Exelon Generation

10CFR 50.55a

CCN: 21-14
February 9, 2021

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

Peach Bottom Atomic Power Station (PBAPS) Unit 2
Renewed Facility Operating License No.
DPR-44 NRC Docket No. 50-277

Subject: Submittal of the Inservice Inspection (ISI) Owner's Activity Report (OAR) for the 23rd Refueling Outage for Unit 2

Attached is the ISI Owner's Activity Report for the 23rd refueling cycle covering ISI activities that span the third period of the 4th ISI inspection interval and the first period of the 5th ISI inspection interval for Unit 2. This report is submitted in accordance with 10CFR 50.55a(b)(2)(xxxii); the ASME Section XI, Article IWA-6200; ASME Code Case N-532-4; and ASME Code Case N-532- 5.

In addition to the OAR-1 report, the following two evaluations are also being submitted:

1. EC 633079 Moisture Barrier Inaccessible Areas Evaluations is being submitted in accordance with 10CFR 50.55a(b)(2)(ix)(A)(2).
2. EC 632895 CH-MB Flaw Evaluation is being submitted in accordance with ASME Section XI, Paragraph IWB-3114.

If you have any questions or require additional information, please contact Ben Jordan at 717-456-4583.

Sincerely,

Matthew J. Herr
Site Vice President
Peach Bottom Atomic Power Station

Attachment

cc: USNRC, Regional Administrator, Region 1
USNRC, Senior Resident Inspector, PBAPS
W. DeHaas, Commonwealth of Pennsylvania
S. Seaman, State of Maryland
B. Watkins, PSEG

FORM OAR-1 OWNER'S ACTIVITY REPORT

Report Number P2R23

Plant Peach Bottom Atomic Power Station, 1848 Lay Road, Delta, PA 17314

Unit No. 2 (if applicable) Commercial Service Date July 5, 1974 Refueling Outage Number P2R23

Current Inspection Interval ISI = Fourth & Fifth Inspection Interval / CISI = Second & Third Inspection Interval (1st, 2nd, 3rd, 4th, other)

Current Inspection Period Third & First Inspection Period (ISI and Containment ISI) (1st, 2nd, 3rd)

Edition and Addenda of Section XI applicable to the Inspection Plans ASME Section XI 2001 Ed. w/2003 Add. (4th ISI/2nd CISI Interval), ASME Section XI 2013 Edition (5th ISI/3rd CISI Interval)

Date and Revision of Inspection Plans 4th/2nd Interval Plans, ER-PB-330-1001 Rev. 0 (8/30/18) 5th/3rd Interval Plans, ER-PB-330-1001 Rev. 1 (12/13/18), Rev. 2 (10/3/19) Rev. 3 (8/13/2020) Rev. 4 (10/16/2020)

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

Code Cases used: N-532-5, N-613-2, N-638-7, N-702, N-716-1, N-747, N-798, N-800

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 P2R23 (refueling outage number) conform to the requirements of Section XI

Signed Jordan, Benjamin M. Digitally signed by Jordan, Benjamin M. DN: cn=Jordan, Benjamin M. Date: 2021.02.05 11:40:38 -05'00' Benjamin Jordan, ISI Program Owner Date 2/5/2021

(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 Hartford Steam Boiler Inspection and Insurance Company 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.

Morris, Jonathan Sherman Digitally signed by Morris, Jonathan Sherman DN: cn=Morris, Jonathan Sherman Date: 2021.02.05 13:45:07 -05'00' Commissions 14732 INR

(Inspector's Signature) (National Board Number and Endorsement)

Date 2/5/2012

TABLE 1

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

Examination Category	Examination Item Number	Item Description	Evaluation Description
E-A	E1.30	Damaged Moisture Barrier	As found condition evaluated by engineering under EC 633079 and determined to be acceptable. Corrective measures were taken under WO 04997289.
E-A	E1.11	External corrosion and coating loss on external Torus	External corrosion and coatings conditions evaluated by engineering under A/R 04379999-02 and determined acceptable with no corrective measures required.
B-A	B1.22	CH-MB multiple new indications that were not acceptable per the IWB-3510 table	As found condition evaluated by engineering under EC 632895 and determined to be acceptable in accordance with IWB-3600.
B-P	B15.10	Leak found at N-16A nozzle during the B-P Pressure Test	As found condition repaired and one cycle justification per EC 632907. Relief Request I5R-14 and evaluations submitted to NRC.[1]

1. Relief Request submitted on November 4, 2020 (ML20309B020). Flaw evaluations submitted on November 24, 2020 under ML20329A345 and ML20329A346.

TABLE 2

ABSTRACT OF REPAIR/REPLACEMENT ACTIVITIES REQUIRED FOR CONTINUED SERVICE

Code Class	Item Description	Description Of Work	Date Completed	Repair/Replacement Plan Number
1	N-16A Nozzle	Performed half nozzle repair based on leak found during B-P pressure test.	11/14/2020	20-113

Engineering Change

Company Name : EXELON GENERATION CO.,LLC

EC Number : 0000632895 001
Status/Date : CLOSED 11/08/2020
Facility : PEA PEACH BOTTOM ATOMIC POWER STATION
Type/Sub-type: EVAL MECH

Print Date: 11/08/2020

EC Title: ASME SECTION XI FLAW EVALUATION - WELD CH-MB P2R23 INDICATIONS 16 AND 28

Mod Nbr : KW1: SR KW2: KW3: KW4: KW5:

Master EC	: N	Work Group	:	Temporary	: N
Outage	: Y	Alert Group	: A5452NESDM	Aprd Reqd Date	:
WO Required	:	Image Addr	:	Exp Insvc Date	:
Adv Wk Appvd	: N	Alt Ref.	:	Expires On	: 08/04/2023
Auto-Advance	: Y	Priority	:	Auto-Asbuild	: N
Caveat Outst	: N	Department	:	Discipline	:
Resp Engr	: TRAVIS	GEHMAN			
Location	:				

Units

Fac	Unit	Description
PEA	02	UNIT TWO

Outages

Fac	Unit	Outage	Description
PEA		P2R23	UNIT 2 REFUEL, CYCLE 23

Systems

Fac	System	Description
PEA	04	REACTOR PRESSURE VESSEL & INTE

Engineering Change

Print Date: 11/08/2020

EC Number : 0000632895 001
Status/Date : CLOSED 11/08/2020
Facility : PEA
Type/Sub-type: EVAL MECH

EC Title: ASME SECTION XI FLAW EVALUATION - WELD CH-MB P2R23 INDICATIONS 16 AND 28

Mod Nbr : KW1: SR KW2: KW3: KW4: KW5:

Master EC :	N	Work Group :		Temporary :	N
Outage :	Y	Alert Group:	A5452NESDM	Aprd Reqd Date:	
WO Required :		Image Addr :		Exp Insvc Date:	
Adv Wk Appvd:	N	Alt Ref. :		Expires On :	08/04/2023
Auto-Advance:	Y	Priority :		Auto-Asbuild :	N
Caveat Outst:	N	Department :		Discipline :	
Resp Engr :	TRAVIS	GEHMAN			
Location :					

Milestone	Date	PassPort	Name		Req By
110-PREPARE EC	11/06/2020	E028493	GEHMAN	TRAVIS	APPROVED
120-REVIEW EC	11/07/2020	RUFOBX	RUFO	BRIAN	APPROVED
I performed an independent review of this revision. I agree with the inputs, methodology, and conclusion.					
210-DEPT RVW-EP	11/08/2020	E114373	JORDAN	BENJAMIN	APPROVED
ISI Program review performed by Ben Jordan, PBAPS ISI Program Owner					
300-APPROVE EC	11/08/2020	U001JL7	LAVERDE	JULIAN	APPROVED

TITLE: ASME Section XI Flaw Evaluation – Weld CH-MB P2R23 Indications 16 and 28

This Engineering Technical Evaluation was prepared in accordance with CC-AA-309-101 Rev. 15. An HU-AA-1212 Rev. 10 Risk Ranking was performed with the following results and compensating methods:

Consequence Risk Factor:

[M.1] – Errors introduced with operational consequences: ISI program review

Human Performance Risk Factors:

[H.4] – Knowledge/experience gaps: Design reviewer has ISI experience

[H.5] – First time task: Perform walk-through of task

This evaluation will require an independent review as it affects safety related components.

Revision 1: This revision does not impact the classification as a Technical Evaluation, the HU-AA-1212 review performed, or the review requirements of revision 0.

1.0 REASON FOR EVALUATION/SCOPE

A scheduled ISI inspection of the Unit 2 RPV head during P2R23 identified indications in weld CH-MB that do not meet the acceptance criteria of ASME Section XI Table IWB-3510-1 and require analysis per the requirements of IWB-3600 to determine if they are acceptable for continued service (IRs 4380356/4382547). This technical evaluation will use a 2002 GE-Hitachi flaw evaluation report [Ref. 1] (referred to as the "2002 report" in this evaluation) of weld CH-MB to determine if the P2R23 flaws are bounded by the previous 2002 evaluation and acceptable for continued service. This methodology mirrors that used to evaluate and accept a CH-C-2 weld flaw in P2R18 [Ref 3].

Revision 1: IR 4382547 documents an additional unacceptable weld CH-MB indication (#28) per ASME Section XI Table IWB-3510-1. This technical evaluation revision will analyze indication 28 IAW the requirements of IWB-3600 to determine if it is acceptable for continued service. Revision 1 changes are indicated with revision bars in the left margin.

2.0 DETAILED EVALUATION

The reactor pressure vessel closure head at Peach Bottom Atomic Power Station, Unit 2 was ultrasonically (UT) examined during P2R23 in accordance with the Peach Bottom Fifth Ten Year ISI Interval Plan, which is committed to the 2013 Edition of ASME Section XI [Ref. 4].

There were multiple indications noted in the Closure Head Meridional Weld (CH-MB). All but two of the indications either were deemed acceptable based on the ASME Section XI, Table IWB-3510-1 or by previous evaluation. Indications #16 and #28 from the P2R23 inspection require evaluation per IWB-3600 to allow continued operation. Indication 16 was presented in GE Report CNF ISI-007 (Attachment 1) [Ref. 2] and indication 28 was presented in GE Report CNF-012 (Attachment 2) [Ref.5].

In 2002, GE-Hitachi performed a flaw evaluation for multiple indications on weld CH-MB. This technical evaluation will use that report (G-080-VC-301) to determine if the new indications are bounded. In order to do so, the following items were evaluated/confirmed:

1. Flaw Size/Type:

   The 2002 report evaluated 16 different surface flaws that were not acceptable per ASME Section XI, Table IWB-3510-1. P2R23 flaw #16 has a length of L = 0.9" and depth of a = 0.16 (a/L = 0.1778). There

are multiple indications in the 2002 report that bound the P2R23 flaw, with the largest having a length L = 3.75" and depth a = 0.25" (a/L = 0.0667).

Indication 16 is a surface flaw with a length to depth aspect ratio that is larger than the bounding 2002 report flaw. The stress intensity factor (K) increases as aspect ratio decreases, as seen in Table 4-1 of the 2002 report. Therefore, the flaw size, type, and stress intensity factor for P2R23 indication 16 are bounded by the 2002 report.

Revision 1: P2R23 flaw 28 has a length of L = 2.0" and depth of a = 0.15 (a/L = 0.075). This surface flaw has a length to depth aspect ratio that is larger than the bounding 2002 report flaw. The stress intensity factor (K) increases as aspect ratio decreases, as seen in Table 4-1 of the 2002 report. Therefore, the flaw size, type, and stress intensity factor for P2R23 indication 28 are bounded by the 2002 report.

2. Since the 2002 evaluation, PBAPS has undergone an extended power uprate (EPU). However, it was confirmed that the bounding loads did not change since the 2002 report:

   The following assumptions were used in the 2002 report and remain valid.

   - The bolt-up temperature is 70 F. This assumption is acceptable per ambient temperature conditions at bolt-up.
   - The test pressure and temperature are 1050 psi and 169 F. Verified per ST-O-080-500(680)-2.

3. Since the 2002 evaluation, PBAPS has received a subsequent license to allow operation up to 80 years. The 2002 report evaluated a bounding fatigue crack growth of 0.025" using the 60-year license at the time. The fatigue crack growth can conservatively be increased using the longer operation period by scaling out the time period: 0.025" x 80/60 = 0.033". This growth is inconsequential and would remain bounded by the 2002 flaw referenced above.

4. It was verified that the applicable sections of ASME Section XI did not change. Therefore, the 2002 report methodology remains valid.

Based on the above considerations, P2R23 indications 16 and 28 are bounded in flaw characteristics and evaluation method performed in 2002 GE report G-080-VC-301.

3.0 CONCLUSIONS/FINDINGS

Per IWB-3132.3, Acceptance By Analytical Evaluation, P2R23 Indications 16 and 28 on weld CH-MB, as detailed in the Attachment 1 and 2 reports, have been evaluated as described in IWB-3600 and meet the acceptance criteria of IWB-3600. Weld CH-MB is acceptable for continued service and is predicted to be acceptable through end of plant life. In accordance with IWB-2420, successive exam requirements will need to be evaluated. This is being tracked via assignment 04380356-02.

Per IWB-3134(b) this analytical evaluation must be submitted to the regulatory authority having jurisdiction at the plant site (i.e. NRC). Assignment 04380356-03 has been generated to track this submittal.

Revision 1: A note has been added to the above assignments to reference the addition of indication 28 to this technical evaluation.

4.0 REFERENCES

1. G-080-VC-301, The Evaluation of Indications in Peach Bottom Unit 2 Vessel Closure Head for Continued Operation.
2. CNF ISI-007 GE Report, CH-MB Closure Head Meridional Weld
3. Evaluation A1118530-02, Technical Evaluation for U2 RPV Closure Head to Flange Weld (CH-C-2) Indication
4. ASME Boiler and Pressure Vessel Code, Section XI, Rules for In-Service Inspection of Nuclear Power Plant Components, 2013 Edition.
5. CNF-012, GE Report CH-MB Customer Notification Form

5.0 ATTACHMENTS

Attachment 1 – CNF ISI-007 GE Report: Indication 16 (3 Pages)
Attachment 2 – CNF-012 GE Report: Indication 28 (2 Pages)

6.0 MILESTONES

See Passport for Milestones.

7.0 Impact Review

ISI program engineer performed an interface review and signed a Passport Milestone.

Per review of CC-AA-102, there were no additional impacts identified.

Revision 1: An ISI program engineer performed an interface review and signed a Passport Milestone.

There are no additional impacts from revision 1 of this technical evaluation.

Engineering Change

EC Number : 0000633079 000
Status/Date : MODIFIED 12/08/2020
Facility : PEA
Type/Sub-type: EVAL STRU

Print Date: 12/08/2020

EC Title: ASSESS UNIT 2 MOISTURE BARRIER DAMAGE IMPACT ON DRYWELL VESSEL

Mod Nbr : KW1: SR KW2: KW3: KW4: KW5:

Master EC	: N	Work Group	:	Temporary	: N
Outage	: N	Alert Group	: A5452NESDM	Aprd Reqd Date	:
WO Required	:	Image Addr	:	Exp Insvc Date	:
Adv Wk Appvd	: N	Alt Ref.	:	Expires On	: 09/03/2023
Auto-Advance	: Y	Priority	:	Auto-Asbuild	: N
Caveat Outst	: Y	Department	:	Discipline	:
Resp Engr	: PAUL R KESTER				
Location	:				

Milestone	Date	PassPort	Name		Req By
110-PREPARE EC	11/23/2020	U000PRK	KESTER	PAUL	APPROVED
120-REVIEW EC	12/03/2020	U000JV6	VACANTE	JOSEPH	APPROVED

I have independently verified this Engineering Technical Evaluation and con
cur with the conclusions herein. All comments have either been incorporate
d or resolved between the originator and verifier. Additional engineering analysis regarding the corrosion mechanisms and environment are deemed appr
opriate and are provided by reference within this document.

210-DEPT RVW-EP	11/23/2020	E114373	JORDAN	BENJAMIN	APPROVED

I have reviewed the technical eval and concur with the specified conclusion. This evaluation meets the ASME Section XI requirements of IWE-2500(d) and 10CFR50.55a(b)(2)(ix)(A)(1).
Ben Jordan (11/23/20)

300-APPROVE EC	12/08/2020	U000A5M	HUBER	AMY	APPROVED

Scope:

This evaluation applies to Peach Bottom Unit 2, addressing the condition discovered during P2R23. The condition being evaluated is that the moisture barrier, where the drywell bottom-elevation concrete floor slab abuts the steel containment vessel, was found degraded. The moisture barrier is essentially a large bead of caulk that seals the interface where the concrete floor stops at the steel containment vessel wall as it rises above the Elevation 119'-11" floor elevation. Refer to dwg. S-193 detail 1 (ref. 4). This interface forms the circular perimeter of the Elevation 119'-11" floor slab. A 4'-long section of the perimeter's sealant material was found to be unadhered and dislodged from the joint from azimuth 145 to azimuth 157. This would leave the joint, and the potential crevice between the concrete and steel below it, open to any water that leaked within the drywell (excluding the under-vessel area). The water has no drainage path from there, so it could remain in the crevice and corrode the steel containment vessel. This area of the vessel, the internal steel surface beneath the concrete floor at Elevation 119'-11", is classified as inaccessible.

The scope of this EC, as directed in AR 4379124 Assignment 02, is to evaluate the as-found condition and determine the acceptability of the inaccessible areas in accordance with 10CFR50.55a(b)(2)(ix)(A). That code states:

> (A) *Metal containment examinations: First provision*. For Class MC applications, the following apply to inaccessible areas.
>
> (*1*) The applicant or licensee must evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or could result in degradation to such inaccessible areas.
>
> (*2*) For each inaccessible area identified for evaluation, the applicant or licensee must provide the following in the ISI Summary Report as required by IWA–6000:
>
> (*i*) A description of the type and estimated extent of degradation, and the conditions that led to the degradation;
>
> (*ii*) An evaluation of each area, and the result of the evaluation; and
>
> (*iii*) A description of necessary corrective actions.

Evaluation:

The drywell is a steel containment vessel with varying thickness. The thickness for each section is designed to provide the needed capacity for all pressure, weight, thermal, seismic and other stresses. This thickness must be monitored to ensure that sufficient capacity remains throughout its design life. The bottom portion of the drywell is considered to be "inaccessible" because it is adjacent to concrete on both sides. Since the thickness and condition of the steel in this area can not be directly measured or

visually monitored, this evaluation provides a qualitative assessment of the potential for material loss due to corrosion from exposure to water.

The “moisture barrier” addressed here is a sealant applied to the perimeter of the drywell concrete floor, at its interface with the steel drywell shell. That sealant is intended to prevent water or moisture from coming into contact with the drywell shell below the elevation of the floor surface. Corrosion in this area would be difficult to detect due to its inaccessibility. With the damage discovered to the sealant during 2R23 and the known leakage in the drywell, it must be assumed that water has infiltrated the interface of the concrete and the drywell shell to some degree. The potential for this to cause corrosion of the drywell shell is therefore assessed.

The chemistry of concrete is very basic (high pH), which protects the steel in contact with it from rusting, much like the rebar contained within concrete is protected from rusting. That chemical process, and its applicability to this specific configuration have been described in detail in the attachment to previous IR 2561844 A03 (ref. 3). It remains applicable to the current concern being addressed for the Unit 2 drywell in P2R23. In addition, oxygen must be present for the drywell steel to oxidize. The drywell is purged with nitrogen most of the time, limiting the presence of oxygen. The area of drywell steel that would have the highest exposure, and therefore vulnerability to moisture and oxygen would be at the location of the moisture barrier. This location is exposed to oxygen during a refueling outage, and is where water leakage in the drywell could collect (in the areas of a damaged moisture barrier). The inaccessible portion of the drywell below the floor’s surface could also be exposed to moisture, but it would not have as much exposure to oxygen, if any at all. This “line of highest vulnerability” is typically observed with submerged steel, having rust at the water line but not above or below it. There is no visual evidence of any significant corrosion in the areas where the moisture barrier has separated. The observed steel at the dislodged area of the moisture barrier had little to no surface corrosion present. Since this is the most likely area for corrosion, it can be concluded that the area beneath the level of the floor is in as good of a condition as the exposed areas, or better.

Note that this condition has been evaluated in detail for other Units in the past. Those past evaluations are included in the references below. Those evaluations were reviewed and determined to be applicable for the subject condition evaluated here. The essential arguments from those evaluations are provided above, while some of the more detailed explanations have not been repeated here. See the references below for more details as needed.

To specifically address the required items (i), (ii) and (iii) from the code above:

(i) The type of degradation being evaluated is the potential internal surface corrosion of the drywell containment vessel below the surface of the 119’-11” concrete floor. Based on the information above and in the cited references, the estimated extent of degradation is, at worst, minor surface corrosion with no significant loss of thickness in all inaccessible areas. This is based on the minor areas of surface corrosion visible at the interface being the worst level of corrosion, due to the chemically protective properties of the concrete and the absence of an environment containing oxygen below the floor’s surface. The condition that lead to the potential for corrosion is the portion of damaged moisture barrier. The exact cause of the damaged moisture barrier is not known, but it is suspected to be due to high temperature fluid leakage (oil or water) causing a loss of adhesion.

(ii) The information above, and the supporting details in the references indicate that there would be no significant corrosion on the inaccessible surface of the drywell containment vessel. It is concluded that there would be no loss of thickness, and therefore the containment remains fully qualified.

(iii) The moisture barrier was restored to its required configuration (ref. 5). No additional corrective actions are required.

Conclusion:

The failed portion of moisture barrier and the resulting potential for water having seeped into the interface between the floor slab and the drywell shell do not present a threat of any significant corrosion occurring to the drywell shell. The deficiencies in the moisture barrier have been corrected to prevent further exposure. No additional action is required.

Administrative:

This is a technical evaluation prepared in accordance with CC-AA-309-101 rev 15. It addresses a safety related structure and therefore requires an independent review, manager approval and transmittal to Records Management. Any required ISI program impacts are intended to be addressed by the program owner under AR 4379124 A03 and A04. A Milestone signoff has been requested of the ISI program owner to ensure that this response addresses the program's remaining needs. Based on a review of CC-AA-102, this evaluation has no other program, procedure or other documentation impacts and does not require interface review by any other group. Application of HU-AA-1212 with Julian Laverde indicated the highest applicable consequence risk factor has a Low severity level (L.2), and one human performance/process risk factor (P.6) is applicable to the scope of this evaluation. The uncertainty of critical parameters is mitigated through investigation of past, similar evaluations and the technical details supporting them. The resulting risk rank is 1, and existing process reviews are appropriate. This evaluation is not complex, and no supplemental reviews are required or warranted.

References:

1. Passport EC 621863 rev. 0, Unit 3 moisture barrier damage discovered during P3R21
2. Passport AR 4066968, Unit 3 moisture barrier damage discovered during P3R21
3. Passport AR 2561844, Unit 3 moisture barrier damage discovered during P3R20
4. Drawing S-193 rev. 4, Reactor Vessel Foundation
5. WO 04997289 02, Repair of Moisture Barrier during P2R23

Attachments:

None