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January 21, 2016
BW160006

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Braidwood Station, Unit 2
Facility Operating License No. NPF-77
NRC Docket No. STN 50-457

Subject: Braidwood Station, Unit 2 Inservice Inspection Summary Report

Enclosed please find the post-outage summary report (i.e., 90 day report) for Inservice Inspection (ISI) examinations conducted during Braidwood Station, Unit 2 Refueling Outage 18 (A2R18). This report is submitted in accordance with the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for the Inservice Inspection of Nuclear Power Plant Components," and ASME Code Case N-532-4, "Repair/Replacement Activity Documentation Requirements and Inservice Summary Report Preparation Submission - Section XI, Division 1."

Attachment 1 provides the Owner's Activity Report (OAR) for ISI activities conducted during A2R18 including a list of items with flaws or relevant conditions that required evaluation for continued service, and an abstract of repair/replacement activities required for continued service. In addition, Attachment 2 provides the results of Containment ISI activities performed in accordance with ASME Section XI, Subsection IWE, "Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Power Plants," and Subsection IWL, "Requirements of Class CC Components of Light-Water Cooled Power Plants," with specified modifications and limitations in 10 CFR 50.55a, "Codes and standards."

Please direct any questions you may have regarding this submittal to Mr. George Golwitzer, Regulatory Assurance Manager, at (815) 417-4571.

A handwritten signature in cursive script, appearing to read "Marri Marchionda-Palmer".

Marri Marchionda-Palmer
Site Vice President
Braidwood Station

Attachments:

1. Owner's Activity Report (OAR) for A2R18
2. A2R18 Containment ISI (IWE/IWL) Results

cc: Regional Administrator - NRC Region III
NRC Senior Resident Inspector - Braidwood Station
NRR Project Manager - Braidwood Station
Illinois Emergency Management Agency - Division of Nuclear Safety

ATTACHMENT 1

FORM OAR-1 OWNER'S ACTIVITY REPORT

**TABLE 1, ITEMS WITH FLAWS OR RELEVANT CONDITIONS THAT
REQUIRED EVALUATION FOR CONTINUED SERVICE**

**TABLE 2, ABSTRACT OF REPAIR/REPLACEMENT ACTIVITIES
REQUIRED FOR CONTINUED SERVICE**

ATTACHMENT 1

FORM OAR-1 OWNER'S ACTIVITY REPORT

Report Number A2R18

Plant Braidwood Generating Station, 35100 South Route 53, Suite 84, Braceville, Illinois 60407

Unit No. 2 Commercial Service Date October 17, 1988 Refueling Outage Number A2R18
(if applicable)

Current Inspection Interval Third Inspection Interval (ISI), Second Inspection Interval (Containment ISI)
(1st, 2nd, 3rd, 4th, other)

Current Inspection Period Second Inspection Period (ISI and Containment ISI)
(1st, 2nd, 3rd)

Edition and Addenda of Section XI applicable to the Inspection Plans ASME Section XI 2001 Edition through 2003 Addenda

Date / Revision of Inspection Plans August 5, 2014 (Revision 11), 9/25/2014 (Revision 12), January 26, 2015 (Revision 13) and August 21, 2015 (Revision 14)

Edition and Addenda of Section XI applicable to repair/replacement activities, if different than the inspection plans Same as above

Code Cases used: N-460, N-508-3, N-508-4, N-513-3, N-532-4, N-532-5, N-566-2, N-586-1, N-597-2, N-613-1, N-639, N-652-1, N-661-1, N-700, N-706-1, N-722-1, N-729-1, N-731, N-751, N-753

CERTIFICATE OF CONFORMANCE

I certify that (a) the statements made in this report are correct; (b) the examinations and tests, meet the Inspection Plan as required by the ASME Code, Section XI; and (c) the repair/replacement activities and evaluations supporting the completion of A2R18 conform to the requirements of Section XI (refueling outage number)

Signed Brendan J. Casey Brendan J. Casey, ISI Program Owner Date 1/19/2016
(Owner or Owner's designee. Title)

CERTIFICATE OF INSERVICE INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and employed by The Harford Steam Boiler Inspection and Insurance Company of Connecticut of Hartford, Connecticut have inspected the items described in this Owner's Activity Report, and state that to the best of my knowledge and belief, the Owner has performed all activities represented by this report in accordance with the requirements of Section XI.

By signing this certificate neither the Inspector nor his employer makes any warranty expressed or implied concerning the repair/replacement activities and evaluation described in this report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection

[Signature] Commissions 13411 A, N, I, C
(Inspector's Signature) National Board, State, Province, and Endorsements

Date January 19, 2016

ATTACHMENT 1

TABLE 1

ITEMS WITH FLAWS OR RELEVANT CONDITIONS THAT REQUIRED EVALUATION FOR CONTINUED SERVICE

Examination Category	Examination Item Number	Item Description	Evaluation Description
D-B	D2.10	2DG5045A	Pitting observed visually at valve body flange surface was evaluated under (IR 2463461 / EC 385798)
D-B	D2.10	2CV8444	Body-to-bonnet bolting evaluation completed under ATI 2430862-02
C-H	C7.10	2CV8146	Body-to-bonnet bolting evaluation completed under ATI 2566190-02
C-H	C7.10	2SI8808C	Body-to-bonnet bolting evaluation completed under ATI 2566198-02
C-H	C7.10	2CV8123	Inlet flange bolting evaluation BRW201516203 under WO 1723403-01
B-P	B15.10	2RC8001B	Bonnet leak off line downgraded from Class 1 to Non-Safety Related under EC 403668
B-P	B15.10	2RC8037A	Body-to-bonnet bolting evaluation completed under ATI 2565879-02
B-P	B15.10	2RC8037B	Body-to-bonnet bolting evaluation completed under ATI 2568716-02
B-P	B15.10	2RC8037C	Body-to-bonnet bolting evaluation completed under ATI 861305-02
B-P	B15.10	2RC8037D	Body-to-bonnet bolting evaluation completed under ATI 948560-02
F-A	F1.10	2RC17060X	Excessive angularity of strut was accepted per EC 403557
C-H	C7.10	2SD01CD	Low wall thickness discovered during FAC examination was accepted per Design Analysis 053505 (EC 403560)

ATTACHMENT 1

TABLE 2

ABSTRACT OF REPAIR/REPLACEMENT ACTIVITIES REQUIRED FOR CONTINUED SERVICE

Code Class	Item Description	Description Of Work	Date Completed	Repair/Replacement Plan Number
3	Line 2DOF3AB leak at threaded fitting (IR 2403957)	Removed fitting, sealed threads and reassembled	12/19/2014	WO# 1781046-01
3	2SX2183D stuck open (IR 1583178)	Weld in new valve	6/16/2015	WO# 1689691-01 (Plan 2-15-029)
3	Through-wall leak at Line 2SX93AA (IR 2546103)	Replaced flanged spool assembly under contingency plan	8/27/2015	WO# 1712104-01 (2-14-001)
2	2CV03F bolt sheared when torqued (incorrect material installed, IR 2566608)	Replace bolting with correct material	10/8/2015	WO# 1867200-01 (Plan 2-15-058)
2	Reorient clamp for Snubber 2FW08018	Reorient snubber clamp	10/11/2015	WO# 1762501-20
1	2RC8042B valve diaphragm leaking (IR 1655323)	Replace valve (and piping/fittings) per EC 401903	10/13/2015	WO# 1735138-01 (Plan 2-15-047)
2	2SI007B flanged connection leak (IR 2574472)	Replace valve	10/14/2015	WO# 1763060-12
1	PT indications in 2RC01BB (2B steam generator) temporary thermocouple attachments (IR 2571599)	Removed PT indications from temporary attachment and verified removal	10/16/2015	WO# 1792637-01 (Plan 2-15-005)
2	2SI20B Weld #2 failed in-process weld RT (IR 2552333)	Repair weld that failed Preservice radiography	10/16/2016	WO# 1692238-10 (2-14-028)
1	2IC01M (Seal Table) fitting leaks (Incore Thimbles F1, N2, C5, D10, R6, E9, F8, K6, J10, K12, E11, F14, A11, H15, J14, and L11)	Tighten mechanical connections discovered with inactive dry boron leakage	10/18/2015	WO# 1757626-01
1	Reorient strut 2SI01029X (IR 2569199)	Reoriented strut within tolerances	10/19/2015	WO# 1868960-01
1	Reorient strut 2SI01032X (IR 2569197)	Reoriented strut within tolerances	10/19/2015	WO # 1868957-01

ATTACHMENT 2

A2R18 CONTAINMENT ISI (IWE/IWL) RESULTS

ATTACHMENT 2

A2R18 CONTAINMENT ISI (IWE/IWL) RESULTS

REPORT OF CONTAINMENT DEGRADATION

Containment inspections were performed in accordance with Subsection IWE (Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Power Plants) and IWL (Requirements for Class CC Components of Light-Water Cooled Power Plants) of ASME Section XI, Division 1, (2001 Edition through the 2003 Addenda) along with specified modifications and limitations in 10CFR 50.55a. The scope of the examinations during A2R18 included General Visual of all accessible interior and exterior surfaces of Class MC Components, parts, and appurtenances, and metallic shell and penetration liners of Class CC Components.

(ASME IWE) REPORT OF CONTAINMENT DEGRADATION

General Visual examinations of Accessible Surface Areas (Category E-A, Item 1.11) and Moisture Barriers (Category E-A, Item 1.30) of Containment Vessel Pressure Retaining Boundary were performed to meet the periodic inspection requirements of ASME Section XI, Table IWE-2500-1. In addition to GV examinations, VT-3 exams were also conducted on pressure retaining containment bolted connections that were disassembled during A2R18. No augmented exams of containment liner (Category E-C, Item 4.11 and 4.12) were scheduled for A2R18 (Second Period of the Second Interval Containment ISI).

Exelon Procedures ER-AA-330-007, "*Visual Examination of ASME Section XI Class MC Surfaces and Class CC Liners*" and ER-AA-335-018 "*Visual Examination of ASME IWE Class MC and Metallic Liners of CC Components*" were used to perform the examinations.

A description of the type and estimated extent of the conditions that led to the degradation [10CFR 50.55a(b)(2)(ix)(A)(2)(i)]:

During the performance of A2R18 General Visual exams under Work Order 1764796, a section of Unit 2 moisture barrier located 4 feet to the left of R-34 was found soft and deformed. A gap (approx. 4 inches long and 0.5 inches wide) was identified between containment liner and moisture barrier material, however there were no signs of water intrusion past the moisture barrier. IR 2566707 was written to generate a WO 1867510 for the removal, examination and restoration of moisture barrier section at the specified location. A VT-1 exam was performed on the containment liner after the removal of moisture barrier section which revealed no additional degradation. The liner surface examined during VT-1 exam was found coated and dry. A baseline GV exam was performed after restoration of moisture barrier with no issues identified.

Extent of Condition:

Evidence of previous pitting was documented in the results of VT-1 exam performed under Work Order 1867510. The area examined during A2R18 had pits that were identified in A2R14, A2R15, or A2R16 and were not repaired in A2R17. Metal loss of varying depths was observed. It should be noted that this metal thickness loss took place prior to application of Keeler and Long 9600 Series coating in A2R14. The pattern of degradation reported during A2R18 is typical of the entire liner plate surface behind the moisture barrier and contained within a horizontal strip of liner plate, approximately 4" high, around the perimeter of the liner. There was no evidence of corrosion at lower elevations of the liner plate below the MB.

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A2R18 CONTAINMENT ISI (IWE/IWL) RESULTS

Description of the Conditions That Led to the Degradation:

Based on the recorded observations it is evident that the significant portions of the liner plate degradation below the moisture barrier (MB) are attributed to corrosion due to moisture barrier degradation combined with water infiltration between the MB and the liner. In addition, the liner coating system may not have been adequate for the application for which it was used. The liner plate surface below the MB was coated with Carbo Zinc CZ11 in year 2000. Carbo Zinc CZ11 does not tolerate improper surface preparation and is not recommended for use unless white metal condition with a contoured surface profile is achieved. Since this strip of liner plate below the MB is not easily accessible, it is unlikely that the proper surface preparation was attained during the initial application. Furthermore, the liner plate surface may not have been completely dried (some moisture left in the wall from the wet Cerafibre resting against it) when the MB was replaced in 2000. In the year 2000, the Cerafibre was found wet and adhering to the metal liner. The liner most likely experienced a slow chronic corrosion rate prior to 2000. The bulk of the liner corrosion likely occurred soon after the year 2000 when the liner below the moisture barrier was coated with Carbo Zinc CZ11. The new coating applied during moisture barrier replacement in A2R08, and used in subsequent outages through A2R17, was Keeler and Long 9600 Series. This coating is used for Service Level I coating in containment. Unlike the original Carbo Zinc CZ11 coating, Keeler and Long 9600 does not require white metal surface conditions prior to coating and therefore is an effective coating for use on the liner plate behind the moisture barrier.

Evaluation of each area, and the result of the evaluation [10CFR 50.55a(b)(2)(ix)(A)(2)(ii)]:

No further evaluation was required for the inaccessible areas of liner because the degraded condition of the moisture barrier was corrected by a replacement activity during A2R18 as per IWE-3122.2. The liner surface examined during VT-1 was found sealed and the coating was still completely attached.

Description of Necessary Corrective Actions Completed [10CFR 50.55a(b)(2)(ix)(A)(2)(iii)]:

- 1) IR 2566707 was written to report the gap identified in Unit 2 moisture barrier section located 4 feet to the left of R-34 in A2R18.
- 2) Work Order 1867510 was generated from the IR to remove and restore a section of moisture barrier.
- 3) Approximately 37 inches of liner plate directly behind the MB was examined after the removal of moisture barrier section.
- 4) The VT-1 exam on the containment liner showed no additional degradation. The liner surface was found coated and dry.
- 5) A new MB was installed at the area where the existing MB was removed during A2R18. A post installation GV exam of the replaced MB was performed with no cracks or voids which would allow water intrusion.

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A2R18 CONTAINMENT ISI (IWE/IWL) RESULTS

- 6) An Engineering evaluation (EC 398857) from A2R17 provides justification for the acceptability of the liner plate at its thinnest location (4/64") and operation of Unit 2 until A2R19, without additional repair or replacement activities on the containment liner plate.
- 7) Portions of Class CC liner below the MB have been categorized as Category E-C (Containment Surfaces Requiring Augmented Examination) in the Unit 2 ISI schedule.

Proposed Corrective Actions for A2R19:

Perform VT and UT examinations at all augmented areas discovered in A2R16 and A2R17 that were not repaired in A2R17.

Conclusions/Findings:

The liner plate is acceptable and capable of performing its intended design function until A2R19 when additional augmented examinations are scheduled. (ATI1433360)

(ASME IWL) REPORT OF CONTAINMENT DEGRADATION

No evidence of active degradation was identified for ASME Class CC Components during A2R18.