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L-13-060

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

SUBJECT:
Beaver Valley Power Station, Unit No. 1
Docket No. 50-334, License No. DPR-66
Response to Request for Additional Information Regarding Containment Liner Random and Non-Random Reports (TAC No. ME9626)

By letter dated February 14, 2011 (Accession No. ML110470404), FirstEnergy Nuclear Operating Company (FENOC) submitted the containment liner random and non-random examinations report for the Beaver Valley Power Station, Unit No. 1 (BVPS-1) fall 2010 refueling outage. By letter dated July 11, 2012 (Accession No. ML12195A155), FENOC submitted the containment liner random and non-random examinations report for the BVPS-1 spring 2012 refueling outage.

On February 5, 2013 (Accession No. ML13023A377), the Nuclear Regulatory Commission (NRC) staff requested additional information regarding these reports. FENOC's response to the request is attached.

There are no regulatory commitments contained in this letter. If there are any questions or if additional information is required, please contact Mr. Thomas A. Lentz, Manager – Fleet Licensing, at (330) 315-6810.

Sincerely,

Paul A. Harden

Attachment:
Response to Request for Additional Information Regarding Containment Liner Random and Non-Random Reports

cc: NRC Region I Administrator
NRC Resident Inspector
NRR Project Manager
Director BRP/DEP Representative
Site BRP/DEP Representative

Attachment
L-13-060

Response to Request for Additional Information Regarding Containment Liner
Random and Non-Random Reports

By letter to the Nuclear Regulatory Commission (NRC) dated February 14, 2011 (Accession No. ML110470404), FirstEnergy Nuclear Operating Company (FENOC) submitted the containment liner random and non-random examinations report for the Beaver Valley Power Station, Unit No. 1 (BVPS-1) fall 2010 refueling outage to satisfy portions of Commitment Nos. 32 and 33 of Appendix A of Supplement 1 to NUREG-1929, "Safety Evaluation Report Related to the License Renewal of Beaver Valley Power Station, Units 1 and 2." By letter dated July 11, 2012 (Accession No. ML12195A155), FENOC submitted the containment liner random and non-random examinations report for the BVPS-1 spring 2012 refueling outage. Additionally, the letter dated July 11, 2012, stated that Commitment Nos. 32, 33, and 34 of Appendix A to Supplement 1 to NUREG-1929 are considered closed.

On February 5, 2013 (Accession No. ML13023A377), the NRC requested additional information regarding these reports. The NRC staff's requests are presented in bold type, followed by FENOC's responses.

Background/Regulatory Basis:

The commitments listed in NUREG-1929, Supplement 1, Appendix A, are required to be completed as specified in BVPS, Unit 1 license condition 2.F. According to the BVPS, Unit 1 Updated Final Safety Analysis Report, Section 5.2.4.1, the thickness of the containment liner cylinder section is 3/8" (.375") and the containment dome liner is 1/2" (.500"). The submittal dated February 14, 2011, does not identify the locations of the measurements (i.e., cylinder or dome) and thus does not clearly identify the nominal thickness and corresponding acceptance criteria for the measurements reported. Without this information, the licensee's conclusions regarding the measurements cannot be verified by the NRC staff. In addition, Commitment No. 32 states that "if degradation is identified, it will be addressed through the corrective action program (as described in FENOC letter L-09-243)." In FENOC letter L-09-243, dated September 4, 2009 (ADAMS Accession No. ML092530241), the licensee stated that "locations with identified loss of material less than 10% but with a breadth and shape will be entered into the corrective action program and tracked as a point of interest for monitoring during subsequent outages until dispositioned." Five locations in the July 11, 2012, report had measurements below what appears to be the nominal thickness of the liner; however, it is not clear if these locations would be monitored in the future.

1. **Identify the appropriate nominal thickness and acceptance criteria of all the measurement locations (random and non-random) in the letter dated February 14, 2011.**

Response

The appropriate nominal thickness and acceptance criteria of all the random and non-random measurement locations in the February 14, 2011 letter is in Table 2, "BVPS-1 Summary of Containment Liner Random and Non-Random Examinations (Fall 2010 Refueling Outage)."

2. **Explain how it was determined what "breadth and shape" was necessary for degradation to be entered into the corrective action program and tracked. If none of the five locations below nominal thickness have been identified for future monitoring, explain why future monitoring is unnecessary. If any locations from the 2011 submittal fall below nominal thickness, include them in the discussion as well.**

Response

Site procedure, "BVPS Containment Liner UT Thickness Guidance Document," states "The examiner will record the lowest thickness found. If a wear pattern exists, having measurable breadth and shape, the examiner will map the area on the exam report and mark the lowest thickness within this wear pattern area on the liner plate."

During pre-job briefings the examiners were instructed to identify any area where loss of wall material was evident. This would be indicated by an area of lower wall thickness within an area having the general wall thickness of the liner plate. A condition report (CR) would be initiated when the extent of an area having lower than nominal measurements was beyond an isolated point, that is, having measurable vertical or horizontal dimension.

There were a total of nine (four were reported in the 2011 letter and five were reported in the 2012 letter) BVPS-1 random exam locations with thickness measurements below the nominal thickness (as shown in Table 1). No non-random exam locations had thickness measurements below the nominal thickness. In eight of the nine locations where the lowest recorded thickness was below the nominal thickness, the examiner reported that there was no evidence of wall loss. That is, the low readings were isolated points that showed no evidence of shape or breadth.

For the ninth location (1RN-073), which was reported in the letter dated February 14, 2011, subsequent evaluations and examinations were performed per CR 10-83958 that concluded the identified low spots were either partially fused nelson studs located on the concrete side of the liner or laminar reflectors inherent in the rolled plate material used to fabricate the liner. Although the evaluation of 1RN-073 contained in CR 10-83958 dispositioned the examination results, reexamination of this location is scheduled during 1R22 (fall 2013 refueling outage) to validate the conclusions of the evaluation.

Historically, degradation initiated on the concrete side of the liner has been characterized as localized corrosion. However, the lowest recorded measurements have been surrounded by much larger areas exhibiting thickness measurements lower than the general wall thickness of the plate. For example:

- During BVPS-2 2R15 (spring 2011 refueling outage), an area of lower thickness was identified during examination of Random Location 2RN-063. The lowest thickness recorded was 0.267 inches, which was described as an isolated point. This point was surrounded by a 2-inch by 10-inch area having a thickness below the general thickness of the liner plate. The reexamination of this area in 2R16 (fall 2012 refueling outage) found no evidence of continued degradation.

- In BVPS-1 1R19 (spring 2009 refueling outage), a 1 inch by 1 3/8 inch rectangular hole was found, surrounded by a significant area (4 inch to 5 inch in diameter) of lower than nominal thickness.

- In BVPS-1 1R17 (spring 2006 refueling outage), two areas of corrosion (lowest thickness of 0.151 inch and 0.225 inch) were identified on the portion of the liner removed for the steam generator replacement project. Once again the low spots were surrounded by a significant area (6-inch by 10-inch area) of lower than nominal thickness.

- In January 2000, a 3/16-inch circular through-liner hole was found at Cook Nuclear Plant Unit 2 caused by a wooden brush handle embedded immediately behind the containment liner. The repair of the liner included replacement of a 7-inch by 7-inch section where the ultrasonic testing (UT) measured thickness of the liner was generally less than the nominal thickness.

- In September 1999, a through-wall defect was found at North Anna Unit 2 caused by a timber embedded in the concrete immediately behind the containment liner. UT thickness measurements taken in the vicinity of the defect revealed anomalous readings, which led to the initial removal of a 5-inch by 7-inch section of the liner plate.

- In April 1999, a through-wall defect was found at Brunswick Unit 2 caused by a cloth work glove embedded in the concrete next to the liner. Photos show multiple indications in this area, spanning several inches of the liner plate.

Unlike certain degradation mechanisms characterized by isolated, localized pitting, previous BVPS and industry liner degradation has manifested a much broader corrosion pattern. Operating experience indicates that concrete-sided liner degradation has proven to be readily evident when the degraded areas are examined by UT thickness measurements. None of the nine BVPS-1 locations noted above are considered to be indicative of the corrosion pattern associated with previous BVPS liner degradation or with industry-reported degradation initiated from the concrete side of the liner. The measurements from the locations exhibiting isolated points below the nominal thickness were likely due to slight variations in plate material thickness, potentially caused by exposure to the weather during plant construction, following liner erection but prior to the concrete pour. Therefore, no future examinations have been scheduled with the exception of location 1RN-073 as explained above.

Table 1 below provides a percentage value of the lowest thickness compared to the nominal thickness for the nine locations.

Table 1
Percentage Value of Lowest Thickness Compared to Nominal Thickness

Location	Location Type	Lowest Thickness	Tnom	% of Nominal	Date Reported
1RN-004	Dome	0.495	0.500	99.0%	7/11/12
1RN-005	Dome	0.480	0.500	96.0%	7/11/12
1RN-012	Dome	0.499	0.500	99.8%	7/11/12
1RN-028	Dome	0.488	0.500	97.6%	7/11/12
1RN-029	Cylinder	0.371	0.375	98.9%	2/14/11
1RN-043	Cylinder	0.355	0.375	94.7%	7/11/12
1RN-060	Cylinder	0.357	0.375	95.2%	2/14/11
1RN-069	Cylinder	0.362	0.375	96.5%	2/14/11
1RN-073	Cylinder	0.363	0.375	96.8%	2/14/11

Table 2
BVPS-1 Summary of Containment Liner Random and Non-Random Examinations
(Fall 2010 Refueling Outage)

Component ID	Location Type	Report No.	Lowest	Tnom	Acceptance Criteria
1NR-01	Cylinder	UT-10-1020	0.383	0.375	0.337
1NR-02	Cylinder	UT-10-1021	0.391	0.375	0.337
1NR-03	Cylinder	UT-10-1002	0.421	0.375	0.337
1NR-04	Cylinder	UT-10-1001	0.406	0.375	0.337
1NR-05	Cylinder	UT-10-1022	1.020	1.000	0.900
1NR-06	Cylinder	UT-10-1048	0.391	0.375	0.337
1NR-07	Cylinder	UT-10-1056	0.402	0.375	0.337
1NR-08	Cylinder	UT-10-1023	0.413	0.375	0.337
1NR-09	Cylinder	UT-10-1057	0.415	0.375	0.337
1NR-10	Cylinder	UT-10-1051	0.404	0.375	0.337
1RN-020	Dome	UT-10-1063	0.516	0.500	0.450
1RN-025	Dome	UT-10-1067	0.516	0.500	0.450
1RN-026	Dome	UT-10-1058	0.527	0.500	0.450
1RN-029	Cylinder	UT-10-1047	0.371	0.375	0.337
1RN-030	Cylinder	UT-10-1065	0.403	0.375	0.337
1RN-031	Cylinder	UT-10-1060	0.399	0.375	0.337
1RN-034	Cylinder	UT-10-1069	0.382	0.375	0.337
1RN-036	Cylinder	UT-10-1059	0.389	0.375	0.337
1RN-037	Cylinder	UT-10-1070	0.382	0.375	0.337
1RN-039	Cylinder	UT-10-1072	0.402	0.375	0.337
1RN-040	Cylinder	UT-10-1052	0.405	0.375	0.337
1RN-041	Cylinder	UT-10-1053	0.400	0.375	0.337
1RN-042	Cylinder	UT-10-1032	0.401	0.375	0.337
1RN-047	Cylinder	UT-10-1064	0.403	0.375	0.337
1RN-048	Cylinder	UT-10-1066	0.412	0.375	0.337
1RN-050	Cylinder	UT-10-1015	0.379	0.375	0.337
1RN-052	Cylinder	UT-10-1012	0.392	0.375	0.337
1RN-053	Cylinder	UT-10-1031	0.403	0.375	0.337
1RN-054	Cylinder	UT-10-1033	0.396	0.375	0.337
1RN-055	Cylinder	UT-10-1029	0.386	0.375	0.337
1RN-056	Cylinder	UT-10-1027	0.403	0.375	0.337
1RN-057	Cylinder	UT-10-1016	0.406	0.375	0.337
1RN-058	Cylinder	UT-10-1030	0.376	0.375	0.337
1RN-059	Cylinder	UT-10-1028	0.399	0.375	0.337
1RN-060	Cylinder	UT-10-1017	0.357	0.375	0.337
1RN-062	Cylinder	UT-10-1054	0.404	0.375	0.337
1RN-063	Cylinder	UT-10-1026	0.401	0.375	0.337
1RN-064	Cylinder	UT-10-1025	0.394	0.375	0.337
1RN-065	Cylinder	UT-10-1008	0.396	0.375	0.337
1RN-067	Cylinder	UT-10-1024	0.410	0.375	0.337
1RN-068	Cylinder	UT-10-1055	0.387	0.375	0.337
1RN-069	Cylinder	UT-10-1009	0.362	0.375	0.337
1RN-070	Cylinder	UT-10-1011	0.416	0.375	0.337
1RN-071	Cylinder	UT-10-1013	0.401	0.375	0.337
1RN-072	Cylinder	UT-10-1014	0.387	0.375	0.337
1RN-073	Cylinder	UT-10-1018	0.363	0.375	0.337
1RN-074	Cylinder	UT-10-1019	0.396	0.375	0.337
1RN-075	Cylinder	UT-10-1010	0.378	0.375	0.337