



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION III
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February 14, 2018

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 05000456/2017004; 05000457/2017004; AND EMERGENCY
PREPAREDNESS ANNUAL INSPECTION REPORT 05000456/2017501;
05000457/2017501**

Dear Mr. Hanson:

On December 31, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Braidwood Station, Units 1 and 2. On January 9, 2018, the NRC inspectors discussed the results of this inspection with the Site Vice President, Ms. M. Marchionda, and other members of your staff. The inspectors documented the results of this inspection in the enclosed inspection report. The NRC also completed its annual inspection of the Emergency Preparedness Program. This inspection began on January 1, 2017, and the issuance of this letter closes Inspection Report 05000456/2017501 and 05000457/2017501.

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

If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to: (1) the Regional Administrator, Region III; (2) the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and (3) the NRC Resident Inspectors' Office at the Braidwood Station.

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

Sincerely,

/RA/

Eric R. Duncan, Chief
Branch 3
Division of Reactor Projects

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

Enclosure:
IR 05000456/2017004; 05000457/2017004;
05000456/2017501; 05000457/2017501

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Letter to Bryan C. Hanson from Eric R. Duncan Dated February 14, 2018

SUBJECT: BRAIDWOOD STATION, UNITS 1 AND 2—NRC INTEGRATED INSPECTION REPORT 05000456/2017004; 05000457/2017004; AND EMERGENCY PREPAREDNESS ANNUAL INSPECTION REPORT 05000456/2017501; 05000457/2017501

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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: 05000456/2017004; 05000457/2017004;
05000456/2017501; 05000457/2017501

Licensee: Exelon Generation Company, LLC

Facility: Braidwood Station, Units 1 and 2

Location: Braceville, IL

Dates: October 1 through December 31, 2017

Inspectors: D. Kimble, Senior Resident Inspector
D. Betancourt, Resident Inspector
M. Garza, Emergency Preparedness Inspector
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Approved by: E. Duncan, Chief
Branch 3
Division of Reactor Projects

Enclosure

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SUMMARY

Inspection Report 05000456/2017004; 05000457/2017004; 05000456/2017501; 05000457/2017501; 10/01/2017 – 12/31/2017; Braidwood Station, Units 1 and 2; Fire Protection.

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

NRC-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

- **Green.** A finding of very low safety significance and an associated NCV of License Condition 2.E were identified by the inspectors for the licensee's failure to have an adequate pre-fire plan for the refueling water storage tank (RWST) tunnel. Specifically, the licensee failed to provide all pertinent information in the pre-fire plans for the Unit 1 and Unit 2 fire areas encompassing the RWST tunnels as required by Procedure OP-AA-201-008, "Pre-Fire Plan Manual." The licensee entered this issue into their corrective action program (CAP) as Issue Report (IR) 4064769 with an action to revise the Unit 1 and Unit 2 pre-fire plans to include the RWST tunnel areas.

The inspectors determined that the performance deficiency was of more than minor safety significance because the lack of information in the pre-fire plans regarding the hazards in the RWST tunnel could complicate firefighting activities by the fire brigade and could either increase the likelihood of a larger fire event or the severity of the fire. The finding was of very low safety significance because it was associated with pre-fire plans and because the fire brigade members had received extensive training to respond to unexpected situations. The finding did not have a cross-cutting aspect associated with it because it was not representative of current licensee performance as the licensee last updated the pre-fire plans in 2009. (Section 1R05)

REPORT DETAILS

Summary of Plant Status

Unit 1

Unit 1 began the inspection period operating at full power. With the exception of minor reductions in power to support scheduled testing activities and brief load changes requested by the transmission system operator (TSO), the unit remained operating at or near full power during the inspection period.

Unit 2

Unit 2 began the inspection period operating at full power. With the exception of minor reductions in power to support scheduled testing activities and brief load changes requested by the TSO, the unit remained operating at or near full power during the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity, and Emergency Preparedness

1R01 Adverse Weather Protection (71111.01)

.1 Winter Seasonal Readiness Preparations

a. Inspection Scope

During the weeks ending December 9, 2017, through December 23, 2017, the inspectors conducted a review of the licensee's preparations for winter conditions to verify that the plant's design features and implementation of procedures were sufficient to protect mitigating systems from the effects of adverse weather. Documentation for selected risk-significant systems was reviewed to ensure that these systems would remain functional when challenged by inclement weather. During the inspection, the inspectors focused on plant-specific design features and the licensee's procedures used to mitigate or respond to adverse weather conditions. Additionally, the inspectors reviewed the Updated Final Safety Analysis Report (UFSAR) and performance requirements for systems selected for inspection, and verified that operator actions were appropriate as specified by plant-specific procedures. Cold weather protection, such as heat tracing and area heaters, was verified to be in operation where applicable. The inspectors also reviewed corrective action program (CAP) items to verify that the licensee was identifying adverse weather issues at an appropriate threshold and entering them into their CAP in accordance with station corrective action procedures. The inspectors' reviews focused specifically on the following plant systems:

- Area space heaters; and
- Selected heat trace circuits.

These reviews by the inspectors constituted a single winter seasonal readiness preparations inspection 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 Alignment Verifications

a. Inspection Scope

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

- The 2A Emergency Diesel Generator (EDG) while the 2B EDG was removed from service for planned maintenance activities during the week ending October 28, 2017; and
- The 2A Residual Heat Removal (RH) train while the 2B RH train was removed from service for scheduled maintenance activities during the week ending October 20, 2017.

The inspectors selected these systems based on their risk significance relative to the Reactor Safety Cornerstones at the time they were inspected. The inspectors determined whether there were any discrepancies that could impact the function of the system and, therefore, potentially increase risk. The inspectors reviewed applicable operating procedures, system diagrams, the UFSAR, Technical Specification (TS) requirements, 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.

These activities by the inspectors constituted two partial system alignment verification inspection samples as defined in IP 71111.04–05.

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05)

.1 Quarterly Fire Protection Zone Inspections

a. Inspection Scope

During the weeks ending October 20, 2017, through November 4, 2017, the inspectors conducted fire protection zone inspection tours which were focused on the availability, accessibility, and condition of firefighting equipment in the following risk-significant plant areas:

- Division 21 Engineered Safety Features Switchgear Room (Fire Zone 5.2–2);
- Auxiliary Building 383' General Area—Center (Fire Zone 11.4–0 Center); and
- Unit 1 and 2 Refueling Water Storage Tank (RWST) Pipe Tunnels (Fire Zones 11.3F–1 and 11.3F–2).

The inspectors reviewed areas to assess if the licensee had implemented a fire protection program that adequately controlled combustibles and ignition sources within the plant, effectively maintained fire detection and suppression capability, maintained passive fire protection features in good material condition, and implemented adequate compensatory measures for out-of-service, degraded or inoperable fire protection equipment, systems, or features in accordance with the licensee's fire plan. The inspectors selected fire areas based on their overall contribution to internal fire risk as documented in the plant's Individual Plant Examination of External Events with later additional insights. The inspectors verified that fire hoses and extinguishers were in their designated locations and available for immediate use; that fire detectors and sprinklers were unobstructed; that transient material loading was within analyzed limits; and fire doors, dampers, and penetration seals appeared to be in satisfactory condition. The inspectors also verified that minor issues identified during the inspection were entered into the licensee's CAP.

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

b. Findings

Failure to Have an Adequate Pre-Fire Plan for the RWST Pipe Tunnels

Introduction: The inspectors identified a finding of very low safety significance (Green) and an associated non-cited violation (NCV) of Braidwood Station License Condition 2.E for the failure to develop a pre-fire plan for the RWST tunnel area for Units 1 and 2 as required by Procedure OP-AA-201-008, "Pre-Fire Plan Manual."

Description: On October 19, 2017, the inspectors performed a fire protection inspection of the Unit 2 RWST tunnel. The RWST tunnel contains safety-related equipment such as the RWST level instrumentation and a tank heater. During this inspection, the inspectors were not able to locate a pre-fire plan associated with the RWST tunnel. The inspectors contacted the licensee who, upon further review, determined that a pre-fire plan that included this specific area did not exist.

As part of their review the inspectors consulted the Braidwood Fire Protection Report, which identified that the RWST tunnel was part of Fire Zone 11.3F-2, "Safety Injection Pump 2B Room." However, the existing pre-fire plan (Pre-Fire Plan 129) for this fire zone was inadequate because it did not include the RWST tunnel. Additionally, the inspectors reviewed licensee procedure OP-AA-201-008, "Pre-Fire Plan Manual," Revision 4, to further understand what was required to be included in pre-fire plans. The following requirements were identified:

- Section 1.3 of OP-AA-201-008 stated that the pre-fire plans, "are designed to provide as much useful information as possible in a short amount of time." Section 1.3 further stated that the pre-fire plans, "provide useful information for quickly determining emergency response strategies based on hazards and equipment in the area";
- Section 4.1.1 of OP-AA-201-008 stated that, "A Pre-Fire Plan shall be established for all safety related areas...";
- Section 4.4.4.2, "Hazards in Area," of OP-AA-201-008 stated that, "trip & fall hazards, and tight quarters that would affect maneuverability of the fire brigade/equipment" needed to be included; and
- Section 4.4.12, "Special Precautions," of OP-AA-201-008 provided an instruction to document, "actions that will need to be taken to address special hazards."

Based on the above procedural requirements, the inspectors reviewed the existing pre-fire plan and noted additional deficiencies in that: 1) it did not address the fact that the normal access point to the RWST tunnel was physically restrictive and could adversely impact the maneuverability of the fire brigade; and 2) for the secondary access point to the RWST tunnel, there was no mention that an outdoor hatch needed to be lifted, creating a breach in the Auxiliary Building and the potential for an unmonitored release. Similar deficiencies were present in the Unit 1 pre-fire plan for the equivalent affected fire zone.

Upon identification of these issues the licensee entered them into their CAP as IR 4064769 with an action to revise the pre-fire plans to address the RWST tunnel area.

Analysis: The inspectors determined that the licensee's failure to include adequate information in pre-fire plans was contrary to Procedure OP-AA-201-008 and was a performance deficiency.

The performance deficiency was determined to be of more than minor safety significance because it was associated with the Mitigating Systems attribute of Protection Against External Factors (i.e., fire) and adversely impacted the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to have

an adequate pre-fire plan for the RWST tunnel could have adversely impacted the fire brigade's ability to fight a fire.

The inspectors determined that the finding could be evaluated using the Significance Determination Process in accordance with Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," issued on October 7, 2016. Because the finding impacted the Mitigating Systems Reactor Safety Cornerstone, the inspectors screened the finding using IMC 0609, Attachment 4, "Initial Characterization of Findings." The finding degraded the fire protection defense in depth strategies and the ability to confine a fire. The inspectors determined, using Table 3, that it could be evaluated using Appendix F, "Fire Protection Significance Determination Process." The inspectors assigned this finding to the Manual Fire Fighting category in Step 1.4 of IMC 0609, Appendix F. The inspectors determined that the issue screened as having very low safety significance (Green) by answering "Yes" to Question 1.4.6-B, "Is the fire finding associated with pre-fire plans?"

The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not representative of current licensee performance. The licensee last updated the pre-fire plan in June 2009.

Enforcement: Braidwood Station License Condition 2.E requires the licensee to implement and maintain in effect all provisions of the approved Fire Protection Program as described in the UFSAR and as approved through the Safety Evaluation Report dated November 1983, and its supplements. Chapter 5 of the Fire Protection Program documentation package stated that, "Pre-fire plans have been developed for the safety-related areas in the plant. The plans include both a sketch and written summary of the...Hazards."

Contrary to the above, as of December 31, 2017, the licensee failed to implement and maintain in effect all provisions of the approved fire protection program. Specifically, the licensee failed to provide both the sketch and a description of the hazards in the Unit 1 and Unit 2 RWST tunnels, which were areas of the plant that contained safety-related equipment.

This violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy because it was of very low safety significance and was entered into the licensee's CAP as IR 4064769. Corrective actions planned by the licensee included, but were not limited to, updating the pre-fire plans to contain the correct information. **(NCV 05000456/2017004-01; 05000457/2017004-01; Failure to Have an Adequate Pre-Fire Plan for the RWST Pipe Tunnels)**

1R07 Heat Sink Performance (71111.07T)

.1 Triennial Review of Heat Sink Performance

a. Inspection Scope

The inspectors reviewed the operability determinations, calculations, performance analyses, and inspection results associated with the 2B essential service water (SX) pump lube oil cooler (2SX01AB). The heat exchanger was chosen based on its risk-significance in the licensee's probabilistic safety analysis, its important safety-related

mitigating system support functions, its operating and performance history, and its relatively low margin.

For the 2B SX pump lube oil cooler (2SX01AB), the inspectors reviewed the operability determination, inspection, maintenance, and monitoring of biotic fouling and macrofouling programs to assess the heat transfer capability of the heat exchanger. This was accomplished by determining whether: 1) the analysis method used was consistent with accepted industry practices; 2) the analysis conditions were consistent with the selected methodology; 3) the analysis acceptance criteria were consistent with the design basis values; and 4) the results of the heat exchanger analysis met established design requirements. The inspectors also determined whether: 1) the analysis results considered differences between operating conditions and design conditions; 2) the frequency of inspections and cleanings considered previous inspection result trends; and 3) inspection results were adequately documented.

For the 2B SX pump lube oil cooler, 2SX01AB, the inspectors reviewed the inspection reports and cleaning procedures to assess the maintenance of the heat exchanger. The inspectors determined whether: (1) the methods used to inspect and clean the heat exchanger were consistent with as-found conditions identified, expected degradation trends, and industry standards; (2) the licensee's inspection and cleaning activities had established acceptance criteria consistent with industry standards; and (3) the as-found results were recorded, evaluated, and dispositioned such that the as-left condition was consistent with the established criteria. In addition, visual inspection records were reviewed to assess the structural integrity of the heat exchanger.

The inspectors reviewed the performance of the ultimate heat sink (UHS) and the safety-related SX system and a sample of subcomponents, such as piping, intake screens, pumps, valves, etc. by tests or other equivalent methods to ensure availability and accessibility to the in-plant cooling water systems. Specifically, the inspectors reviewed the UHS in accordance with U.S. Nuclear Regulatory Commission (NRC) IP 71111.07, "Heat Sink Performance," Section 02.02, Sub-Sections d.2 and d.5.

The inspectors reviewed the results of the licensee's inspection of the UHS weirs or excavations. The inspectors also determined whether identified settlement or movement indicating loss of structural integrity and/or capacity was appropriately evaluated and dispositioned by the licensee. In addition, the inspectors assessed the licensee's trending and removal of debris or sediment buildup in the UHS to ensure sufficient reservoir capacity.

The inspectors reviewed the licensee's performance testing of a sample of components of the SX system and UHS. The inspectors reviewed performance tests, including American Society of Mechanical Engineers (ASME) inservice testing (IST) results, for the 1B SX pump, 2A SX pump, valve 2SX007, valve 2SX136, and valve 1SX173. The inspectors also reviewed SX flow balance test results for adverse effects.

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

These activities by the inspectors constituted two triennial heat sink inspection samples as defined in IP 71111.07-05.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Regualification Program (71111.11)

.1 Resident Inspector Quarterly Review of Licensed Operator Simulator Training

a. Inspection Scope

On October 17, 2017, the inspectors observed a crew of licensed operators in the plant's simulator during a graded simulator scenario. 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. In addition, the inspectors verified that licensee personnel were observing NRC examination security protocols to ensure that the integrity of the graded scenario was protected from compromise. The inspectors evaluated the following areas:

- Licensed operator performance;
- The clarity and formality of communications;
- The ability of the crew to take timely and conservative actions;
- The crew's prioritization, interpretation, and verification of annunciator alarms;
- The correct use and implementation of abnormal and emergency procedures by the crew;
- Control board manipulations;
- The oversight and direction provided by licensed Senior Reactor Operators (SROs); and
- The ability of the crew to identify and implement appropriate TS actions and Emergency Plan (EP) actions and notifications.

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

These observations and activities by the inspectors constituted a single quarterly licensed operator requalification program simulator training inspection sample as defined in IP 71111.11-05.

b. Findings

No findings were identified.

.2 Resident Inspector Quarterly Observation of Control Room Activities

a. Inspection Scope

During the inspection period, the inspectors performed several observations of licensed operator performance in the plant's control room to verify that operator performance was adequate and that plant evolutions were being conducted in accordance with approved plant procedures. Specific activities observed that involved a heightened tempo of activities or periods of elevated risk included, but were not limited to:

- Unit 2 load changes requested by the TSO during the weeks ending October 7, 2017, and October 21, 2017; and
- Response to an elevated Unit 2 reactor coolant system (RCS) unidentified leakage rate during the week ending December 2, 2017.

The inspectors evaluated the following areas during the course of the control room observations:

- Licensed operator performance;
- The clarity and formality of communications;
- The ability of the crew to take timely and conservative actions;
- The crew's prioritization, interpretation, and verification of annunciator alarms;
- The correct use and implementation of normal operating, annunciator alarm response, and abnormal operating procedures by the crew;
- Control board manipulations;
- The oversight and direction provided by on-watch SROs and plant management personnel; and
- The ability of the crew to identify and implement appropriate TS actions and notifications.

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

These observation activities by the inspectors of operator performance in the station's control room constituted a single quarterly inspection sample as defined in IP 71111.11-05.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

.1 Routine Quarterly Evaluations

a. Inspection Scope

The inspectors evaluated performance issues and/or maintenance effectiveness involving the following:

- The licensee's most recent periodic maintenance effectiveness evaluation required by Title 10 of the *Code of Federal Regulations* (CFR) 50.65(a)(3) during the weeks ending October 7, 2017, through October 14, 2017; and
- Recent issues with the station's 125 volt direct current (Vdc) and 250 Vdc batteries and battery chargers during the weeks ending October 7, 2017, through October 14, 2017.

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

- Implementing appropriate work practices;
- Identifying and addressing common cause failures;
- Scoping of systems in accordance with 10 CFR 50.65(b) of the maintenance rule;
- Characterizing system reliability issues for performance;
- Charging unavailability for performance;
- Trending key parameters for condition monitoring;
- Ensuring 10 CFR 50.65(a)(1) or (a)(2) classification or re-classification; and
- Verifying appropriate performance criteria for structures, systems, and components (SSCs)/functions classified as (a)(2), or appropriate and adequate goals and corrective actions for systems classified as (a)(1).

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

These maintenance effectiveness review activities conducted by the inspectors constituted two 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:

- Replacement of failed controller cards within the 1B Feedwater Pump control system during the week ending October 28, 2017;
- Emergent automatic control system repairs to the 1A Steam Generator (SG) Feedwater Regulating Valve (1FW510) during the week ending October 21, 2017; and
- Unplanned corrective maintenance and repairs to the station's dry fuel storage cask transporter during the week ending October 28, 2017.

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 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.

The inspectors' review of these maintenance risk assessments and emergent work control activities constituted three inspection samples as defined in IP 71111.13–05.

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15)

.1 Operability Evaluations and Functionality Assessments

a. Inspection Scope

Throughout the course of the inspection period, the inspectors reviewed the following issues:

- The historical functionality of redundant main control room radiation monitors, as documented in IR 4057335, during the week ending November 18, 2017;
- Assessment of the operability impact on the main control room due to an error in the post-accident main control room dose calculation model, as documented in IR 4077169, during the weeks ending December 2, 2017, through December 30, 2017; and
- Assessment of the impact of an increase in RCS leakage on RCS operability, as documented in IRs 4077837, 4077867, and 4078162, during the weeks ending December 2, 2017, through December 30, 2017.

The inspectors selected these potential operability issues based on the risk significance of the associated SSCs. The inspectors examined the technical adequacy of the evaluations to ensure that TS operability was properly justified, and also to ensure that the applicable SSCs remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the TSs and UFSAR to the licensee's evaluations to determine whether the applicable SSCs were operable. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were appropriately controlled. The inspectors verified, where applicable, that the bounding limitations of the evaluations were valid. 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 and functionality assessments.

The review of these operability evaluations and functionality assessments by the inspectors constituted three inspection samples as defined in IP 71111.15–05.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19)

.1 Quarterly Resident Inspector Observation and Review of Post-Maintenance Testing Activities

a. Inspection Scope

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

- Operational and functional testing of the 2B RH pump following planned maintenance activities during the week ending October 20, 2017;
- Operational and functional testing of the Unit 1 Spent Fuel Pool Cooling pump following a planned maintenance work window during the week ending November 25, 2017;
- Operational and functional testing of the 1A RH pump following planned maintenance activities during the weeks ending December 9, 2017, and December 16, 2017; and
- Operational and functional testing of the 0A Control Room Ventilation train following planned maintenance activities during the weeks ending December 9, 2017, and December 16, 2017.

These activities were selected based upon the SSC'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 the PMT activities to determine whether the licensee was identifying problems and entering them in the corrective action program (CAP) and whether the problems were being corrected commensurate with their importance to safety.

The inspectors' reviews of these activities constituted four PMT inspection 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:

- Monthly operability testing for the 2A EDG during the week ending October 14, 2017 (Routine);
- Semiannual fast-start surveillance testing for the 1B EDG during the week ending October 21, 2017 (Routine);
- Weekly Operations Department visual inspections of the site's circulating water blowdown (CWBD) line corridor during the week ending December 2, 2017 (Routine);
- Periodic stroke testing of the 1B Containment Spray power-operated valves during the week ending December 23, 2017 (Routine);
- Periodic monthly operability testing for the 1B Auxiliary Feedwater train during the week ending December 23, 2017 (Routine);
- Pump performance testing for the 1B RH train, as required under the ASME IST Code during the week ending October 28, 2017 (IST); and
- Periodic RCS leak rate surveillance testing on Unit 2 while monitoring a probable small RCS leak in containment during the week ending December 2, 2017 (RCS Leakage).

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;

- 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 inservice testing activities, was testing performed in accordance with the applicable version of the ASME code, and were reference values consistent with the system design basis;
- Where applicable for safety-related instrument control surveillance tests, was the reference setting data accurately incorporated into the test procedure;
- Was equipment returned to a position or status required to support the performance of its safety function following testing;
- Were problems identified during the testing appropriately documented and dispositioned in the licensee's CAP;
- Were annunciators and other alarms demonstrated to be functional and were setpoints consistent with design requirements; and
- Where applicable, were alarm response procedure entry points and actions consistent with the plant design and licensing documents.

These activities conducted by the inspectors constituted five routine surveillance testing inspection samples, a single inservice testing inspection sample, and a single RCS leakage surveillance inspection sample as defined in IP 71111.22, Sections 02 and 05.

b. Findings

No findings were identified.

1EP2 Alert and Notification System Evaluation (71114.02)

.1 Alert and Notification System Evaluation

a. Inspection Scope

The inspectors reviewed documents and held discussions with EP staff regarding the operation, maintenance, and periodic testing of the primary and backup alert and notification system (ANS) in the plume pathway emergency planning zone. The inspectors reviewed monthly trend reports and siren test failure records from March 2015 through September 2017. Information gathered during document reviews and interviews were used to determine whether the ANS equipment was maintained and tested in accordance with emergency plan commitments and procedures.

The inspectors' reviews constituted a single ANS evaluation inspection sample as defined in IP 71114.02-06.

b. Findings

No findings were identified.

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

.1 Emergency Response Organization Staffing and Augmentation System

a. Inspection Scope

The inspectors reviewed and discussed with plant EP management and staff the emergency plan commitments and procedures that addressed the primary and alternate methods of initiating an emergency response organization (ERO) activation to augment the on-shift staff as well as the provisions for maintaining the plant's ERO team and qualification lists. The inspectors reviewed reports and a sample of CAP records of unannounced off-hour augmentation drills and pager tests, which were conducted from March 2015 through September 2017, to determine the adequacy of the drill critiques and associated corrective actions. The inspectors also reviewed a sample of the training records of approximately six ERO personnel, who were assigned to key and support positions, to determine the status of their training as it related to their assigned ERO positions.

The inspectors' reviews constituted a single ERO augmentation inspection sample as defined in IP 71114.03–06.

b. Findings

No findings were identified.

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

a. Inspection Scope

The regional inspectors performed an in-office review of the latest revisions to the Emergency Plan, Emergency Action Levels (EALs), and EAL Bases document to determine if these changes decreased the effectiveness of the Emergency Plan. The inspectors also performed a review of the licensee's CFR Part 50.54(q) change process and Emergency Plan change documentation to ensure proper implementation for maintaining Emergency Plan integrity.

The NRC review was not documented in a safety evaluation report, and did not constitute approval of licensee-generated changes; therefore, this revision is subject to future inspection. The specific documents reviewed during this inspection are listed in the Attachment to this report.

This EAL and Emergency Plan Change inspection constituted one sample as defined in Inspection Procedure 71114.04–06.

b. Findings

No findings were identified.

1EP5 Maintenance of Emergency Preparedness (71114.05)

.1 Maintenance of Emergency Preparedness

a. Inspection Scope

The inspectors reviewed the nuclear oversight staff's 2016 and 2017 audit of Braidwood Station's EP program to determine whether the independent assessments met the requirements of 10 CFR 50.54(t). The inspectors reviewed a sample of CAP records associated with the 2016 biennial exercise, as well as various EP drills conducted in 2015, 2016, and 2017, in order to determine whether the licensee fulfilled drill commitments and to evaluate the licensee's efforts to identify and resolve identified issues. The inspectors reviewed a sample of EP items and corrective actions related to the station's EP program and activities to determine whether corrective actions were completed in accordance with the site's CAP.

The inspectors' reviews constituted a single EP maintenance inspection sample as defined in IP 71114.05-06.

b. Findings

No findings were identified.

2. RADIATION SAFETY

Cornerstones: Occupational Radiation Safety and Public Radiation Safety

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

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

a. Inspection Scope

The inspectors compared the radiological results achieved with the intended radiological outcomes and verified that the licensee captured lessons learned for use in the next outage.

These reviews by the inspectors constituted a single complete inspection sample as defined in IP 71124.02-05.

b. Findings

No findings were identified.

.2 Problem Identification and Resolution

a. Inspection Scope

The inspectors reviewed self-assessments and/or audits performed of the as-low-as-reasonably-achievable (ALARA) program and determined if these reviews identified problems or areas for improvement.

The inspectors assessed whether problems associated with ALARA planning and controls were being identified by the licensee at an appropriate threshold and properly addressed for resolution.

These reviews by the inspectors constituted a single complete inspection sample as defined in IP 71124.02–05.

b. Findings

No findings were identified.

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

.1 Radioactive Material Storage

a. Inspection Scope

The inspectors selected areas where containers of radioactive waste were stored, and evaluated whether the containers were labeled in accordance with 10 CFR 20.1904, or controlled in accordance with 10 CFR 20.1905.

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

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

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

These reviews by the inspectors constituted a single complete inspection sample as defined in IP 71124.08–05.

b. Findings

No findings were identified.

.2 Radioactive Waste System Walk-Down

a. Inspection Scope

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

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

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

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

The inspectors evaluated whether tank recirculation procedures provided sufficient mixing.

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

These reviews by the inspectors constituted a single complete inspection sample as defined in IP 71124.08-05.

b. Findings

No findings were identified.

.3 Waste Characterization and Classification

a. Inspection Scope

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

The inspectors evaluated whether changes to plant operational parameters were taken into account to: 1) maintain the validity of the waste stream composition data between

the sample analysis update; and 2) assure that waste shipments continued to meet the requirements of 10 CFR Part 61.

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

These reviews by the inspectors constituted a single complete inspection sample as defined in IP 71124.08–05.

b. Findings

No findings were identified.

.4 Shipment Preparation

a. Inspection Scope

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

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

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

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

These reviews by the inspectors constituted a single complete inspection sample as defined in IP 71124.08–05.

b. Findings

No findings were identified.

.5 Shipping Records

a. Inspection Scope

The inspectors reviewed select shipments to evaluate whether the shipping documents indicated the proper shipper name; emergency response information and a 24-hour contact telephone number; accurate curie content and volume of material; and appropriate waste classification, transport index, and UN number. The inspectors assessed whether the shipment marking, labeling, and placarding was consistent with the information in the shipping documentation.

These reviews by the inspectors constituted a single complete inspection sample as defined in IP 71124.08-05.

b. Findings

No findings were identified.

.6 Identification and Resolution of Problems

a. Inspection Scope

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

These reviews by the inspectors constituted a single complete inspection sample as defined in IP 71124.08-05.

b. Findings

No findings were identified.

4. **OTHER ACTIVITIES**

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

40A1 Performance Indicator Verification (71151)

.1 Reactor Coolant System Leakage

a. Inspection Scope

The inspectors sampled licensee submittals for the RCS Leakage PI for the period from the second quarter 2016 through the third quarter 2017 for Units 1 and 2. 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, were used. The

inspectors reviewed the licensee's operator logs, RCS leakage tracking data, IRs, event reports and NRC inspection reports for the period of April 2016 through September 2017 to validate the accuracy of the submittals. The inspectors also reviewed the licensee's CAP database to determine if any problems had been identified with the PI data collected or transmitted for this indicator.

These reviews by the inspectors constituted two RCS Leakage PI inspection samples as defined in IP 71151-05.

b. Findings

No findings were identified.

.2 Drill and Exercise Performance

a. Inspection Scope

The inspectors sampled licensee submittals for the Drill and Exercise Performance (DEP) PI for the period from the first quarter of 2016 through the second quarter of 2017. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in NEI 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, were used. The inspectors reviewed the licensee's records associated with the PI to verify that the licensee accurately reported the DEP indicator, in accordance with relevant procedures and NEI guidance. Specifically, the inspectors reviewed licensee records and processes, including procedural guidance on assessing opportunities for the PI; assessments of PI opportunities during pre-designated control room simulator training sessions; performance during the 2016 biennial exercise; and performance during other drills.

These reviews by the inspectors constituted a single DEP PI inspection sample as defined in IP 71151-05.

b. Findings

No findings were identified.

.3 Emergency Response Organization Drill Participation

a. Inspection Scope

The inspectors sampled licensee submittals for the ERO Drill Participation PI for the period from the first quarter of 2016 through the second quarter of 2017. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in NEI 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, were used. The inspectors reviewed the licensee's records associated with the PI to verify that the licensee accurately reported the indicator, in accordance with relevant procedures and NEI guidance. Specifically, the inspectors reviewed licensee records and processes, including procedural guidance on assessing opportunities for the PI; participation during the 2016 biennial exercise and other drills; and revisions of the roster of personnel assigned to key ERO positions.

These reviews by the inspectors constituted a single ERO Drill Participation PI inspection sample as defined in IP 71151–05.

b. Findings

No findings were identified.

.4 Alert and Notification System Reliability

a. Inspection Scope

The inspectors sampled licensee submittals for the ANS PI for the period from the first quarter of 2016 through the second quarter of 2017. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in NEI 99–02, “Regulatory Assessment Performance Indicator Guideline,” Revision 7, were used. The inspectors reviewed the licensee’s records associated with the PI to verify that the licensee accurately reported the indicator, in accordance with relevant procedures and NEI guidance. Specifically, the inspectors reviewed licensee records and processes, including procedural guidance on assessing opportunities for the PI and results of periodic ANS operability tests.

These reviews by the inspectors constituted a single ANS Reliability PI inspection 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 IPs 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. Minor issues entered into the licensee’s CAP as a result of the inspectors’ observations are included in the Attachment to this report.

These routine reviews for the identification and resolution of problems did not constitute any additional inspection samples. Instead, by procedure they were considered an integral part of the inspections performed during the quarter 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 IR 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 Semi-Annual Trend Review: Repetitive Ground Alarms in Direct Current Electrical Systems

a. Inspection Scope

The inspectors performed a review of the licensee's CAP and associated documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors' review was focused on repetitive equipment issues, but also considered the results of daily inspectors CAP item screening discussed in Section 4OA2.1 above, licensee trending efforts, and licensee human performance results. The inspectors' review nominally considered the period of July 1, through December 31, 2017, although examples expanded beyond those dates where the scope of the trend warranted.

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

This review constituted a single semi-annual trend inspection sample as defined in IP 71152-05.

b. Observations

During the course of their review for this sample, the inspectors noted a more than nominal number of issues involving the station's direct current electrical systems and components, with the majority of these issues involving grounds. The inspectors examined the number of issues, the location of the grounds, and actions taken by the licensee, and determined that although there appeared to be slightly more than the usual number of random occurrences of system grounds, there was no commonality regarding

their location or cause. Additionally, the inspectors determined that the licensee had taken appropriate actions to address the identified grounds in all cases.

c. Findings

No findings were identified.

.4 Follow-Up Sample for In-Depth Review: Review of Licensee Actions to Ensure Circulating Water Blowdown Line Integrity and Conformance with the Buried Pipe Program

a. Inspection Scope

Following the recent identification that water containing tritium was discharged through an unapproved pathway at Braidwood Station (NRC Inspection Report 05000456/2017003; 05000457/2017003—ADAMS Accession No. ML17306A664), the NRC inspectors performed reviews focused on the licensee's maintenance of the buried CWBD piping to assess conformance with the licensee's buried piping program.

Background information and the results of the inspectors' inspection activities are segregated into the following areas: 1) a description of the Braidwood CWBD piping that was inspected during this inspection, 2) a discussion of the buried piping program used to monitor the integrity of the CWBD piping, 3) a discussion of more recent licensee activities and NRC inspections, and 4) NRC inspection results and conclusions that were developed during this most recent inspection period.

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

b. Observations

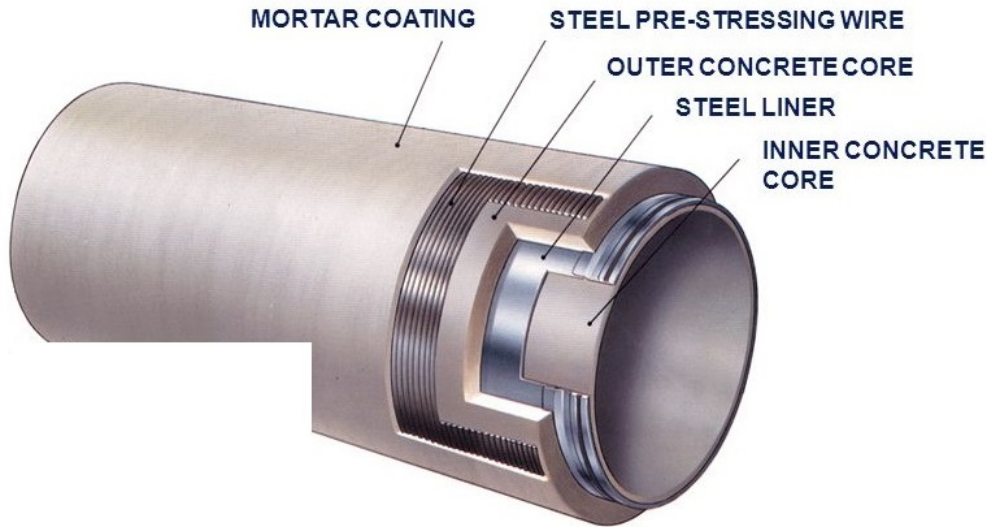
The inspectors identified weaknesses in the licensee's evaluations associated with maintaining the integrity of the CWBD piping. The NRC inspections performed during this inspection period prompted the licensee to accelerate their follow-up inspection plans. These follow-up inspections resulted in the discovery of cracks in the mortar and concrete surrounding the steel piping that were subsequently repaired. These cracks were repaired prior to any CWBD piping leakage. One finding of minor significance was identified.

Description of Circulating Water Blowdown Piping at Braidwood

The buried portion of the CWBD piping begins at Braidwood Station and terminates at the Kankakee River following an approximately due east run of about 5 miles. Most of the piping is fabricated from large diameter prestressed concrete cylinder pipe (PCCP). A section of PCCP similar to the construction of the CWBD piping at Braidwood is illustrated below.

Cut-away Section of a Pre-stressed Concrete Cylinder Pipe (PCCP)

PIPE MAKE-UP



The CWBD piping performs the following functions:

- The piping provides a means to transfer water from the station's cooling lake to the Kankakee River;
- The piping provides a means to maintain cooling lake chemistry by allowing turnover of the water in the lake to limit the concentration of natural chemicals and silt due to evaporation; and
- The piping provides a flow path and dilution flow for the authorized release of treated radioactive liquid effluents within the limitations of the station's discharge permit.

Buried Piping Program Discussion

In 2010, the Nuclear Energy Institute (NEI) issued NEI 09-14, "Guideline for the Management of Buried Piping Integrity" (Agencywide Document Access Management System (ADAMS) Accession No. ML103090142). This industry guidance document prescribed a system of goals and actions for licensees that resulted from a nuclear industry initiative on underground piping and tanks.

In 2013, NRC inspectors reviewed the licensee's program for buried piping to assess whether or not the program contained attributes consistent with NEI 09-14 and to determine if these attributes were being accomplished in a manner which reflected good or poor practices in program management.

The results of this inspection at Braidwood were documented in NRC Inspection Report 05000456/2013002; 05000457/2013002 (ADAMS Accession No. ML13129A179). The NRC concluded that the buried piping program at Braidwood was established in accordance with Temporary Instruction (TI) 2515/182, "Review of the Implementation of the Industry Initiative to Control Degradation of Underground Piping and Tanks." In addition, the inspectors determined that activities which corresponded to completion dates specified in the program had been accomplished.

Discussion of Recent NRC Inspections and Licensee Activities

During this inspection period, and as a result of the identification that water containing tritium was discharged intermittently from May 31, 2017, through June 11, 2107, using an unapproved pathway near the CWBD building, the inspectors performed reviews focused on the licensee's maintenance of the buried CWBD piping. The inspectors developed the following timeline of more recent licensee activities that had been accomplished to meet the buried piping program guidelines:

May 24–28, 2010: Utilizing specialized services of a vendor, a remote field transformer coupling (RFTC) inspection on the PCCP portion of the buried CWBD piping was performed. All of the PCCP piping segments were inspected, with the identification that about 7 percent of these segments had broken prestressed wires in each affected piping segment. Additionally, portions of three piping segments were excavated to support external visual inspections, electrical continuity measurements on the exposed prestressed wires, and the collection of mortar coating, soil, and groundwater samples. Areas of incomplete external grouting at portions of the two pipe joints exposed were identified and repaired with the conclusion that it was likely other joints were not fully grouted along the pipeline. Based on subsequent electrical continuity testing of the prestressed wire on a pipe segment which was performed as a follow-on to the RFTC inspection, the licensee identified significantly more wire breaks than expected based on the RFTC inspection results. For the distressed piping segments, the licensee identified three options—repair, replace, or monitor. For monitoring the degraded pipe, the vendor recommended an acoustic monitoring method to detect areas that were actively deteriorating.

January 13, 2011: A report was received from their vendor assessing the remaining structural margins for the distressed pipes in the CWBD piping. The vendor calculated an additional number of failed prestressed wires expected by 2015 on each of the distressed pipe segments. Additionally, the vendor identified that the distressed pipes, which were expected to potentially experience cracking of their concrete cores, had lost structural margin with respect to their maximum pressure capability prior to failure. The vendor recommended: 1) re-inspection of the pipeline in 5 years to identify newly distressed pipes and determine the rate of growth in the number of previously identified distressed pipes, 2) an evaluation of soil and groundwater corrosivity near road crossings; and 3) the performance of leak detection surveys over the high distressed areas and at locations of high soil corrosivity at 5 year intervals

December 16, 2014: An engineering evaluation was completed to assess the integrity of buried piping within the scope of the buried pipe program as identified in licensee procedure ER-AA-5400, "Underground (Buried) Piping and Raw Water Corrosion Program Guide." This evaluation included the buried CWBD piping, which concluded that a reasonable assurance of integrity for this piping would be achieved by developing

a long-term pipeline repair and maintenance strategy. In the long-term strategy, the licensee also identified a need for additional soil and ground water samples to evaluate for corrosivity. Based on the 2011 report from the vendor and on their own engineering judgment, the licensee concluded the CWBD piping should be inspected again in 2018 to identify newly distressed pipes and determine the rate of growth in the number of distressed pipes and prestressed wire breaks.

July 2016: The licensee documented the basis for their deferral of additional RFTC inspections of the CWBD piping to 2018. The RFTC inspections of the CWBD piping in 2010 had yielded a recommendation to inspect the piping again in 2015. In their justification, the licensee identified the technical concern as: "Broken prestressing wires are known to effect the performance of the pipe. Structural cracking of the core will expose the embedded cylinder to corrosion in the embedded cylinder pipe." In this justification, the licensee also identified a recommended strategy: "Reinspect the pipeline to determine the rate of growth in the number of distressed pipes and the rate of growth in the number of broken wires based on the results of the 2010 and 2018 electromagnetic inspections. Use the information from two inspections, failure risk analysis, and cost of repairs and inspections to develop long-term pipeline repair and maintenance strategy. Evaluate soil and groundwater corrosivity near road crossings. Perform leak detection survey over the high distressed areas and at locations of high soil corrosivity at 5 year intervals (starting in 2018). Leak detection can be performed using either internal or external acoustic detection instruments." In this justification for deferral from 2015 to 2018, the licensee identified that the Fleet Risk Severity Level, a measure of the potential risk, was insignificant.

NRC Inspections and Conclusions

The inspectors identified weaknesses in the licensee's evaluations associated with maintaining the integrity of the CWBD piping.

In their 2014 engineering evaluation of the CWBD piping, the licensee assessed corrosion impacts from the external environment (soil), but did not evaluate the impact on pipe integrity from corrosion of the embedded steel cylinder due to the internal environment. Specifically, operation with a sufficient numbers of broken prestressed wires could result in cracking of the internal core that would expose the embedded steel cylinder to the internal process fluid (a raw water environment), and the licensee had not assessed the loss of pipe structural integrity or leak tightness caused by internally induced corrosion of the embedded steel cylinder. Because the embedded cylinder is extremely thin, the time to corrosion-induced leakage or failure would be shorter than a pipe manufactured under the current American Water Works Association (AWWA) Code, which requires a thicker gauge of embedded steel cylinder. Additionally, the licensee had not assessed the impact to pipe integrity of missing grout, which their vendor concluded likely existed at pipe joints along the CWBD piping.

The licensee had also not considered the impact of the loss of structural margins for degraded pipe segments identified in the 2011 vendor report on the CWBD system operation. The inspectors identified that licensee procedure BwOP CW-12, "Circulating Water Blowdown System Fill, Startup, Operation and Shutdown", did not contain sufficient restrictions to limit system pressure to below the capability of the degraded pipe segment failure limits identified by their vendor (e.g. approximately 70 pounds per square inch gauge (psig)). Specifically, BwOP CW-12 limited the CWBD piping

pressure to 75 psig as measured at a gauge in the CWBD valve house located adjacent to the Kankakee River. Additionally, the pressure upstream in the CWBD piping would be at a higher pressure than what would be read on this gauge. The inspectors estimated that upstream inlet pressure could be up to 34 psig higher than the pressure read at the CWBD building based upon a comparison of pressures found at the CWBD building and at the Unit 2 CWBD booster pump discharge.

Technical Specification 5.4.1, "Procedures," states, in part, that written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, dated February 1978. Section 7 of Regulatory Guide 1.33, Revision 2, Appendix A, 1978, "Procedures for Control of Radioactivity," includes the requirement for procedures related to the discharge of effluents. Contrary to this requirement, as of November 30, 2017, the licensee had not maintained an adequate CWBD operating procedure as required by TS 5.4.1 because procedure BwOP CW-12, a procedure necessary for limiting materials released to the environment that is specified by Regulatory Guide 1.33, did not contain adequate guidance to ensure the CWBD system was operated within the pressure retaining capability of its degraded pipe segments. However, because the licensee's normal practice was to limit CWBD piping discharge pressure to less than 30 psig, which would not result in exceeding the pressure limits for the degraded pipe, and no evidence of leakage was identified during weekly surveillances of this piping, the inspectors determined that this violation was of minor significance and not subject to formal enforcement action in accordance with Section 2.3 of the NRC Enforcement Policy. The licensee entered this issue into their CAP as IR 4079312 and at the end of the inspection was evaluating the changes required for procedure BwOP CW-12.

The inspectors noted that the licensee had also not considered available operating experience and industry data on PCCP failures in their evaluations of the CWBD piping. The inspectors identified applicable industry operating experience data that could have been considered by the licensee in assessing the condition of the buried CWBD piping:

- The station's CWBD piping was manufactured by the Interpace Company in 1977 with Type IV prestressed wire. Interpace PCCP with this type of wire manufactured in this timeframe had been linked to higher failure rates based on industry data collected for failed PCCP. Specifically, piping manufactured by this vendor in this era represented 39 percent of the significant ruptures and leaks that had occurred as reported in an Environmental Protection Agency (EPA)-sponsored study completed in 2008.
- The licensee's decision to re-inspect the distressed pipe segments 8 years after the first RFTC examination was not consistent with industry best practice recommendations. Specifically, distressed pipelines or pipes manufactured in the 1970s with Class IV wire and poor coating may need to be inspected more often—once every 5 years or every 3 years for highly distressed pipe based on an EPA-sponsored study completed in 2012.

Although a follow-up RFTC inspection of the CWBD piping was planned for 2018, the licensee had not identified other methods to reduce the risk of failure for the distressed pipe segments and industry guidance to reduce the risk of failure was available. For example, an EPA-sponsored study described ways to reduce the risk of failure for

degraded piping that included pressure control, spot repair, rehabilitation of piping sections, and cathodic protection.

Based on the aggregate of these observations, the inspectors could not confirm that the licensee's buried piping program for the buried CWBD piping would assure structural or leakage integrity. Specifically, the licensee's monitoring strategy relied on, in part, detection of leakage. It did not include an operative basis for the follow-up RFTC inspection interval, and did not identify remediation or repair options for the degraded pipe sections identified in the 2010 vendor-supported examination of the CWBD piping. As a result, the inspectors concluded that the licensee had not established a basis to assure leakage and structural integrity of the CWBD piping. The licensee entered these observations into their CAP as IR 4079312 with the intention to develop a more robust long-term monitoring and remediation strategy for the degraded CWBD piping.

In response to the inspectors' observations, the licensee elected to accelerate the schedule for the planned 2018 inspection of the CWBD piping. By December 16, 2017, the licensee, utilizing specialized services of a vendor, completed a follow-up RFCT inspection and visual examination of the interior surface of the CWBD piping. During this examination, the licensee identified one pipe segment with two internal axial cracks of the inner concrete core. The licensee excavated this pipe segment to facilitate repairs and take samples of groundwater and the soil adjacent to this pipe segment.

On December 20, 2017, the inspectors performed a visual examination of the exterior of the excavated pipe segment and observed a single axial crack (not through-wall) in the non-structural mortar pipe coating that extended for most of the exposed pipe length. The licensee subsequently performed repairs, which included installation of steel cables (post-tension system) to restore the structural integrity of this degraded pipe segment. This degraded section of pipe was not leaking because this pipe had an embedded steel cylinder and no elevated levels of tritium were detected in the excavated soil and water samples. A final comprehensive report from the licensee's vendor regarding the examinations conducted on the CWBD piping in December 2017 was expected by March 2018.

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

.1 Steam Generator 1A Main Feedwater Regulating Valve Failure

a. Inspection Scope

The inspectors reviewed the operating crew and station response to the failure of the SG 1A Main Feedwater Regulating Valve (1FW510). On the morning of October 20, 2017, with Unit 1 operating at full power, the SG 1A Main Feedwater Regulating Valve failed suddenly to the closed position. Alerted by several alarms on the main control boards, control room operators responded quickly to the transient and were able to reopen the SG 1A Main Feedwater Regulating Valve in accordance with established plant procedures using manual control. Water level in SG 1A dropped to approximately 41.5 percent (the reactor low SG water level trip actuates at 18 percent) before being returned by operator action to its normal full power value of 60 percent. Reactor power during the transient was reviewed and determined to have remained below 100 percent. Troubleshooting by the licensee identified a failed control card within the SG 1A feedwater control circuitry. The failed control card was replaced and the SG 1A Main

Feedwater Regulating Valve was returned to normal automatic operation on October 21, 2017, without further incident.

The inspectors reviewed the licensee's response to the event, including but not limited to:

- The status of plant equipment and verification of proper operation in both automatic and manual modes;
- Control room operator response to the transient condition;
- The licensee's evaluation of plant/reactor power during the event; and
- The licensee's troubleshooting and development and implementation of repair plans.

This event follow-up review constituted a single inspection sample as defined in IP 71153-05.

b. Findings

No findings were identified.

4OA6 Management Meetings

.1 Exit Meeting Summary

On January 9, 2018, the inspectors presented the inspection results to the Site Vice President, Ms. M. Marchionda, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

.2 Interim Exit Meetings

Interim exits were conducted for:

- The results of emergency preparedness program inspections with the Site Vice President, Ms. M. Marchionda, and other members of the licensee staff on October 5, 2017, and with the Plant Manager, Ms. A. Ferko, via telephone on December 8, 2017;
- The results of inspections in the area of radiation protection and radiation safety with the Site Vice President, Ms. M. Marchionda, and other members of the licensee staff on October 20, 2017. An item from these inspections was re-exited with the Plant Manager, Ms. A. Ferko, and other members of the licensee staff on November 20, 2017, via telephone; and
- The results of the triennial review of heat sink performance with the Plant Manager, Ms. A. Ferko, and other members of the licensee staff on November 17, 2017.

The inspectors confirmed that none of the potential report input discussed was considered proprietary. Proprietary material received by the inspectors and reviewed in the course of these inspections 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. Cady, Radiation Protection Manager
R. Cameron, Training Director
B. Currier, Engineering Director
B. Finlay, Security Manager
M. Gagnon, Health Physicist
R. Hall, Chemical Environment & Radwaste Manager
M. Holba, Environmental Chemistry Coordinator
T. Leaf, Operations Director
D. Merkle, Engineering Program Manager
V. Moore, III, Maintenance Manager
D. Punke-Bendt, Emergency Preparedness Coordinator
P. Rausch, Work Management Director
B. Reed, Security
S. Reynolds, Regulatory Assurance 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

05000456/2017004-01; 05000457/2017004-01	NCV	Failure to Have an Adequate Pre-Fire Plan for the RWST Pipe Tunnels (Section 1R05.1)
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Closed

05000456/2017004-01; 05000457/2017004-01	NCV	Failure to Have an Adequate Pre-Fire Plan for the RWST Pipe Tunnels (Section 1R05.1)
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Discussed

None

LIST OF DOCUMENTS REVIEWED

The following is a partial list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors 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

Procedures:

- 0BwOA ENV-1; Adverse Weather Conditions Unit 0; Revision 123
- OP-AA-108-111-1001; Severe Weather and Natural Disaster Guidelines; Revision 15

Other:

- Certification of 2017-218 Winter Readiness; November 15, 2017
- WO 4577792; Functional Verification of Important Heat Trace Applications; November 17, 2017

1R04 Equipment Alignment

Procedures:

- BwOP DG-1; Diesel Generator Alignment to Standby Condition; Revision 29
- BwOP DG-E3; Electrical Lineup Unit 2, 2A Diesel Generator; Revision 7
- BwOP DG-M3; Operating Mechanical Lineup Unit 2, 2A D/G; Revision 15
- BwOP RH-E2; Electrical Lineup – Unit 2 Operating; Revision 8
- BwOP RH-M3; Operating Mechanical Lineup; Revision 10

1R05 Fire Protection

Action Requests/Issue Reports:

- 4064769; Pre-Fire Plan 129 Missing the RWST Tunnel in the Drawing; October 19, 2017

Procedures:

- BwAP 1100-16; Fire/Hazardous Materials Spill and/or Injury Response; Revision 32
- BwAP 1100-4; Fire Brigade Implementing Procedure; Revision 5
- BwAP 1110-1; Fire Protection Program System Requirements; Revision 41
- BwAP 1110-1A3; GOCAR Action Chart Fire Protection Water Suppression Systems; Revision 8
- BwAP 1110-1A4; GOCAR Required Compensatory Measures Action Response Carbon Dioxide Fire Suppression Systems; Revision 10
- BwAP 1110-1A5; GOCAR Required Compensatory Measures Action Response Halon Fire Suppression Systems; Revision 5
- BwAP 1110-3; Plant Barrier Impairment Program; Revision 38
- BwOP FP-100; Fire Response Guidelines; Revision 23
- BwOP PBI-1; Plant Barrier Impairment Program Pre-Evaluated Barrier Matrix; Revision 1
- CC-AA-201; Plant Barrier Control Program; Revision 11
- ER-AA-600-1069; High Risk Fire Area Identification; Revision 4
- ER-BR-600-1069; Site List of High Risk Fire Areas – Braidwood Unit 1 and Unit 2; Revision 0
- OP-AA-201-004; Fire Prevention for Hot Work; Revision 14
- OP-AA-201-008; Pre-Fire Plan Manual; Revision 4

- OP-AA-201-009; Control of Transient Combustible Material; Revision 20
- OP-MW-201-007; Fire Protection System Impairment Control; Revision 7

Pre-Fire Plans:

- PFP-128; Fire Zone 11.3F-1 AB 364' Safety Injection Pump 1B Room
- PFP-129; Fire Zone 11.3F-2 AB 364' Safety Injection Pump 2B Room
- PFP-132; Fire Zone 11.4-0 Center; AB 383' AUX BLDG General Area – Center
- PFP-44; Fire Zone 5.2-2; SWGA 426' Division 21 ESF Switchgear Room

Work Orders:

- 1918118; Permanent Repair of Pipe Leak Per EC 618358

1R07 Triennial Heat Sink Performance Inspection

Action Requests/Issue Reports:

- 1614057; Hypo WS and SX B Lines Likely Frozen; January 29, 2014
- 1659337; 1Q14 – NRC Green FIN – Ensure Equip Avail For Frazil Ice; May 12, 2014
- 2391670; Traveling Screens Work Instruction Deficiencies; October 6, 2014
- 2452880; 0B CW Pump Trip on Low Intake Level; February 15, 2015
- 2473211; Concrete Deteriorating Between Fish Basket and Door at Lake; March 21, 2015
- 2491087; 0CF18T Level Indication Divergence; April 26, 2015
- 2608213; Lake Temperature Warmer Than Normal This Winter; January 5, 2016
- 2732455; Dust Build-up on 2B SX PP Cubicle Cooler (2VA01SB); October 25, 2016
- 3957747; 2 C/D Lake Traveling Screen DPS Indicating at 0.0" WC; December 30, 2016
- 3957750; 2 E/F Lake Traveling Screen DPS Indicating at 0.0" WC; December 30, 2016
- 3976217; 2B SX Pump Oil Cooler SX Supply Piping Blocked with No Flow; February 20, 2017
- 4014100; Hypochlorite Chemical Leak – 0WS383B; May 23, 2017
- 4024533; NOS ID: UHS Sheet Piling 5-Year Examination PM Not Created; June 22, 2017
- 4028890; GL 89-13 & NRC UHS Inspection Self-Assessment; October 16, 2017
- 4029495; Potential for Fish Loss Due to Elevated Lake Temperature, July 7, 2017
- 4033943; Potential for Fish Loss Due to Elevated Lake Temperature, July 20, 2017
- 4036789; 0BWOA ENV-7 Entered Due to Low Lake Dissolved Oxygen, July 28, 2017
- 4036790; Potential for Fish Loss Due to Low Lake Dissolved Oxygen, July 28, 2017
- 4037724; Potential for Fish Loss Due to Elevated Lake Temperature, August 1, 2017
- 4053187; U-2 CW Sodium Hypochlorite Injection Lasted Only 65 Minutes; September 18, 2017
- 4054488; No Biocide Injection to SX B Train; September 20, 2017
- 4054783; Sodium Hypochlorite Leak Upstream 0WS383B at Red Connection; September 22, 2017
- 4075344; NRC Identified: UHS Surface Area – Correction Needed to UFSAR Description; November 16, 2017

Procedures:

- BwAR 2-2-D1; SX Pump Lube Oil Pressure Low; Revision 51E2
- 1BwOSR 5.5.8.SX-3A, Group A IST Requirements for 2A SX Pump, Revision 14
- 1BwOSR 5.5.8.SX-3B, Group A IST Requirements for 1B SX Pump, Revision 14

Drawings/Prints:

- 80GX-100-H; Oil Cooler Type MAHT-2-A-SS Size 3-W-9; Revision 0
- M-126, Sheet 1; Essential Service Water Unit 2; Revision BP
- M-126, Sheet 2; Essential Service Water Unit 2; Revision AJ

- M-126, Sheet 3; Essential Service Water (Primary Containment Vent. System) Unit 2; Revision AJ
- M-42, Sheet 1A; Essential Service Water Units 1 & 2; Revision BL
- M-42, Sheet 1B; Essential Service Water Units 1 & 2; Revision BD
- M-42, Sheet 2A; Essential Service Water Units 1 & 2; Revision AV
- M-42, Sheet 2B; Essential Service Water Units 1 & 2; Revision AY
- M-42, Sheet 3; Essential Service Water Unit 1; Revision BN
- M-42, Sheet 4; Essential Service Water; Revision BC
- M-42, Sheet 5A; Essential Service Water (Primary Containment Vent. System) Unit 1; Revision AL
- M-42, Sheet 5B; Essential Service Water (Primary Containment Vent. System) Unit 1; Revision AM
- M-42, Sheet 6; Essential Service Water; Revision U
- M-900, Sheet 1Y; Outdoor Piping Arrangement; Revision K
- M-906, Sheet 7; Outdoor Essential Service Water Discharge Piping; Revision D

Engineering Changes/Technical Evaluations:

- EC 619171; Review of Calculation BRW-95-218 for Application to Identified Low Flow Condition on 2B SX Pump Oil Cooler; Revision 0
- IST Pump Evaluation Form PP-SX-10 for 2A SX Pump; September 23, 2016
- IST Pump Evaluation Form PP-SX-11 for 1B SX Pump; October 12, 2016
- IST Pump Evaluation Form PP-SX-13 for 2A SX Pump; January 20, 2017

Engineering Design Analyses/Calculations:

- Calculation BRW-15 -0023-M; Shell and Tube Lube Oil Heat Exchanger Capacity; Revision 0
- ATD-0109; Thermal Performance of UHS During Postulated Loss of Coolant Accident; Revision 4
- ATD-0109; Thermal Performance of UHS During Postulated Loss of Coolant Accident; Revision 4A
- 83-239; Ultimate Heat Sink Up Date; Revision 0

Component Data Specification Sheets:

- SX Pump Lube Oil Cooler Specification Sheet; February 25, 1980
- SX Pump Lube Oil Cooler Data Sheet, Revision 1

Work Orders:

- 1682760; 1B Forebay - August Diver Inspection and Screen Adjustment
- 1691043; 1C Forebay - August Diver Inspection and Screen Adjustment
- 1694632; 1A Forebay - August Diver Inspection and Screen Adjustment
- 1695324; 2B Forebay - August Diver Inspection and Screen Adjustment
- 1709795; OP U2 SX Train B Valve Indication Tests 18 Month Surveillance
- 1745194; IST-STT-2SX007-U2 SX Outlet from CC Heat Exchanger
- 1790489; 2C Forebay - August Diver Inspection and Screen Adjustment
- 1790490; 2A Forebay - August Diver Inspection and Screen Adjustment
- 1793451; Braidwood Cooling Lake Hydrographic Survey
- 1825273; 1C Forebay - August Diver Inspection and Screen Adjustment
- 1828057; 1A Forebay - August Diver Inspection and Screen Adjustment
- 1847649; OP U2 SX Train B Valve Indication Tests 18 Month Surveillance
- 1865724; 1B SX Pump Comprehensive IST Requirements Test
- 1871524; SX System Flow Balance Surveillance
- 1885291; OP-IST-STT-2SX007-U2 SX Outlet from CC Heat Exchanger

- 1891945; LR-1B Forebay - August Diver Inspection and Screen Adjustment
- 1937902; LR – Braidwood Cooling Lake Hydrographic Survey
- 1960165; U1 SX System Flow Balance Surveillance
- 4605090; LR-OP ASME Surveillance Requirements for 2A SX Pump
- 4643131; LR-IST-For 2SX002A – ASME Test for 2A SX Pump
- 4652136; LR-IST-For 1SX002B – ASME Test for 1B SX Pump

Other:

- 2B SX Pump Lube Oil Cooler Clean and Inspection Report, February 23, 2016
- 2B SX Pump Lube Oil Cooler Clean and Inspection Report, February 20, 2017
- September 2016 Vendor SX Chemical Feed Report
- October 2017 Vendor SX Chemical Feed Report
- CW, WS and SX Systems Chemical Analysis Data Sheet; January 4, 2017
- CW, WS and SX Systems Chemical Analysis Data Sheet; February 22, 2017
- CW, WS and SX Systems Chemical Analysis Data Sheet; October 4, 2017
- CW, WS and SX Systems Chemical Analysis Data Sheet; October 11, 2017
- CW, WS and SX Systems Chemical Analysis Data Sheet; October 18, 2017
- CW, WS and SX Systems Chemical Analysis Data Sheet; October 25, 2017
- CW, WS and SX Systems Chemical Analysis Data Sheet; November 1, 2017
- CW, WS and SX Systems Chemical Analysis Data Sheet, November 8, 2017

1R11 Licensed Operator Regualification Program

Procedures:

- OP-AA-101-111-1001; Operations Standards and Expectations; Revision 19
- OP-AA-101-113; Operator Fundamentals; Revision 11
- OP-AA-101-113-1006; 4.0 Crew Critique Guidelines; Revision 8
- OP-AA-103-102; Watch-Standing Practices; Revision 18
- OP-AA-103-102-1001; Strategies for Successful Transient Mitigation; Revision 2
- OP-AA-103-103; Operation of Plant Equipment; Revision 1
- OP-AA-104-101; Communications; Revision 3
- OP-AA-108-107-1002; Interface Procedure Between BGE/COMED/PECO and Exelon Generation (Nuclear/Power) for Transmission Operations; Revision 11
- OP-AA-111-101; Operating Narrative Logs and Records; Revision 13
- OP-AA-300; Reactivity Management; Revision 12
- TQ-AA-10; Systematic Approach to Training Process Description; Revision 5
- TQ-AA-150; Operator Training Programs; Revision 15
- TQ-AA-155; Conduct of Simulator Training and Evaluation; Revision 7
- TQ-AA-306; Simulator Management; Revision 8
- TQ-BR-201-0113; Braidwood Training Department Simulator Examination Security Actions; Revision 21

1R12 Maintenance Effectiveness

Action Requests/Issue Reports:

- 4047778; Adverse Trend in Charger/Battery 111 Performance; October 31, 2017
- 4056582; Battery 123 Charger Failed; September 28, 2017
- 4046121; Charger 111 Output Voltage High; August 27, 2017

- 4041566; Battery 111 Voltage Above Admin Limit/Adjustment; October 13, 2017
- 4034545; Charger 111 Output Voltage is Swinging; July 23, 2017
- 4078943; Unexpected Alarm 1-21-E8 Received; November 29, 2017

Procedures:

- BwOP FW-19; Turbine Driven Feedwater Pump Speed Setter Control to Boiler Control Swap; Revision 0
- DC Power Storage and Distribution Maintenance Rule System Basis Document; October 3, 2017;
- ER-AA-310; Implementation of the Maintenance Rule; Revision 10
- ER-AA-310-1001; Maintenance Rule – Scoping; Revision 4
- ER-AA-310-1002; Maintenance Rule Functions – Safety Significant Classification; Revision 3
- ER-AA-310-1003; Maintenance Rule – Performance Criteria Selection; Revision 5
- ER-AA-310-1004; Maintenance Rule – Performance Monitoring; Revision 13
- Maintenance Rule Function Evaluation DC Power; September 18, 2017
- Maintenance Rule Periodic a(3) Assessment #13

1R13 Maintenance Risk Assessments and Emergent Work Control

Action Requests/Issue Reports:

- 4065155; 1FW510 Main Feedwater Valve to 1A Steam Generator Failed Closed; October 20, 2017
- 4065631; Unexpected Alarms Associated with the 1B Feedwater Pump; October 22, 2017
- 4066475; Outage Control Center Critique – 1B Feedwater Pump Transfer to Speed Setter; October 24, 2017
- 4066950; DCS Campaign: L4 Strut Idler Hub Failure; October 25, 2017

Procedures:

- BwFP FH-64; Transporter Operations; Revision 8
- BwFP FH-65; Spent Fuel Cask Site Transportation; Revision 13
- ER-AA-600; Risk Management; Revision 7
- ER-AA-600-1042; On-Line Risk Management; Revision 11
- OP-AA-108-117; Protected Equipment Program; Revision 4
- WC-AA-101-1006; On-Line Risk Management and Assessment; Revision 2
- WC-AA-104; Integrated Risk Management; Revision 24

Work Orders:

- 1925034; VCT Transporter for Dry Cask Storage
- 4702512; Replace Feedwater Pump 1B Speed Controller

Other:

- Engineering Change 620716; Evaluate Replacement 7300 System Tracking Driver Card Group 3 for Obsolete NTD Card for 1FCY-0510 & 1SCY-0509B; Revision 1

1R15 Operability Evaluations and Functionality Assessments

Action Requests/Issue Reports:

- 4057335; Past Operability Review of Loss of Main Control Room Area Radiation Monitoring; September 29, 2017
- 4077837; Unexpected RM-11 Alarms – 2PR11J; November 25, 2017
- 4077867; Elevated Unit Two RCS Leak Rate; November 26, 2017
- 4078162; 2PR11J in Continuous High Rad Alarm on Particulate; November 27, 2017

- 4078289; Cycling of Valves in Containment; November 27, 2017
- 4078389; Unit 2 RF Sump Sample Flow; November 28, 2017

Procedures:

- OP-AA-106-101-1006; Operational Decision Making Process; Revision 18
- OP-AA-108-111; Adverse Condition Monitoring Program; Revision 10
- OP-AA-108-115; Operability Determinations (CM-1); Revision 19

Drawings/Prints:

- M-135, Sheet 3; Reactor Coolant Loop 3 – Unit 2; Revision BD

1R19 Post-Maintenance Testing

Action Requests/Issue Reports:

- 3962927; 1FC01P Low Oil Level Due to Pump Bearing Housing Leak; January 13, 2017

Drawings/Prints:

- M-63, Sheet 1C; Fuel Pool Cooling and Clean-Up; Revision BC

Procedures:

- BwMS 3110-023; Spent Fuel Pit Pump Disassembly, Inspection and Rebuild; Revision 7
- BwMS 3150-032; Spent Fuel Pit Pump Coupling Inspection and Grease Change-Out; Revision 4
- BwOP FC-1; Fuel Pool Cooling System Start Up; Revision 27
- ER-AA-330-001; Section XI Pressure Testing; Revision 14
- ER-AA-330-009; ASME Section XI Repair/Replacement Program; Revision 13
- ER-AA-335-015-2003; VT-2 Visual Examination in Accordance with ASME 2001 Edition, 2003 Addenda; Revision 1
- MA-AA-734-400; Constant Level Oiler and Sight-Glass Maintenance; Revision 2

Work Orders:

- 1749101; 1FC01P Coupling Inspection and Grease Change-Out
- 1858726; 1FC01P Shaft Bearing Oil Change and Oil Sample for Analysis
- 1895589; PMT Functional Run/Leak Check
- 1895590; 2RH01PB PMT Functional Run
- 1932511; UMB Oil Change and Sample Visually 1A RH Pump
- 1932514; RHR Valves Indication Test 18 Month Surveillance
- 4593291; 1FC01P Low Oil Level Due to Pump Bearing Housing Leak
- 4672535; ASME Surveillance Requirement for 2B RHR Pump

1R22 Surveillance Testing

Action Requests/Issue Reports:

- 4059777; Observation of Circulating Water Blowdown Corridor Inspection Surveillance; October 5, 2017
- 4077837; Unexpected RM-11 Alarms – 2PR11J; November 25, 2017
- 4077867; Elevated Unit Two RCS Leak Rate; November 26, 2017
- 4078162; 2PR11J in Continuous High Rad Alarm on Particulate; November 27, 2017
- 4078289; Cycling of Valves in Containment; November 27, 2017
- 4078389; Unit 2 RF Sump Sample Flow; November 28, 2017

- 4689733; 0A Control Room Chilled Water Pump ASME; December 7, 2017
- 4690296; Unit 1 Train B Containment Spray Isolation Valve; December 19, 2017
- 4721213; Unit 2 Diesel Driven AF PP Monthly Run; December 17, 2017

Procedures:

- 0BwOS CW-1; Circulating Water System Blowdown Line Inspection; Revision 3
- 1BwOSR 5.5.8.RH-5B; Group A IST Requirements for Residual Heat Removal Pump 1RH01PB; Revision 17
- 2BwOL 3.4.13; LCOAR RCS Operational Leakage – Technical Specification LCO 3.4.13; Revision 5
- 2BwOSR 3.4.13.1; Unit 2 Reactor Coolant System Water Inventory Balance Surveillance; Revision 37
- 2BwOSR 3.8.1.2-1; 2A Diesel Generator Operability Surveillance; Revision 42
- BwOP DG-1; Diesel Generator Alignment to Standby Condition; Revision 29
- BwOP DG-11; Diesel Generator Startup and Operation; Revision 47
- BwOP DG-12; Diesel Generator Shutdown; Revision 30
- BwOP RH-5; RH System Startup for Recirculation; Revision 25
- ER-AP-331-1003; RCS Leakage Monitoring and Action Plan; Revision 9
- OP-AA-108-111; Adverse Condition Monitoring Program; Revision 10

Work Orders:

- 4632243; 1B EDG Operability Semi-Annual Surveillance
- 4675945; 1B RH Pump ASME Surveillance
- 4684891; 2A EDG Operability Monthly Surveillance

Other:

- Unit 2 RCS Elevated Unidentified Leak Rate Adverse Condition Monitoring Plan; Revisions 1 – 2

1EP2 Alert and Notification System Evaluation

Action Requests/Issue Reports:

- 2735542; EP-Failure to Cancel Siren Sound (BD05); November 1, 2016
- 2519585; EP-Siren Failure (BD17, BD19, BW08, BW22); June 25, 2015
- 2543192; EP-Siren Failure (BD18, BW22, BW25); August 18, 2015
- 2712545; EP-Early Siren Activation; September 6, 2016
- 3993259; EP-Siren Failure (BD01); April 3, 2017
- 4049078; EP-Siren Failure (BW29); September 5, 2017

Other:

- FEMA ANS Design Report; August 2009
- Siren Testing and Maintenance Data; April 2015 through September 2017

1EP3 Emergency Response Organization Staffing and Augmentation System

Action Requests/Issue Reports:

- 2596408; Ops Shift Below Desired Minimum Staffing; December 6, 2015
- 2645040; Duty Team ERO Did Not Attend Unscheduled Drive in Drill; March 24, 2016
- 2694254; Everbridge System Degraded; July 18, 2016
- 3945155; Staffing Below BWAP 320-1 Desired Minimums; November 24, 2016

- 3954713; EP – Unannounced Call in Drill Team E; December 17, 2016
- 3956603; Staffing Below BWAP 320-1 Desired Minimums; December 26, 2016
- 4036806; Ops Crew 5 Less Than Minimum Staffing – 7/29, Night Shift; July 28, 2017

Procedures:

- BWAP 320-1; Braidwood Station Shift Staffing; Revision 25

Other:

- Current Qualification Records for Select Emergency Response Organization Staff
- Select Call-In Drill Reports from April 2015 through September 2017

1EP4 Emergency Action Level and Emergency Plan Changes

Procedures:

- EP-AA-1001; Addendum 3, Emergency Action Levels for Braidwood Station; Revisions 1 and 2
- EP-AA-1001; Emergency Plan Annex for Braidwood; Revisions 32 and 33

Other:

- Evaluation 16-127; 50.54(q) Evaluation and Effectiveness Review, EALs for Braidwood Station; Dated September 19, 2016

1EP5 Maintenance of Emergency Preparedness

Action Requests/Issue Reports:

- 2495260; 1Q15 – NRC NCV – Fail to Activate ERO During an Actual Event; April 30, 2015
- 3988708; BWD MET Tower Upgrade Needed Due to Obsolete Equipment; March 23, 2017
- 4046705; EP Pre NRC Self-Assessment Deficiency; September 28, 2017
- 2600687; Emergency Preparedness Standard Compliance; January 8, 2016
- 2622562; EP DEP PI Drill Used Duplicate Players; February 5, 2016
- 3974948; Emergency Preparedness Audit Report; April 12, 2017
- 4007980; March EP PI Data Needs to be Adjusted; May 8, 2017
- 4046704; EP Pre NRC Self-Assessment Deficiency; August 29, 2017
- 4031821; NRC Emergency Preparedness Baseline Inspection; August 29, 2017

Procedures:

- EP-AA-1000; Exelon Nuclear Standardized Radiological Emergency Plan; Revision 28
- EP-AA-1001; Exelon Nuclear Radiological Emergency Plan Annex Braidwood Station; Revision 33

Other:

- Alternative Facility Inventory Sheets; 4th Quarter of 2016 through 3rd Quarter of 2017
- Most Current Review of Letters of Agreement with Offsite Agencies
- Select Exercise and Drill Reports from 2016 and 2017

2RS2 Occupational As-Low-As-Reasonably-Achievable Planning and Controls

Action Requests/Issue Reports:

- 4001966; No ALARA Practices Utilized for Removal of 2VE-LM001; April 24, 2017
- 4003041; Elevated Dose Rates; April 26, 2017
- 4003041; Exceed Business Plan Goal for Dose for A2R19 – NCAP Investigation Report Elevated Dose Rates During A2R19; April 26, 2017

- 4003192; A2R19LL Forced Oxidation Co-58 Peak Higher than Prediction; April 24, 2017
- 4003623; Work Delay Due to Tele Dosimetry Miscommunication; April 26, 2017
- 4005054; Trend in Improper Radiation Worker Practices; May 1, 2017
- 4005322; Worker Dose Rate Alarm Due to Possible Misleading Initial Survey; May 1, 2017
- 4006466; A2R19LL; EMD Department Received Total 266 mrem Due to Higher than Usual Working Areas Dose Rates; May 4, 2017
- 4007182; Scaffold Teardown Deferment to Save Dose; May 5, 2017
- 4007202; A2R19LL Potential Dose Saving Opportunity by Placing Lead Shielding on CV Letdown; May 5, 2017
- 4007655; Two RWPs at Greater than One Rem Projected to Exceed Estimate by 25%; May 7, 2017
- 4012603; A2R19LL; Six RWPs Accumulated Greater than 1 Rem and Exceeded by 25%; May 19, 2017

Procedures:

- RP-AA-4004: Braidwood Station A2R19 RP/ALARA Outage Report, Spring 2017

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

Action Requests/Issue Reports:

- 04055924; Emergent Radioactive Shipments Due to Failed Chemistry Equipment; September 26, 2017
- 2635506; Radwaste Resin Samples Were Not Sent for Off-Site Analysis; December 10, 2016
- 2641997; C-Van Not Staged to Support 0WX01DC Resin Removal; March 18, 2016
- 2687941; RW Shipping Quarterly Trending of Scaling Factor Deficient; June 30, 2016
- 2688019; NOS ID that Chemistry and Radiation Protection Records were Not Turned Over for Archiving; June 30, 2016
- 2700928; Lesson Learned Radioactive Shipment Observation; August 4, 2016
- 2710121; Westinghouse RCP Motor Shipping Container Scraped in Transit
- 2714011; Deficiency in General Atomics Shipment of Calibration Source; September 9, 2016
- 2727400; ODCM Monthly CWBD Composite Greater than LLD for Gross Alpha; October 12, 2017
- 3950632; PI-AA-126-1001-F-01; Self-Assessment for Radioactive Solid Waste Processing and Radioactive Material Handling, Storage and Transportation; August 14, 2017
- 3953097; Uncharacterized Filters Loaded in Disposal Liner; December 13, 2016
- 4018920; Can't Remove Motor from Aux Building Due to Contamination; June 6, 2017
- 4040232; Incomplete Radioactive Shipment Document Found During Assessment; May 4, 2017
- 4055947; Emergent Radioactive Shipments of Equipment to Byron; September 26, 2017
- 4065270; NRC Open Item from Inspection Regarding to Radwaste Resin Sampling; October 20, 2017
- 4076818; NRC Re-Exit from IP 71124.08 Inspection; November 20, 2017

Procedures:

- BwOP WX-202; Spent Resin Storage Tanks Recirculation and Sampling; Revision 8
- BwOP WX-204; High Level Resin Storage Tank Transfer to a Radwaste Liner; Revision 11
- BwOP WX-210; High Level Spent Resin Storage Tank Transferred to a Radwaste Liner Using the Low Level Spent Resin Storage Tank Pump; Revision 4
- RP-AA-605; 10 CFR 61 Program; Revision 7
- RW-AA-100; Process Control Program for Radioactive Waste; Revision 11

Drawings/Prints:

- M-48, Sheet 57; Diagram of Waste Disposal Resin Removal; Revision X

Radioactive Waste Shipment Packages:

- RWS15-002; UN-2916 Radioactive Material, Type B(U) Package, 7, Fissile Excepted, RQ Radionuclides
- RWS15-007; UN-2916 Radioactive Material, Type B(U) Package, 7, Fissile Excepted, RQ Radionuclides
- RWS15-008; UN-2916 Radioactive Material, Type B(U) Package, 7, Fissile Excepted, RQ Radionuclides
- RWS17-022; UN-2910, Radioactive Material, Excepted Package, Limited Quantity of Material, 7, Fissile Excepted
- RWS17-023; UN-3321; Radioactive Material, Low Specific Activity (LSA-II), 7
- RWS17-030; UN-2912, Radioactive Material, Low Specific Activity (LSA-I), 7, Fissile Excepted

Other:

- I-134 / Co-60 Ratios for Previous Four Quarters between July 1, 2016 through June 30, 2017

4OA1 Performance Indicator Verification

Procedures:

- LS-AA-2001; Collecting and Reporting of NRC Performance Indicator Data; Revision 14

Other:

- NRC Performance Indicator Data; Emergency Preparedness – Alert and Notification System Reliability; 1st Quarter of 2016 – 2nd Quarter of 2017
- NRC Performance Indicator Data; Emergency Preparedness – Drill/Exercise Performance; 1st Quarter of 2016 – 2nd Quarter of 2017
- NRC Performance Indicator Data; Emergency Preparedness – ERO Readiness 1st Quarter of 2016 – 2nd Quarter of 2017
- Performance Indicator Data Compiled by the Licensee from April 2016 through September 2017

4OA2 Identification and Resolution of Problems

Action Requests/Issue Reports:

- PIF A1998-04324; CW Blowdown Vacuum Breaker Leak; December 4, 1998
- PIF A2000-04389; Inadequate Response to 1998 CW Vacuum Breaker Valve Leak; November 15, 2000
- 1094031; Perform CW Blowdown Pipeline RFEC Data Validation - 0CW09C; July 23, 2010
- 1398530; Self-Assessment – Control Degradation of Underground Piping/Tanks; November 5, 2012
- 1629406; Leakage Potential from River Screen House Piping; March 5, 2014
- 2454382; VB3 Water in Vault Notification Received; February 18, 2015
- 2484388; Change to Liquid Release Limit on 10,000 Gallon Releases; April 13, 2015
- 2500520; Water Collected in VB-1 Compositor Above ODCM H3 LLD; May 13, 2015
- 2551895; Procedure Enhancement; 0BWOS CW-2; September 6, 2015
- 2555120; Not Having 1CW08P Will Impact Outage Liquid Releases; September 14, 2015
- 3963017; 250 VDC Battery 1DC07E, Pilot Cell Gravity Below Admin Limit; January 14, 2017
- 3967699; Small Ground on DC Bus 111; January 28, 2017
- 3972704; High Positive Ground on Bus 211, Erratic Readings on Rounds; February 10, 2017
- 3979960; Unexpected Alarm 1-21-E8 125 VDC Batt Charger 111 Trouble; March 1, 2017

- 3985872; Received 125 V DC Battery Charger 111 Trouble During Ground Checks; March 16, 2017
- 4002640; DC 212 AF-2 Breaker Charging Issue; April 26, 2016
- 4008247; Inverter Failed to Pre-Charge During Attempted Start-Up; May 8, 2017
- 4009758; Impact of CW Blowdown Shutdown on Outage Water Processing; May 11, 2017
- 4020644; H3 Water Being Pumped onto Surrounding Ground; June 11, 2017
- 4021825; Extent of Condition for IR 4020644: H3 Water Being Pumped to Surrounding Ground; June 14, 2017
- 4022887; Pin Hole Leak ID CW Blowdown Piping Downstream of 0CW260A&B; June 17, 2017
- 4027918; New Blowdown House Cameras Offline on Amcrest View; July 1, 2017
- 4029381; Notice of Violation Received From the IEPA; July 6, 2017
- 4032662; CW Blowdown Isolated Due to High Lake pH; July 17, 2017
- 4039400; Silt Buildup at Mouth of Old CWBD Discharge to River; August 5, 2017
- 4046861; Circulating Water Blowdown House Sump Pump BwOP WX-902; August 29, 2017
- 4053386; Water Slowly Dripping into CWBD House Sump; September 19, 2017
- 4056711; RW-11 Sump Pump Needs Replacement; September 28, 2017
- 4060060; IEPA Compliance Commitment Agreement Acceptance Letter Dated 9/20/2017 October 6, 2017
- 4062041; Water Intrusion at Circulating Water Blowdown House; October 12, 2017
- 4066827; Unit 2 RCS Leakrate Deviation Action Level 1 Exceeded; October 25, 2017
- 4072595; Lake Above Trigger Point of pH 8.80; November 8, 2017
- 4074846; RW-11 and RW-12 Need Engineering Evaluation for Heat Trace Requirements; November 15, 2017
- 4078839; 1PI-CW013 CWBD Booster Pump DP Gauge Not Working; November 29, 2017
- 4079312; Braidwood NRC Circulating Water Blowdown Inspection Results; November 30, 2017
- 4085850; CWBD As Found OD Crack in Mortar Coating; December 20, 2017

Work Orders:

- 1284199; Replace Complete Vacuum Breaker Assembly Including Isolation
- 1335774; Remove Vacuum Breakers 2 - 11 on CW Blowdown Line 0CW09C

Procedures:

- 0BwOS CW-1; Circulating Water System Blowdown Line Inspection; Revision 3
- BwOP CW-12; Circulating Water Blowdown System Fill, Startup, Operation and Shutdown; Revision 66
- BwOP WX-902; Use of Portable Sump Pumps for Non-Installed Sump Pump Application; Revision 0
- EN-AA-103; Environmental Review; Revision 7
- EN-AA-103-0001; Environmental Evaluations; Revision 8
- EN-AA-103-F-02; Environmental Screening Checklist; Revision 2
- EN-AA-103-F-03; Environmental Evaluation; Revision 0
- EN-AA-407; Response to Inadvertent Releases of Licensed Materials to Groundwater, Surface Water, Soil, or Engineered Structures; Revision 8
- EN-AA-408; Radiological Groundwater Protection Program; Revision 0
- EN-BR-103-F-01; Environment Equipment at Braidwood Station; Revision 12
- EN-BR-402; NPDES [National Pollutant Discharge Elimination System]; Revision 4
- EN-BR-408-4160; Radiological Groundwater Protection Program Reference Material; Revision 5
- ER-AA-5400; Underground (Buried) Piping and Raw Water Corrosion Program Guide; Revision 9

- ER-AA-5400-1002; Underground Piping and Tank Examination Guide; Revision 8
- NO-AA-10; Quality Assurance Topical Report; Revision 92
- PI-AA-120; Issue Identification and Screening Process; Revision 8
- PI-AA-125; Corrective Action Program (CAP) Procedure; Revision 6
- PI-AA-125-1001; Root Cause Analysis Manual; Revision 3

Drawings/Prints:

- DIT-BRW-2010-0042; Transmittal – Braidwood Circulation Water Blowdown Pipe Drawings, Pipe Laying Schedule, and Pipe Specifications; April 24, 2010
- M-900, Sheets 1H, 1J, 1V, 2, 3, 4, 5, 6, 7, 8, 13A, 13B, 13C; Outdoor Piping Arrangement; Revisions A - Z

Engineering Changes/Technical Evaluations:

- EC 400165; Braidwood Generating Station – Engineering Evaluation of Buried Pipe Inspections for Reasonable Assurance; December 16, 2014

Other:

- Analytical Results - VB-5 Pipe 769 North East Sample No. 2; December 16, 2017
- BPRWCP Program Health Report; Third Period 2016
- BRW-0-2016-0370; Risk Assessment - Delay CW Blowdown Inspection; July 12, 2016
- Buried Pipe Risk Analysis; November 14, 2008
- General Liquid Radionuclide Analysis - VB-5 Pipe 769 Sample No.3 NE; December 16, 2017
- NES MS 15.2; Guidance for Determining Reasonable Assurance for Structural and/or Leakage Integrity for Buried Piping; Revision 1
- Specification SB-77-27-1; 60-Inch and 48-Inch Prestressed Concrete Embedded Cylinder Pipe w/Rubber and Steel Joint (SP-12); June 13, 1977
- Unconditional Release Radionuclide Analysis Dirt/Sediment - VB-5 Pipe 769 Sample NE 4'; December 16, 2017
- Unconditional Release Radionuclide Analysis Dirt/Sediment - VB-5 Pipe 769 Sample NE 8'; December 16, 2017
- Vendor Report - DCI-PRJ06-0001; NDE Pipeline Condition Assessment of 48-Inch Concrete Blowdown Line Using SAHARA Leak Detection Technology; January 2006
- Vendor Report - EnTech EnSITE V, Infrared - Energy Pattern Analysis (IR-EPA) for Ground Surface Energy Anomalies Indicative of Make-up and Blowdown Pipeline Leaks and Resulting Erosion Voids for the Braidwood Generating Station; March 14, 2014
- Vendor Report - EXLN-REP-20100723-S4H0 48-Inch Circulating Water PCCP Blowdown Pipeline for the Exelon Generating Co., LLC, Using Remote Field Transformer Coupling; June 2010
- Vendor Report - SGH Project 100353; Circulating Blowdown Water Pipeline of Braidwood Nuclear Plant – Failure Risk Analysis and Repair Priorities of Distressed 48-Inch Diameter Pipes; January 13, 2011
- AWWA Research Foundation and the U.S. EPA under Cooperative Agreement No. CR826432-01, Failure of Prestressed Concrete Cylinder Pipe, Copyright 2008
- Best Practices Manual for Prestressed Concrete Pipe Condition Assessment, What Works? What Doesn't? What's Next? Copyright 2012

4OA3 Follow-Up of Events and Notices of Enforcement Discretion

Action Requests/Issue Reports:

- 4065155; 1FW510 Main Feedwater Valve to 1A Steam Generator Failed Closed; October 20, 2017
- 4065631; Unexpected Alarms Associated with the 1B Feedwater Pump; October 22, 2017
- 4066475; Outage Control center Critique – 1B Feedwater Pump Transfer to Speed Setter; October 24, 2017

- Drawings/Prints:
- M-36, Sheet 1C; Main Feedwater – Unit 1 (Steam Generator Loop 1); Revision BD

Procedures:

- 1BwAR 1-15-A4; Steam Generator 1A Flow Mismatch Feedwater Flow Low; Revision 7
- 1BwAR 1-15-B3; Steam Generator 1B Flow Mismatch Steam Flow Low; Revision 9
- 1BwOA PRI-16; Response to Overpower Condition – Unit 1; Revision 4
- 1BwPR 1-15-SG; Steam Generator Level Control Malfunction Prompt Response; Revision 0
- BwOP FW-30; Feedwater Regulating Valve Base Load Operation; Revision 1
- OP-AA-106-101-1001; Event Response Guidelines; Revision 29

LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access Management System
ALARA	As Low As Reasonably Achievable
ANS	Alert and Notification System
ASME	American Society of Mechanical Engineers
AWWA	American Water Works Association
CAP	Corrective Action Program
CFR	<i>Code of Federal Regulations</i>
CWBD	Circulating Water Blowdown
DEP	Drill and Exercise Performance
EAL	Emergency Action Level
EDG	Emergency Diesel Generator
EP	Emergency Preparedness
EPA	Environmental Protection Agency
ERO	Emergency Response Organization
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Issue Report
IST	Inservice Testing
NCV	Non-Cited Violation
NEI	Nuclear Energy Institute
NRC	U.S. Nuclear Regulatory Commission
PCCP	Prestressed Concrete Cylinder Pipe
pCi/L	picocurie per liter
PI	Performance Indicator
PMT	Post-Maintenance Testing
psig	Pounds Per Square Inch Gauge
RCS	Reactor Coolant System
RFTC	Remote Field Transformer Coupling
RH	Residual Heat Removal
RWST	Refueling Water Storage Tank
SECY	Office of the Secretary of the Commission
SG	Steam Generator
SRO	Senior Reactor Operator
SSC	Structure, System, and Component
SX	Essential Service Water
TS	Technical Specification
TSO	Transmission System Operator
UFSAR	Updated Final Safety Analysis Report
UHS	Ultimate Heat Sink
Vdc	Volt Direct Current
WO	Work Order