

August 20, 2014
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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 17 (A2R17). 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 A2R17 including a list of items with flaws or relevant conditions that required evaluation for continued service and an abstract of repair/replacements 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. Phil Raush, Regulatory Assurance Manager, at (815) 417-2800.

Respectfully,



Mark E. Kanavos
Site Vice President
Braidwood Station

Attachments:

1. Owner's Activity Report (OAR) for A2R17
2. A2R17 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 A2R17

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

Unit No. 2 Commercial Service Date October 16, 1988 Refueling Outage Number A2R17
(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 February 4, 2013 / Revision 9 and September 5, 2013 / Revision 10

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-513-3, N-532-4, N-566-2, N-586-1, N-597-2, N-613-1, N-624, N-639, N-648-1, N-649, N-652-1, N-661-1, N-685, N-700, N-706-1, N-722-1, N-731, N-739, 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 A2R17 conform to the requirements of Section XI (refueling outage number)

Signed Brendan J. Casey Brendan J. Casey, ISI Program Owner Date 8/17/2014
(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 the State or Province of Illinois and employed by HSBCT 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 NB # 8756 ANIC, IL # 1085
(Inspector's Signature) National Board, State, Province, and Endorsements

Date 8-18-2014

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TABLE 1

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

Examination Category	Examination Item Number	Item Description	Evaluation Description
C-H	C7.10	Boric acid leakage noted at bolt 46/49 on 2A Residual Heat Removal Heat Exchanger	Removed bolt and examined by VT-1 (WO 1359794); evaluation of bolting completed under ATI 1479051-02
C-H	C7.10	Boric acid at Valve 2RH8703B body-to-bonnet connection	Body-to-bonnet leak evaluation completed under ATI 1484466-02 and 1520950-02
C-H	C7.10	Boric acid accumulation on 2B CV Pump seals	Seal evaluation completed under ATI 1492417-02
C-H	C7.10	Boric acid accumulation on 2B CV Pump seals	Seal evaluation completed under ATI 1516272-02
C-H	C7.10	Boric acid at Valve 2RH8703A body-to-bonnet connection	Body-to-bonnet leak evaluation completed under ATI 1520949-02 and 1553250-02; removed bolt for VT-1 (WO 1671191-01)
C-H	C7.10	Boric acid at Valve 2SI8921B body-to-bonnet connection	Body-to-bonnet leak evaluation completed under ATI 1522583-02
C-H	C7.10	Dry boron at 4" flushing connection flange on Line 2SI0B-24"	Flange bolting evaluation completed under ATI 1522682-02
C-H	C7.10	Boric acid at Valve 2SI8921A body-to-bonnet connection	Body-to-bonnet leak evaluation completed under ATI 1522909-02
B-P	B15.10	Dry boron at Valve 2RC8037A body-to-bonnet connection	Body-to-bonnet bolting evaluation bounded by previously completed ATI 948558-02
B-P	B15.10	Dry boron at Valve 2RC8037B body-to-bonnet connection	Body-to-bonnet bolting evaluation bounded by previously completed ATI 948558-02
B-P	B15.10	Dry boron at Valve 2RC8037C body-to-bonnet connection	Body-to-bonnet bolting evaluation bounded by previously completed ATI 948558-02
C-H	C7.10	Dry boron at Flange 2FE-160	Flange bolting evaluation completed under EC 398240
B-P	B15.10	Dry boron at Flange 2FE-428	Flange bolting evaluation completed under EC 398203
D-B	D2.10	Dry boron at Valve 2FC8762B body-to-bonnet connection	Body-to-bonnet bolting evaluation completed under EC 398660
C-H	C7.10	Dry boron at Valve 2PS9350B	Body-to-bonnet leak evaluation completed under ATI 1655535-02

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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	2DG01KA-Y1	Corrected lube oil leak at cooler on 2A Diesel Generator	4/29/2013	WO 1622215
2	2SA032	Correct disc/seat leakage by replacing valve plug	5/28/2013	WO 1515783-01 (Plan 2-13-007)
3	2AB03T	Correct access cover flange leak	8/1/2013	WO 1102354-33
3	2DG01KB-Y2	Corrected lube oil leak on 2B Diesel Generator	10/31/2013	WO 1608776-03
3	2DG01KB-Y2	Corrected lube oil leak on 2B Diesel Generator	11/8/2013	WO 1608776-05
2	2RY8028	Replaced body-to-bonnet gasket	1/15/2014	WO 1702272-01
3	2DG01KA-X2	Corrected jacket water leak on 2A Diesel Generator	2/6/2014	WO 1701696-01
3	2DG01KB-X2	Corrected jacket water leak on 2B Diesel Generator	2/7/2014	WO 1709855-01
3	2SX002A	Replace check valve	3/7/2014	WO 1435543-01 (Plan 2-13-072)
3	2VA07S	Plugged two tubes based on eddy current results	3/27/2014	WO 1514354
3	2SX2082A	Replace ball valve	4/22/2014	WO 1111899-01 (Plan 2-13-033)
2	2SI8811A	Corrected leakage at body-to-bonnet	5/9/2014	WO 1610837-22
1	2CV14039S	Replace snubber per Service Life Monitoring	5/9/2014	WO 1608449-01 (Plan 2-13-017)
1	2CV11019S	Replace snubber per Service Life Monitoring	5/9/2014	WO 1608745-01 (Plan 2-13-019)
2	2MS01074BS	Replace snubber per Service Life Monitoring (failed)	5/11/2014	WO 1452287-01 (Plan 2-14-004)
2	2CS03022S	Replace load stud and nuts on snubber	5/11/2014	WO 1590749-11 (Plan 2-14-006)
2	2CV13051S	Replace snubber per Service Life Monitoring (failed)	5/13/2014	WO 1590749-16 (Plan 2-14-005)
2	2CV8160	Corrected leakage at body-to-bonnet	5/13/2014	WO 1735380
2	2RC01BC	Replace secondary cover MJ-19A on 2C steam generator	5/13/2014	WO 1597289-01 (Plan 2-14-057)

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ABSTRACT OF REPAIR/REPLACEMENT ACTIVITIES REQUIRED FOR CONTINUED SERVICE

Code Class	Item Description	Description Of Work	Date Completed	Repair/Replacement Plan Number
MC	2PC01R	Repair pits in containment liner	5/14/2014	WO 1511777-01 (Plan 2-14-062) WO 1511557-05 (Plan 2-14-063) WO 1511557-07 (Plan 2-13-064)
1	2RC01BB	Plug tubes in 2B steam generator based on eddy current results	5/15/2014	WO 1591522-02 (Plan 2-13-038)
1	2RC01BC	Plug tubes in 2C steam generator based on eddy current results	5/15/2014	WO 1591523-02 (Plan 2-13-039)
1	2RC01BD	Plug tubes in 2D steam generator based on eddy current results	5/15/2014	WO 1591524-02 (Plan 2-13-040)
2	2AB23B044X	Modify support per EC 393838	5/15/2014	WO 1662830-07 (Plan 2-14-003)
1	2IC5006B	Corrected leakage at fitting in instrument tubing	5/16/2014	WR 463811
1	2IC5004B	Corrected leakage at compression fitting in instrument tubing	5/16/2014	WR 444722
1	2RC8042B	Install seal welded cap per EC 398090	5/16/2014	WO 1736885-01 (Plan 2-14-008)
1	2RC8037C	Dry boron at valve body-to-bonnet connection	5/17/2014	WO 1656063-01
2	2CV08021S	Replace snubber per Service Life Monitoring	5/17/2014	WO 1608753-01 (Plan 2-13-018)
2	2AF014D	Replace check valve	5/17/2014	WO 1576497-01 (Plan 2-13-046)
2	2CS008A	Replace check valve	5/17/2014	WO 1576493-01 (Plan 2-14-009)
2	2FE-160	Torque flange bolting	5/19/2014	WO 1737182-01
1	2FE-428	Torque flange bolting	5/20/2014	WO 1738352-01
1	2RY045	Replaced lost blind flange	5/20/2014	WO 1606445-01 (Plan 2-13-030)
2	2VQ03M	Replace lost bolting	5/20/2014	WO 1608754-04 (Plan 2-14-012)
1	2IC5001A	Corrected leakage at compression fitting in instrument tubing	5/21/2014	WR 465871

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ABSTRACT OF REPAIR/REPLACEMENT ACTIVITIES REQUIRED FOR CONTINUED SERVICE

Code Class	Item Description	Description Of Work	Date Completed	Repair/Replacement Plan Number
1	2IC01M (2IC5001A, 2IC5001B, 2IC5001E, 2IC5002F, 2IC5003B, 2IC5003C, 2IC5004B, 2IC5006A, 2IC5006B, and 2IC5007A)	Corrected leakage at compression fittings in instrument tubing	5/21/2014	WR 465869
3	2DG01KA-AF	Corrected jacket water leak at air intake of 2A Diesel Generator	6/12/2014	WO 1631236
3	2DG01KA-X1	Corrected jacket water leak on 2A Diesel Generator	6/13/2014	WO 1705474-01
3	2FC8765	Replace valve per EC 392252	7/2/2014	WO 1616298-07 (Plan 2-14-016)

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A2R17 CONTAINMENT ISI (IWE/IWL) RESULTS

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A2R17 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 A2R17 included VT-1 examinations at all remaining areas behind the moisture barrier (MB) that were not examined during previous outages. Containment liner plate repairs by welding were completed at all locations where metal thickness losses exceeded 4/64", including those newly discovered during A2R17 (refer to Work Order 1511557 for documentation of repairs).

(ASME IWE) REPORT OF CONTAINMENT DEGRADATION

Examinations of the Class CC liner during A2R17 (Second Period of the Second Interval Containment ISI) were performed in accordance with the requirements of 2001 Edition of ASME Section XI, through 2003 Addenda. The scope of the examinations included all locations below the moisture barrier that were not examined during previous outages. Additionally, repair by welding was completed at all locations where metal thickness losses exceeded 4/64".

Exelon Procedures ER-AA-330-007, "Visual Examination of ASME Section XI Class MC Surfaces and Class CC Liners", ER-AA-335-018 "Visual Examination of ASME IWE Class MC and Metallic Liners of CC Components", and ER-AA-335-004 "Ultrasonic Measurement of Material Thickness and Interfering Conditions" 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)(1)]:

As previously discussed, all locations behind the moisture barrier which had metal thickness losses exceeding 4/64" were repaired by welding. These repairs were completed prior to conducting the Containment Integrated Leak Rate Test (ILRT). With regard to other degradation identified during A2R17, the most notable type of degradation was liner metal thickness loss due to corroded metal just behind the MB, found as a result of VT examinations. Metal thickness loss of varying depths was found. The maximum pit depth identified was 6/64". It should be noted this metal thickness loss took place prior to moisture barrier replacement and application of Keeler and Long 9600 Series coating in A2R08. All VT areas examined during A2R17 were found coated and dry.

Extent of Condition:

The maximum metal thickness loss of 6/64" occurred at four locations based on VT examinations of the areas inspected. These examinations also indicated that the liner plate had contained numerous pits in the areas behind the MB. It should be noted that areas examined in A2R17 included areas that were not examined during previous outages. The degradation found in A2R17 was similar to that found during A2R14, A2R15, and A2R16. It is concluded that the pattern of degradation found in A2R17 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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A2R17 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 behind 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 prior to the 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 behind the MB is not easily accessible, it is unlikely that the proper surface preparation was attained during the initial coating application. Furthermore, the liner plate surface was not completely dried (some moisture left in the wall from the wet Cerafibre resting against it) before 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 prior to the year 2000, when the coating for the liner below the moisture barrier was 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)]:

An Engineering evaluation (EC 398857) was performed to address all the indications. The evaluation determined that the liner plate with the highest degraded condition (4/64" metal thickness loss after all repairs were made) will remain operational and meet its intended design function throughout the upcoming cycle. Additional augmented examinations are scheduled during the next period (A2R19). As previously discussed, repair by welding was completed at locations where liner material losses exceeded 4/64".

Description of Necessary Corrective Actions Completed [10CFR 50.55a(b)(2)(ix)(A)(3)]:

- 1) Approximately 171' of liner plate directly behind the MB was examined in A2R17, in all remaining areas that were not examined during previous outages.
- 2) Repairs were completed in A2R17 for areas previously examined in A2R14, A2R15 and A2R16, and areas that were examined for the first time in A2R17, with a metal loss greater than 4/64".
- 3) An Engineering evaluation (EC 398857) was completed to provide 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.
- 4) The liner surfaces at all exposed locations where the moisture barrier and existing coating had been removed during A2R17 were coated with Keeler and Long 9600 series coating (used for Level I coating in containment).

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A2R17 CONTAINMENT ISI (IWE/IWL) RESULTS

- 5) A new MB was installed at all areas where the existing MB was removed during A2R17. A post installation VT-3 exam of the entire MB was performed (Work Order 1511557-04. No cracks or voids which would allow water intrusion were observed.
- 6) 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. (ATI 1433360)

(ASME IWL) REPORT OF CONTAINMENT DEGRADATION

No evidence of active degradation was identified for ASME Class CC Components during A2R17.