



Exelon Generation Company  
Braidwood Station  
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Braceville, 60407-9619

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U. S. Nuclear Regulatory Commission  
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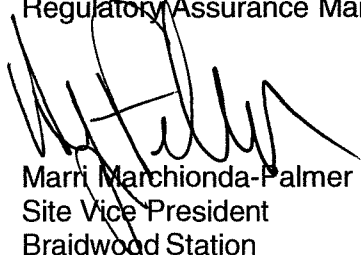
Braidwood Station, Unit 1  
Renewed Facility Operating License No. NPF-72  
NRC Docket No. STN 50-456

Subject: Braidwood Station, Unit 1 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 1 Refueling Outage 19 (A1R19). 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-532-5, "Repair/Replacement Activity Documentation Requirements and Inservice Inspection Summary Report Preparation Submission - Section XI, Division 1."

Attachment 1 provides the Owner's Activity Report (OAR) for ISI activities conducted during A1R19 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. Steven Reynolds, Regulatory Assurance Manager, at (815) 417-2800.



Marri Marchionda-Palmer  
Site Vice President  
Braidwood Station

Attachments:

1. Owner's Activity Report (OAR) for A1R19
2. A1R19 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 A1R19

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

Unit No. 1 Commercial Service Date July 29, 1988 Refueling Outage Number A1R19  
(if applicable)

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

Current Inspection Period Third Inspection Period (ISI and Containment ISI)  
(1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>)

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

Date and Revision of Inspection Plans August 21, 2015 / Rev. 14; January 22, 2016 / Rev. 15; May 10, 2016 / Rev. 16

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

Code Cases used for inspection and evaluation: N-460, 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-700, N-706-1, N-722-1, N-729-1, N-731, N-751, N-753  
(if applicable, including cases modified by Case N-532 and later revisions)

### 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 A1R19 conform to the requirements of Section XI. (refueling outage number)

Signed Brendan J. Casey Brendan J. Casey, ISI Program Owner Date 1/19/2017  
(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 Hartford Steam Boiler Inspection and Insurance Company 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 15538 I, N, R  
(Inspector's Signature) (National Board Number and Endorsement)

Date 1/19/2017

**TABLE 1**

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

<b>Examination Category</b>	<b>Examination Item Number</b>	<b>Item Description</b>	<b>Evaluation Description</b>
B-P	B15.10	1RH8702A Packing	IR 2720985, EC 401887
C-C	C3.20	1MS-01-SW09 Welded Attachment indications previously documented in A1R14 examination	IR 2726407, EC 374961 (Previous evaluation reconfirmed as acceptable)
C-H	C7.10	1A RH Pump Suction Flange Bolting	IR 2723609, EC 406784
C-H	C7.10	1SI8818A Body-to-Bonnet Bolting	IR 2722748, EC 406829
C-H	C7.10	1SI8816C Body-to-Bonnet Bolting	IR 2722746, EC 406830
C-H	C7.10	1CV8418B Flange Bolting	IR 2720356, EC 406831
D-B	D2.10	1FC8762A	IR 3962942, EC 617850

**TABLE 2**

**ABSTRACT OF REPAIR/REPLACEMENT ACTIVITIES REQUIRED FOR CONTINUED SERVICE**

<b>Code Class</b>	<b>Item Description</b>	<b>Description Of Work</b>	<b>Date Completed</b>	<b>Repair/Replacement Plan Number</b>
2	1RY8028	Body-to-Bonnet Leak (IR 2529381)	7/28/2015	WO# 1846585-08
3	0SXH2AA-6"	Modify line (visual corrosion observed) per EC 403997 (IR 2589930)	12/15/2015	WO# 1880188-01 (Plan 1-15-045)
3	1SX002A	Replace check valve that leaked by seats (IR 2557610)	11/11/2015	WO# 1793781-01 (Plan 1-15-036)
1	1RC01BA	Plug steam generator tubes due to secondary side FME	10/6/2016	WO# 1547161-02 (Plan 1-16-007)
2	1RH8708A	Replace relief valve leaking at threaded plug (IR 1561912)	10/6/2016	WO# 1676965-01 (Plan 1-16-024)
2	1CV02SB	Replace oil cooler cover that was corroded (IR 2724195)	10/13/2016	WO# 1816257-01 (Plan 1-16-064)
3	1SX2014C	Replace ball valve with twisted stem (IR 1562955)	10/3/2016	WO# 1676956-01 (Plan 1-16-005)
1	1RC01R Penetration 69	Reduce PT indications by buffing (IR 2723199)	10/9/2016	WO# 1851555-76 (Plan 1-16-050)
3	1SX23001R	Rod hanger loose, needed adjustment	10/9/2016	WO# 1954465-01
3	1VA08S	Restore corroded divider plate by welding (IR 2725744)	10/11/2016	WO# 1815702-13 (Plan 1-16-065)
1	1CV34008S	Replace snubber that failed functional test (IR 2720982)	10/5/2016	WO# 1846924-16 (Plan 1-16-061)
1	1SI01021S	Replace snubber that failed functional test (IR 2724125)	10/7/2016	WO# 1846924-66 (Plan 1-16-062)
1	1SD24073S	Replace snubber that failed functional test (IR 2722537)	10/7/2016	WO# 1846924-60 (Plan 1-16-063)
2	1CV8352A	Replace valve disc and bonnet on valve leaking by seats (IR 678966)	10/10/2016	WO# 1068679-01 (Plan 1-16-016)
2	1SD06050R	Perform base metal repair on support (IR 2478359)	10/15/2016	WO# 1821108-01 (Plan 1-15-024)
2	1SI095	Boric acid at packing (IR 2720991)	10/20/2016	WR 541140
1	1RY025	Pressure seal ring leak (IR 2728164)	10/12/2016	WO# 1958540-03
1	1IC01M	Leaks at seal table/incore tubing threaded connections (IR 2732009)	10/24/2016	WR 543622
1	1RC8042A	Replace valve found leaking per EC 401903 (IR 2719971)	10/6/2016	WO# 1955801-01 (Plan 1-16-059)
1	1CV09068S	Levelize trapeze support (IR 2723207)	10/8/2016	WO# 1957205-01
2	1FW03DC-16"	Replace segment of pipe due to flow accelerated corrosion wear/in-process weld repairs (IR 2485064)	10/23/2016	WO# 1836557-01 (Plan 1-16-006) WO# 1836557-22 (Plans 1-16-068 and 1-17-001)

**ATTACHMENT 2**

**A1R19 CONTAINMENT ISI (IWE/IWL) RESULTS**

## ATTACHMENT 2

### A1R19 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) 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 IWE inspections during A1R19 included General Visual (GV) exams of all accessible interior and exterior surfaces of Class MC components, parts, and appurtenances, and metallic shell and penetration liners of Class CC Components (refer to Work Order 1848226) and Augmented exams of 137 locations below the moisture barrier (MB) where previous examinations revealed loss in excess of 1/64" but not exceeding 4/64" (refer to Work Order 1864537).

#### (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 A1R19.

Augmented examinations (Category E-C, Item 4.11 and 4.12) of containment liner were performed at 137 locations below the moisture barrier in accordance with the requirements of ASME Section XI, Table IWE-2500-1, "Category E-C, Containment Surfaces Requiring Augmented Examination". The scope of the examinations included locations that exhibited metal thickness losses greater than 1/64" in A1R16 that were not repaired in A1R17 and any new augmented areas found as a result of UT's during A1R17 or were repaired and still remain augmented after A1R17.

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 degradation, and the conditions that led to the degradation [10CFR 50.55a(b)(2)(ix)(A)(2)(i)]:**

During the performance of A1R19 augmented exams, no additional degradation was found at the locations below the moisture barrier. None of the liner metal losses exceeded 4/64", therefore no weld repairs were required. With regard to the existing degradation examined during A1R19, the most notable type of degradation was liner pitting just below the MB resulting in metal loss of varying depths. Maximum pit depth identified through VT-1 examination was 4/64". It should be noted this metal loss took place prior to application of Keeler and Long 9600 Series coating in A1R14. All UT areas were found coated and dry.

#### **Extent of Condition:**

The maximum metal loss based on UT examinations of the areas inspected was 0.035" at three locations (20.11, 20.12 and 20.13). These examinations also indicated that the liner plate had contained numerous pits in the areas below the MB. It should be noted that augmented locations examined in A1R19 were identified in A1R16 or A1R17. The depths of the pits did not change from exams performed in previous period; therefore these areas no longer require augmented examinations in accordance with IWE-2420 (c).

## ATTACHMENT 2

### A1R19 CONTAINMENT ISI (IWE/IWL) RESULTS

#### Description of the Conditions That Led to the Degradation:

It is evident based on the recorded observations that the significant portions of the liner plate degradation below the MB are attributed to corrosion. The liner plate surface below the MB was coated with Carbo Zinc CZ11 in year 2000 which does not tolerate improper surface preparation. This coating product 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. 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. After the year 2000 when the MB was opened up, the bulk of the liner corrosion probably occurred in the early years after the year 2000 when MB was replaced. The new coating applied in A1R14 through A1R19 was Keeler and Long 9600 Series used for Service Level I coating in containment which does not require white metal surface conditions.

#### Evaluation of each area, and the result of the evaluation

##### [10CFR 50.55a(b)(2)(ix)(A)(2)(ii)]:

An Engineering Evaluation (EC #406833) was performed to address all the indications. The evaluation determined that the liner plate with the highest degraded condition 0.0625" loss (approximately 4/64") will remain operational and meet its intended design function during the upcoming run cycle until the next CISI period where additional examinations are scheduled. No liner repairs were performed and no Containment Integrated Leak Rate Test (ILRT) was scheduled for A1R19.

#### Description of Necessary Corrective Actions

##### [10CFR 50.55a(b)(2)(ix)(A)(2)(iii)]:

#### Corrective Actions Completed in A1R19:

- 1) Approximately 174 feet of the Moisture Barrier (MB) was removed to perform visual examinations and ultrasonic testing on the normally inaccessible areas of the liner directly below the MB at elevation 377'-0". The degraded areas of the liner plate were designated by "AREA" numbers 1-14 as called out in WO 1864537.
- 2) VT-1 and UT examinations were performed at approximately 137 augmented locations, to find if any additional metal loss has occurred since the previous exams in A1R16 and A1R17.
- 3) The VT-1 examination results as documented in WO 1864537 showed no change in the pit depths from previous exams. The maximum pit depth measured through VT-1 was 4/64".
- 4) The UT examination results as documented in WO 1864537 gave minimum liner plate thickness of 0.215" or metal loss of 14% nominal liner wall thickness (1/4") at three locations 20.11, 20.12 and 20.13.
- 5) All examined areas during A1R19 were found dry with no active corrosion; however, there were minor changes in coating conditions as compared to previous exams.
- 6) None of the pit depths exceeded 4/64" and did not require any repairs in A1R19. It should be noted that all areas documented in A1R14, A1R15, or A1R16 having metal loss of greater than 4/64" were repaired in A1R17.
- 7) Engineering evaluation 406833 was completed to provide justification for the acceptability of the containment liner plate at its thinnest location and for the operation of Unit 1 until the next CISI period without additional repair or replacement activities on the containment liner.



## ATTACHMENT 2

### A1R19 CONTAINMENT ISI (IWE/IWL) RESULTS

- 8) The liner surfaces at all the exposed locations where the moisture barrier had been removed were coated with Keeler and Long 9600 series coating (used for Level I coating in containment) that was applied during A1R19 along with a new Cerafibre and new MB.
- 9) A new MB was installed at all areas where the MB was removed. GV exam was performed after the installation of MB and no cracks or voids were found to allow water intrusion (minor imperfections on the MB surfaces remain locally with no voids).
- 10) Portions of Class CC liner below the MB have been categorized as Category E-C in the ISI schedule.

#### Proposed Corrective Actions for A1R21 or A1R22:

Schedule VT-1 and UT examinations of augmented locations 20.11, 20.12, 20.13, 20.4, 20.6 and 4-610-1 on containment liner plate directly below MB in A1R21 or A1R22 (ATI # 2726973-03).

#### Conclusions/Findings:

The augmented areas identified in A1R16 and A1R17 were re-examined during A1R19 to ensure no additional degradation had taken place. Based on the results of VT-1 and UT examinations, the six degraded locations (4-610-1, 20.13, 20.12, 20.11, 20.6 and 20.4) as documented in IR 2726973 will remain augmented for the next ISI period. The rest of the degraded locations examined in A1R19 remain essentially unchanged from the last inspection period and will no longer require augmented examinations in accordance with Section IWE-2420(c). The liner plate is acceptable and capable of performing its intended design function until next ISI period where additional augmented examinations are scheduled. (ATI #2726973-03).

### (ASME IWL) REPORT OF CONTAINMENT DEGRADATION

#### Class CC (IWL) Containment Examinations

The 30<sup>th</sup> Year ASME Section XI IWL Post Tensioning Systems examinations for Braidwood Unit 1 and Unit 2 began in November of 2016 and are scheduled to be completed in January 2017. The 30<sup>th</sup> Year ASME Section XI IWL Concrete examinations for Unit 1 began in March 2016 and Unit 2 began in September 2016. The containment concrete examinations for both units are scheduled to be completed in April 2017. Final reporting in accordance with ASME Section XI IWL-3310 and 10CFR50.55a will be included in the IWA-6000 ISI Summary Report for Refuel Outage A2R19 which is currently scheduled for April 2017.

At the time of preparation of this report, the presence of free water, IWL-3221.3 (a) is the only identified reportable condition. No evidence of degradation or active corrosion was identified on either the anchorage components or the surrounding concrete. Sheathing filler was not discolored (indicative of moisture saturation) in the as found condition. Chemical analysis for the sheathing filler and free water are in progress. However results are pending. The following table describes the presence of water identified for the specific tendons for available results. With the exceptions of the dome tendons, all locations are below grade level.

## ATTACHMENT 2

### A1R19 CONTAINMENT ISI (IWE/IWL) RESULTS

#### Containment Tendon Inspection Results (As of 1/5/2017)

Unit	Reason For Examination Selection	Tendon Identifier	Tendon Type	Tendon End	Free Water Collected (Ounces)	Issue Report No.
2	Augmented Free Water	H04-ED-D	Hoop	Shop	2	3957717
2	Augmented Free Water	H04-ED-E	Hoop	Field	4	3957477
2	Augmented Free Water	H06-FE-E	Hoop	Field	4	3952156
2	Augmented Free Water	H05-FE-E	Hoop	Field	7	3952155
2	Augmented Free Water	D4-36	Dome	Field	32	2742695
2	Augmented Free Water	D6-13	Dome	Shop	12	2742688
2	Augmented Free Water	D4-39	Dome	Shop	2	2742675
2	Augmented Free Water	D4-27	Dome	Shop	8	2742632
2	Augmented Free Water	D4-38	Dome	Field	32	2742625
2	Augmented Free Water	D4-08	Dome	Field	32	2742615

#### Conclusions/Findings:

Based on the as found conditions where no degradation or active corrosion was identified on the anchorage components or surrounding concrete, there is no indication the presence of free water has resulted in any degradation of the specific tendons, post tensioning systems, or the containment structures. At the time the A1R19 ISI Summary Report was being prepared these conditions were being evaluated in accordance with ASME Section XI, IWL-3222. An Engineering Evaluation Report will be prepared for the examination results that do not meet the acceptance standards of IWL-3100 or IWL-3200 and will be included with the A2R19 ISI Summary Report.