Actuator Needs Rebuilt; April 9, 2014
- IR 01649302; 0C VA Chiller Unable to be Run Due to Oil Level; April 18, 2014

- IR 1665614; U2 SUFWP Mechanical Seal Replacement; May 29, 2014
- IR 01678834; OVA303Y Failed Open; July 4, 2014
- IR 1679422; U1 SUFWP Mechanical Seal Replacement; July 7, 2014
- IR 01680605; OVA09FA – FHB Charcoal Sample Failure; July 10, 2014
- IR 2502075; OVA435Y will not Close; May 18, 2015
- IR 02384238; OVA025Y Did not Modulate Open When OVA03CD Fan Started; September 22, 2014
- IR 02390124; OVA429Y Position Discrepancy; October 2, 2014
- IR 02415076; During Calibration of OPD2-VA189 Damper OVA189Y Failed; November 20, 2014
- IR 02439763; OVA272Y Failed Closed; January 20, 2015
- IR 02419254; OVA438YB Failed Closed; January 20, 2015
- IR 02501635; OVA435Y Closed Following OVA04CB Run; May 16, 2015
- IR 02509110; Weld Cracked on Louver Counter Weight 0FZ-VA503C; June 2, 2015
- IR 02527447; 0FIC-VA720 is OOT and Will Need Replacement; July 13, 2015
- IR 2572970; 2FW009 Limit Switch Adjustment Required; October 19, 2015
- ER-AA-1200; Critical Component Failure Clock; Revision 12
- ER-AA-200; Preventive Maintenance Program; Revision 2
- ER-AA-200-1001; Equipment Classification; Revision 1

1R13 Maintenance Risk Assessments and Emergent Work Control

- 2BwOSR 5.5.8.SI-1A; Train A Safety Injection System Valve Stroke Surveillance; Revision 10
- CR 2567811; 2A RH HX Flow Control Valve (2RH606) Failed to Open; October 8, 2015
- WO 01732759 01; 2SI8807A Surveillance for Age Related Degradation; February 1, 2016
- WO 01742412 01; 2SI8807A Motor Operated Valve Diagnostic Testing Surveillance; February 2, 2016

1R15 Operability Evaluations

- IR 2635702; CDBI – Question on AFW Diesel Air Intake; March 4, 2016
- 1BwOL 3.8.1 LCOAR AC Sources – Operating Tech Spec LCO 3.8.1; Revision 12
- 1BwOSR 3.8.1.1; Offsite AC Power Availability Surveillance; Revision 4
- 2BwOSR 3.8.1.1; Offsite AC Power Availability Surveillance; Revision 5
- OP-AA-101-113-1004; Equipment Issue, IR 02635702 CDBI Question on AFW Diesel Air Intake; Revision 31
- Bulletin USC-201501; Spool Arc 65 1/8" TIG Product; December 18, 2015

1R18 Plant Modifications

- CC-AA-102; Operations Department (Including Radwaste) Configuration Change Checklist (EC 404988); Revision 28
- CC-AA-209; Approved Fire Protection Program Configuration Change Impact Review (EC 404988); Revision 5
- CC-AA-212-1001; ALARA Design Review (EC 404988); Revision 2
- Design Analysis BYR04-045 & BRW-04-0039-M; Re-Analysis of Control Rod Ejection Accident (CREA) Using Alternative Source Terms; Revision 4
- EC 404988; Remove AF Diesel Air Intake elbow and Blank Off TB Air Intake; March 6, 2016
- 50.59 Review TCCP EC-404988; Remove AF Diesel Air Intake Elbow and Blank Off TB Air Intake; Revision 0/0

1R19 Post Maintenance Testing

- IR 2620523; 4.0 Critique for 2SI8807A Diagnostic Testing; February 1, 2016
- IR 2637480; NRC Concerns During 1B Aux Feed Restoration; March 7, 2016
- IR 2637495; IR Not Written in a Timely Manner; March 8, 2016
- BwOP SI-1; Safety Injection System Startup; Revision 23
- BwOP SI-2; Safety Injection System Shutdown; Revision 16
- 1BwOSR 5.5.8.AF-3B; Group A IST Requirements for Unit One Diesel Driven Auxiliary Feedwater Pump; Revision 18
- WO 01904687 06; MM Unit 1 Install TCCP Per EC-404988; March 7, 2016

1R22 Surveillance Testing

- IR 2574248; Gas Void Discovered Along 2SI03BA; October 20, 2015
- IR 2640751; Gas Void Along 2SI03BA; March 15, 2016
- IR 2644532; NRC ID – Implementation of ER-AA-2009; March 23, 2016
- IR 2646862; BWD 2016 PEX Other ERO Performance Issues CR TSC OSC; March 2, 2016
- IR 2646853; BWD 2016 PEX CRSIM ERO Performance Failed DCS; March 2, 2016
- IR 2646859; BWD 2016 PEX TSC ERO Performance Failed DCS; March 2, 2016
- IR 2646869; BWD 2016 PEX Station EX Management Issues; March 2, 2016
- IR 2646871; BWD 2016 PEX Station Facilities Issues; March 2 2016
- 2BwEP ES-1.4; Transfer to Hot Leg Recirculation; Revision 201 WOG 2
- 1BwOSR 3.1.4.2; Movable Control Assemblies Surveillance
- 2BwOSR 3.3.2.8-611B; ESFAS Instrumentation Slave Relay Surveillance (B Train Automatic Safety Injection – K611); Revision 13
- 2BwOSR 3.4.14.1; Reactor Coolant System Pressure Isolation Valve Leakage Surveillance; Revision 6
- 1BwOSR 3.5.2.2-2; ECCS and CS Venting and Valve Alignment/UT Verification Surveillance; Revision 32
- 2BwOSR 3.5.2.2-2; ECCS and CS Venting and Valve Alignment/UT Verification Surveillance; Revision 23
- 2BwOSR 3.8.1.2-2; 2B Diesel Generator Operability Surveillance; Revision 39
- 1BwOSR 5.5.8.SX-3A; Group A IST Requirements for 1A Essential Service Water Pump (1SX01PA); Revision 11
- BRW-15-0110-M; Evaluation of Void in Line 2SI03BA – EC 405085; March 16, 2016
- EC 403638; Processing of Design Analysis BRW-15-0110-M; Revision 000
- OP-AA-108-11; Adverse Condition Monitoring and Contingency Planning; Revision 10
- GL-2008-01; Managing Gas Accumulation in ECCS, Decay Heat Removal, and CS Systems; January 11, 2008
- DIT-BRW-2015-0050; Void Detected on Discharge Line from SI Pumps to RCS Hot Legs; November 18, 2015
- NAI-1940-001; SI Gas Void Evaluation; Revision 0
- NAI-1419-002; Evaluation of Gas Accumulation in Byron Unit 1 ECCS Discharge Piping; Revision 0
- STI BR-15-002; Initial Issue; Revision 000
- WO 01748094 01; IST-LT-2SI8948/8818/8819/8849 All A-D-PIV (800-1000 PG-SEC7, 8; October 22, 2015
- WO 01748096 01; IST-LT-2SI8815/8841A/B/8905A-D-PIV LK; October 23, 2015
- WO 01870323 01; U1 Semi Annual ECCS Venting & Valve Alignment Status Surveillance; December 17, 2015
- Drawing 2C-SI-24; U2 Containment Building Safety Injection; 1985

- Drawing M-136; Diagram of SI Unit 2; 1976
- Drawing PG-2539C-215; Safety Injection Containment Building; January 6, 1986
- Drawing PG-2539C-216; Safety Injection Containment Building; January 3, 1986
- Exelon Letter to NRC; Three Month Response to GL 2008-01; April 11, 2008
- Exelon Letter to NRC; Supplemental Response to GL 2008-01; January 20, 2009
- NRC Letter to Exelon; Closeout of GL 2008-01, Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems; June 27, 2011

2RS1 Radiological Hazard Assessment and Exposure Controls

- IR 2669856; Personnel Contamination Events (PCE) A2R18; Apparent Cause Investigation Report; November 9, 2015
- IR 2479761; Braidwood Level-1 PCE; April 4, 2015
- IR 2481297; U2 Incore Detector Replacement Work Scope Add Required; April 7, 2015
- IR 2568889; A2R18 PCE Level 1 Log #15-012 Work Group from Crawler Robot Decon; October 10, 2015
- IR 02569831; A2R18 PCE Level 2; Bartlett BHI from Walking Around at Aux Building; October 12, 2015
- IR 2569856; Braidwood Adverse Trend A2R18 PCE Performance; October 13, 2015
- IR 2571283; A2R18 LL PCEs and Schedule Affected by Lack of Labor; October 5, 2015
- Personnel Contamination Log; January through December 2015
- Sample Personnel Exposure Investigation; 003603; January 9, 2015
- Sample Personnel Exposure Investigation; 955162; June 5, 2014
- Sample Personnel Exposure Investigation; 004582; April 30, 2015
- Sample Personnel Exposure Investigation; 909000; February 15, 2015
- RWP-10017306; Auxiliary Building Outage Valve Work with Added Control; Revision 0
- RWP-10017321; Containment Outage Valve Work Added Controls; Revision 0
- RWP-10017322; Reactor Head Disassembly/Reassembly; Revision 0
- RWP-10017326; Reactor Coolant Pump Motor Maintenance; Revision 0
- RWP-10017801; Steam Generator Bowl Drain Replacement Project
- RWP-10017314; Containment Scaffold Assembly/Disassembly
- RWP-10017801; A2R18 Steam Generator Drain Mod; Revision 1
- RP-AA-800-001; National Source Tracking System 2016 Annual Inventory Reconciliation 2B.127
- 2016 Annual Inventory Reconciliation Report; NSTS Notification of 2016 Submission Acknowledgement ID 5851; License No. NPF-72
- RP-AA-401-1002; Radiological Risk Management; Revision 19
- RP-AA-401-1003; Contamination Control Best Practice Application; Revision 2
- RP-AA-403; Planned Dose Rate Alarm Form; Revision 8
- RP-AA-441; Methodology for Estimating Airborne Radioactivity Based upon Contamination Levels and Work Activities; Revision 5
- RP-AA-460; Controls for High and Locked High Radiation Areas; Revision 26
- RP-AA-460-001; Controls for Very High Radiation Areas; Revision 5
- RP-AA-460-002; Additional High Radiation Exposure Control; Revision 3
- RP-AA-461; Radiological Controls for Contaminated Water Diving Operations; Revision 5
- RP-AA-462; Controls for Radiographic Operations; Revision 10
- RP-AA-800; Semi Annual Inventory and Leak Test; June 1, 2015
- OU-AA-390; Spent Fuel Pool (SFP) Material Control; Revision 3
- SFP Material Log; Braidwood Unit-Common

2RS2 Occupational ALARA Planning and Controls

- ALARA–10017306; Auxiliary Building Outage Valve Work with Added Control; Revision 0
- ALARA–10017321; Containment Outage Valve Work Added Controls; Revision 0
- ALARA–10017322; Reactor Head Disassembly/Reassembly; Revision 0
- ALARA–10017326; Reactor Coolant Pump Motor Maintenance; Revision 0
- ALARA–10017801; Steam Generator Bowl Drain Replacement Project
- ALARA–10017314; Containment Scaffold Assembly/Disassembly
- ALARA–10017801; A2R18 Steam Generator Drain Mod; Revision 1
- RP–AA–400; ALARA Program; Revision 12
- RP–AA–400–1007; Elevated Dose Rate Response Planning; Revision 2
- IR 257255; RWP–10017801; Post Job Review Associated with A2R18 Steam Generator Bowl Drain Mod; October 21, 2015
- IR 2579394; Review A2R18 Standards Team Trending Results for Actions; dated October 30, 2015
- IR 2457674; Planning for Unexpected Radiological Conditions; February 23, 2015

40A1 Performance Indicator Verification

- LER 05000456/2015–002–00; Indication In Control Rod Drive Mechanism Nozzle Weld Due to Embedded Flaws Opening up from Thermal And Pressure Stresses During Operation; April 3, 2015
- LER 05000457/2015–002–00; Automatic Actuation of Auxiliary Feedwater and Automatic Reactor Trip Signal Due to Startup Feedwater Pump Failing to Start on Demand and Motor Driven Feedwater Pump Elevated Bearing Temperature Exceeding Limits; October 5, 2015
- LER 05000456/ 2015–003–00; 05000457/2015–003–00; Unanalyzed Condition Due to a Design Deficiency with Pressurizer Power Operated Relief Valve Circuitry that Could Prevent Valve Manual Closure to Mitigate Spurious Operation; August 20, 2015
- LS–AA–2140; Monthly Data Elements for NRC Occupational Exposure Control Effectiveness; Revision 5
- PI Record Review from January through December 2015

40A2 Problem Identification and Resolution

- Assessment 02444749-04; Braidwood Cyber Security Health; July 10, 2015
- AR 01454694; Cyber Security: Track Actions in Response to “APC 12–47; December 20, 2012
- AR 01481282; Cyber: Peach Bottom Lessons Learned Records Retention; February 28, 2013
- AR 01481288; Cyber Security: PB LL For Portable/Media Devices; February 28, 2013
- AR 01481292; Cyber Security: Peach Bottom LL on Scanning Kiosk; February 28, 2013
- AR 01481296; Cyber PB Lessons Learned for CDA ID of Digital Test Equipment & CDAs; February 28, 2013
- AR 01491355; Cyber Security CDA Digital Test Equipment Audit Discrepancies; March 22, 2013
- AR 01492115; Discrepancy Between Byron and Braidwood EP/Security CDA; March 25, 2013
- AR 01429845; Cyber Security – CDA Identification Component Types Delta; March 26, 2013
- AR 01493002; Cyber Security Biometrics Computer Near Miss; March 26, 2013
- AR 01493460; Cyber: Digital Compo Identif. Questionnaires not Completed; March 27, 2013
- AR 01500853; Cyber Security: Milestone 3 Issues With Security Digital Assets; April 11, 2013
- AR 01522309; Cyber Security: Scoping of Physical Security Digital Assets (Byron); June 6, 2013
- AR 01525867; Cyber Security: Scoping of Physical Security Digital Assets; June 17, 2013

- AR 02583220; Cyber Security NRC Green NCV Milestone 2; November 6, 2015
- AR 02583225; Cyber Security NRC Green NCV Milestone 3; November 6, 2015
- AR 02583231; Cyber Security NRC Green NCV Milestone 4; November 6, 2015
- AR 02583232; Cyber Security NRC LIV Milestone 4; November 6, 2015
- MA-AA-716-235; Control of CDA Portable Media and Portable Devices; Revision 4
- PI-AA-125; Corrective Action Program Procedure; Revision 2
- BW160013; Status of Corrective Actions for 2013 Braidwood Cyber Inspection; February 10, 2016
- ML 13191A972; Braidwood Cyber-Security Inspection Report 05000456/2013406; 05000457/2013406; July 9, 2013
- ML 14316A042; IP 71152, Problem Identification and Resolution; February 26, 2015
- System Admin; Admin Controls for the Reinstatement Unescorted Access; September 27, 2012
- Bulletin 2012-02; Authorization (30 Days or Less) and Maintaining of UAA/UA; Revision 2

4OA5 Other

- BwOP-FW-5; Operation of a Startup Feedwater Pump; Revision 13
- IR 1183021; NRC Question Regarding Degraded 2B RCP Thermal Barrier; July 7, 2014
- IR 1697650; URI 2B RCP Thermal Barrier; August 28, 2014
- IR 2565442; OSP-A Pump Failed to Start; October 4, 2015
- IR 2628911; Failure of SUFWP during U2 Plant Shutdown; February 19, 2016

LIST OF ACRONYMS USED

AC	Alternating Current
ADAMS	Agencywide Document Access and Management System
ALARA	As-Low-As-Is-Reasonably-Achievable
AR	Action Request
ASME	American Society of Mechanical Engineers
CAP	Corrective Action Program
CDF	Core Damage Frequency
Δ CDF	Delta Core Damage Frequency
CFR	Code of Federal Regulations
ECCS	Emergency Core Cooling System
EOP	Emergency Operating Procedure
ET	Exposure Time
FLEX	Diverse Flexible Mitigation Capability
gpm	gallons per minute
HEP	Human Error Probability
IEL	Initiating Events Likelihood
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Issue Report
IST	Inservice Test
LCO	Limiting Condition for Operation
LERF	Large Early Release Frequency
MOV	Motor Operated Valve
NCV	Non-Cited Violation
NEI	Nuclear Energy Institute
NRC	U.S. Nuclear Regulatory Commission
PARS	Publicly Available Records System
PI	Performance Indicator
PI&R	Problem Identification and Resolution
POS	Plant Operating State
ppm	parts per million
psig	pounds per square inch gauge
RCS	Reactor Coolant System
RHR	Residual Heat Removal
RWST	Refueling Water Storage Tank
SDP	Significance Determination Process
SI	Safety Injection
SPAR	Standardized Plant Analysis Risk
SRA	Senior Reactor Analyst
SUFWP	Startup Feedwater Pump
TI	Temporary Instruction
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
UT	Ultrasonic Testing
VCT	Volume Control Tank
WO	Work Order

B. Hanson

-2-

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Sincerely,

/RA/

Eric Duncan, Chief
Branch 3
Division of Reactor Projects

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