

July 6, 2009

Mr. Peter P. Sena, III
Site Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
Mail Stop A-BV-SEB1
P. O. Box 4, Route 168
Shippingport, PA 15077

SUBJECT: BEAVER VALLEY POWER STATION, UNIT 1 - NRC ROUTINE INSPECTION
REPORT 05000334/2009006

Dear Mr. Sena:

On June 18, 2009, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Beaver Valley Power Station, Unit 1. The enclosed inspection report documents the inspection results and observations, which were discussed during a teleconference exit on June 18, 2009, with Mr. Mark Manoleras and others of your staff.

The inspection was conducted in response to FirstEnergy Nuclear Operating Company's (FENOC) discovery on April 23, 2009, of a through-wall hole in the Unit 1 Reactor Containment Building steel liner due to corrosion. While the condition did not warrant a reactive inspection in accordance with NRC Management Directive 8.3, "NRC Incident Investigation Program," the matter and circumstances surrounding this issue are documented in this separate inspection report in order to provide integration of the pertinent facts and information; and assess licensee performance and actions relative to issue identification and resolution in accordance with applicable NRC regulatory requirements and standards.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, no findings of significance were identified. In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, and its enclosures, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of

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NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

John R. White, Chief
Plant Support Branch 2
Division of Reactor Safety

Docket No.: 50-334

License No: DPR-66

Enclosures: Inspection Report 05000334/2009006
w/Attachment A: Supplemental Information
w/Attachment B: Photographs

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w/Attachment A: Supplemental Information
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SUNSI Review Complete: JRW (Reviewer's Initials)

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**U. S. NUCLEAR REGULATORY COMMISSION
REGION I**

Docket No. 50-334

License No. DPR-66

Report No. 05000334/2009006

Licensee: FirstEnergy Nuclear Operating Company (FENOC)

Facility: Beaver Valley Power Station, Unit 1

Location: Post Office Box 4
Shippingport, PA 15077

Dates: May 26 – June 18, 2009

Inspectors: P. Kaufman, Senior Reactor Inspector, Division of Reactor Safety (DRS)

Approved by: John R. White, Chief
Plant Support Branch 2
Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000334/2009006; 05/26/2009 - 06/18/2009; Beaver Valley Power Station, Unit 1; Routine Inspection Report.

The report covered two on-site inspections and in-office reviews by a Senior Reactor Inspector. No findings of significance were identified.

A. NRC-Identified and Self-Revealing Findings

None.

B. Licensee-Identified Violations

None.

REPORT DETAILS

4.0 OTHER ACTIVITIES

1. INTRODUCTION

1.1 Event Description and Condition Summary

On April 21, 2009, Beaver Valley Power Station (BVPS) Unit 1 was shutdown for 1R19 refueling outage. In accordance with its Inservice Inspection program, the licensee conducted a scheduled ASME Section XI, Subsection IWE, General Visual Inspection of the inside surface of the primary containment steel liner, i.e., visual inspection of 100% of all accessible portions of the containment steel liner. As a result of this planned activity, the licensee identified an indication that consisted of blistered paint that measured approximately 3" in diameter at the 746' elevation of the Reactor Containment Building (RCB). No other similar deficiencies were identified.

The licensee cleaned the blistered paint area on April 23, 2009, to allow further evaluation. Upon removal of the paint blister, the FENOC examiner, conducting the visual inspection, observed a rectangular through-wall hole in the steel containment liner. The size of the hole was approximately 1" x 3/8" in the 0.375" nominal thick steel liner plate fabricated from ASME SA-516, Gr. 60 material. (Photograph in Attachment B pertains)

The containment liner defect was entered into the licensee's corrective action program as CR 09-57762. The matter was subsequently reported to the NRC by Event Notification No. 45015 in accordance with 10 CFR 50.72 and Licensee Event Report (LER) 50-334/2009-003-00 in accordance with 10 CFR 50.73.

Subsequently, ultrasonic thickness measurements were taken in the vicinity surrounding the defect to determine the extent of liner thinning. The measurements revealed readings that were indicative of localized type corrosion. As a result, the licensee removed a 2" inch by 5" inch portion of the affected liner plate to further evaluate and characterize the condition in accordance with Work Order 200367239. The affected steel liner section was sent to the licensee's Beta Laboratory for analysis.

Removal of the degraded liner section revealed a partially decomposed piece of wood embedded in the concrete containment wall, located at the interface with the steel liner plate directly behind the through-wall liner hole. A sample of the wood was also sent to the Beta Laboratory for analysis.

The laboratory analysis indicated that the wood contained approximately 13% moisture and low pH of 3.7, i.e., mildly acidic. The licensee determined that such conditions were sufficient to promote the corrosion mechanism and cause the through-wall flaw in the liner over-time, i.e., since construction in the early 1970's. The liner opening was subsequently enlarged to approximately 11" x 15" inches in order to remove the wooden debris from the concrete. A piece of wood (approximately 2" x 4" x 6") was extracted. The licensee determined from its examination of the affected area that all of the wood debris at that location was removed from the affected area.

Subsequently, the licensee restored and repaired the affected area by grouting the concrete area that was displaced by the wooden debris, and welding a new section of steel plate to replace the previously removed portion of the liner. The work was accomplished in accordance with Engineering Change Package (ECP) 09-0365-001 and Work Order 200367242.

After welding the new steel plate into the containment liner, non-destructive examinations were performed (i.e., Magnetic Particle and volumetric Ultrasonic Testing) to confirm the required structural integrity of the repair and the quality of the weldment. Subsequently, the licensee confirmed the leak-tight integrity of the repair by performing a Local Leak Rate Test (LLRT) of the repaired barrier, in accordance with ASME Section XI Code requirements. Since visual observation of the affected welds during leak rate pressure testing was not possible because of the concrete containment wall, the licensee submitted a relief request to the NRC to permit viewing the welds before and after the test as an alternative to visual examination during leak rate testing. The relief request was approved by the NRC.

The LLRT was completed successfully and the repaired area was determined to fully meet the applicable ASME codes and standards. A protective white epoxy coating was applied to the repaired liner plate area; and the liner was restored to specification prior to plant startup. (Photograph in Attachment B pertains)

The cause of the through-wall flaw in the liner was determined by the licensee to be corrosion pitting originating from the concrete side of the containment liner at the point of interface between the steel liner and the wood debris that was embedded in the 4'-6" inch thick Reactor Containment Building (RCB) concrete wall. The licensee presumes that the wood was left embedded in the concrete containment building wall, likely, as a result of inadequate housekeeping and quality assurance practices during original construction of the containment building structure in the early 1970's.

The next ASME Section XI, Subsection IWE program examinations of accessible containment liner surfaces were scheduled for Unit 1 refueling outage 1R21 and Unit 2 refueling outage 2R15. However, the licensee has accelerated the schedule to perform 100% general visual inspection of accessible portions of the containment liners during the next refueling outages, 1R20 and 2R14, to confirm that other instances of through-wall corrosion have not occurred. Further, re-examination of the repaired portion of the Unit 1 containment liner, by volumetric UT inspection, is also scheduled for 1R20. Other actions are described in Section 2.6, Review of Aging Management Program Implications.

1.2 Inspection Scope

The NRC conducted this inspection to gain a better understanding of the circumstances involving the identification of a small through-wall hole in the BVPS Unit 1 containment liner discovered on April 23, 2009. This inspection assessed the effectiveness of the ASME Section XI, IWE in-service inspection (ISI) program for monitoring degradation of the containment boundary for Beaver Valley Nuclear Station (BVPS) Unit 1.

The inspector applied NRC Inspection Procedure 71111.08, Inservice Inspection Activities, as a guide to conduct the inspection of the degraded containment liner and

repair activities. Additional inspection and review activities were conducted using NRC Inspection Procedures 7111.15, Operability Evaluations, to evaluate the licensee operability determination; NRC Inspection Procedure 71152, Identification and Resolution of Problems, to review the root cause and corrective actions performed by the licensee to address this condition; and, NRC Inspection Procedure Inspection Procedure 71153, Event Followup, to review the Licensee Event Report and the licensee's investigative activities.

The inspector reviewed pertinent procedures, technical specifications, corrective action documents, applicable work orders, engineering calculations and analyses, and engineering change packages to determine if the licensee's performance relative to assessment and evaluation of this condition conformed with ASME Boiler and Pressure Vessel Code, Section XI, Technical Specifications; applicable design and licensing bases; and the requirements of 10CFR 50.55a, "Codes and Standards." The inspector also interviewed key plant personnel regarding the discovery and resolution of the degraded liner condition. The documents and the personnel interviewed are identified in Attachment A to this report. Further, the inspector directly observed the performance of several licensee activities conducted to evaluate and characterize this condition.

2. **AREAS OF INSPECTION**

2.1 Sequence of Events (IP 71111.08)

a. Inspection Scope

The inspector developed a sequence of events related to FirstEnergy Nuclear Operating Company's (FENOC) discovery of the BVPS Unit 1 containment liner through-wall corrosion flaw and FENOC's followup actions to address the condition.

b. Condition Identification and Resolution Chronology

The inspector, with FENOC input, developed the following chronology of events associated with the discovery and resolution of the BVPS Unit 1 through-wall liner flaw.

April 21, 2009 - During the 1R19 ASME XI IWE General Visual Examinations Inservice inspection, a surface discontinuity and blistered paint, at the 746' elevation near Column 14 on the Unit 1 Reactor Containment Building liner was identified by FENOC inspectors and documented in CR 09-57589.

April 23, 2009 - A VT-3 (i.e, a direct visual) inspection confirmed a through-wall hole of the containment steel liner. The flaw that penetrated the liner was sized as approximately 1" horizontal x 3/8" vertical; documented in Condition Report CR 09-57762; and reported to the NRC per 10CFR50.72, as Event Notification No. 45015.

April 27, 2009 - The corroded section of the containment steel liner plate was removed and a piece of partially decomposed wood was discovered embedded in the concrete behind the hole in the liner.

April 28, 2009 - The liner opening was enlarged to approximately 11" x 15" inches so the entire piece of wood, determined to be approximately 2"x 4"x 6" inches, could be completely removed from the concrete.

May 3, 2009 - Following removal of the wood, the void created in the concrete containment wall was grouted; and the liner opening was repaired by welding a new piece of steel plate in the opening, that was supported by a 2" inch schedule 80 pipe approximately 1" inch long which was tack welded to the replacement plate. The support was added to ensure the plate met the containment design specification with respect to allowable stresses. After welding of the replacement plate, Magnetic Particle and volumetric Ultrasonic Test (UT) inspections were completed that confirmed the integrity of the weldment. The affected liner section replacement was completed per ECP 09-0365-001 and in accordance with ASME Code requirements.

May 4, 2009 - A local leak rate test (LLRT), Type B, was performed on the replaced containment liner section with satisfactory results.

May 7, 2009 - The protective coating to the repaired liner surface area was restored to specification prior to plant startup.

2.2 Review of Operating Experience (IP 71111.08)

a. Inspection Scope

The inspector reviewed the licensee's evaluation and assessment of previous operating experience involving corrosion of containment liners; and the actions taken by the Beaver Valley Power Station (BVPS) staff to identify and address these types of conditions, including the BVPS Unit 1 liner corrosion identified during 1R17 Steam Generator Replacement Project (SGRP).

b. Findings and Observations

No findings of significance were identified.

The inspector confirmed that the licensee was aware of, and applied experience gained from review of, similar events at other nuclear power facilities. These events involved embedded organic debris in concrete containment walls, particularly wood, that was causal to through-wall corrosion originating at the concrete-to-liner interface. The licensee was aware of Generic Communications, such as NRC Information Notice 2004-09, that fully described these conditions.

The inspector also confirmed that the licensee assessed its own Operating Experience relative to liner corrosion indications that were observed during 1R17 in 2006, to determine any similarity; or if the currently observed through-wall liner hole was related to activities associated with the construction access opening that was cut into the Reactor Containment Building (RCB) at that time to support the 1R17 Steam Generator Replace Project. The licensee did not identify any plausible connection or causal factor similarity.

2.3 Review of Root Cause and Extent-of-Condition (IP 71111.08)

a. Inspection Scope

The inspector reviewed the licensee's root cause analysis report, CR 09-57762, BV1 Containment Liner Plate Hole, and assessed the condition for evidence of inadequate design, inspection, testing, and construction. The inspector evaluated plant procedures, design drawings, inspections, integrated leak rate testing (ILRT) results, laboratory analysis, construction and design specifications, ASME codes (including the Unit 1 ASME Section XI, Subsection IWE Inservice Inspection program), and NRC applicable regulatory requirements.

The inspector conducted direct field observations of the degraded containment liner and inspected a sample of implemented corrective actions relative to activities associated with the repair, non-destructive examination, and local leak rate test of the liner repair. In addition, the inspector reviewed the proposed corrective actions and extent-of-condition to verify that the actions appropriately addressed the degraded containment liner condition. The resident inspection staff attended the Corrective Action Review Board presentation for the root cause investigation on June 17, 2009 for the containment liner corrosion defect.

b. Findings and Observations

No findings of significance were identified.

The root cause evaluation documented in CR 09-57762 was thorough and comprehensive in addressing the cause of the containment liner corrosion degradation condition, and conclusions were well based.

The licensee's Beta Laboratory test results of the removed containment liner plate revealed general pitting corrosion on the liner plate surface next to the containment concrete wall and analyses of the wood by the laboratory identified the presence of 13% moisture and a pH of approximately 3.7 in the wood.

The licensee determined the direct cause documented in CR 09-57762 to be pitting corrosion caused by a piece of wood that was embedded in the containment concrete wall for 37 years and in direct contact with the liner since original construction of the Beaver Valley Unit 1 RCB in the early 1970's. Based on review of licensee photographs, laboratory reports, operating experience documents, and direct field observations, the inspector found the licensee root cause conclusions to be reasonable and plausible for this circumstance.

The probable cause documented in CR 09-57762 was determined by the licensee to be inadequate worker practices and quality controls that resulted in foreign material being deposited and left in the concrete during the original construction, between 1971 and 1972, i.e, the approximate time when the concrete exterior wall was poured for the Beaver Valley Unit 1 Reactor Containment Building (RCB). The inspector found the licensee's probable cause acceptable based on review of direct field observations of the

as-found wood piece and operating experience documents related to inadequate construction work practices and foreign material causing corrosion of containment liners.

Relative to extent of condition, the inspector confirmed that the licensee had adequately performed the scheduled Inservice Inspection of the BVPS Unit 1 containment liner in accordance with ASME Section XI, Subsection IWE; and that the inspection was a 100% General Visual Inspection on all accessible liner surfaces. No other significant indications were identified during 1R19 outage. The inspector verified completion of the 100% General Visual Inspection by reviewing the licensee's IWE inspection procedure, inspection records, and condition reports. Corrective actions and follow-up activities are described in Section 2.5, Review of Corrective Actions.

2.4 Review of Operability Determination (IP 71111.15)

a. Inspection Scope

The inspector reviewed the engineering analyses and operability determination that supported the past operability of the BVPS Unit 1 Containment. The inspector evaluated containment operability by reviewing the containment design requirements, construction installation specifications, event reports, operating experience, and various NUREGs, to evaluate containment operability. The inspector reviewed compliance with applicable Unit 1 Technical Specifications (TS), 10 CFR 50, Appendix J, and ASME Section XI.

b. Findings and Observations

No findings of significance were identified.

Based upon review of the operability determination assessment, no discrepancies were noted with respect to compliance with Technical Specifications, ASME Section XI code, and NRC regulatory requirements. The inspector considered that the evaluation used a technically sound approach and demonstrated the existence of a safety margin. The inspector determined that the licensee's assessment provided sufficient bases to conclude that the BVPS Unit 1 RCB was degraded with respect to leak tightness, but that it remained operable as described in Technical Specification (TS) 3.6.1, Containment; and there was no impact on structural integrity of the containment.

From the description in the BVPS Unit 1 Updated Final Safety Analysis Report (UFSAR) the inspector determined the steel liner acts as an impervious membrane, transmits loads to the concrete, and the containment structure does not require the participation of the liner as a structural component. Therefore, the inspector determined that the liner flaw had no impact on containment structural integrity or the frequency of any initiating events since the hole could not initiate a design basis accident.

The inspector reviewed the basis for the licensee's decision not to perform a local leak rate test (LLRT) on the as-found defective liner condition. Initially, the licensee considered performing an as-found pressure test, but upon further evaluation, determined the possibility that a local pressure test could introduce a high pressure air pocket between the containment liner and the concrete backing, that had the potential of adversely affecting the overall integrity of the containment structure. The licensee considered that a pressure pocket had the potential to migrate to cause separation of the

liner from the concrete, or bowing or bulging of the liner. Alternatively, the licensee elected to use a calculation method to establish the bounding as-found leak rate condition.

The inspector reviewed the bases and assumptions applied by the licensee in the performance of the bounding calculation of potential leak rate from the containment building (i.e., leakage through the liner and the concrete Reactor Containment Building structure). The basis and assumptions noted in the licensee's PRA-BV3-09-001-R00, LERF Containment Failure Size Determination for BVPS PRA Models analysis and assessment appeared technically sound and reasonable.

The licensee utilized data and information derived from the operating experience of another nuclear facility that experienced a similar degraded liner condition in 1999, and had a containment design and operating parameters similar to BVPS Unit 1; and data developed from the recently performed Integrated Leak Rate Test (ILRT) of BVPS Unit 1 RCB on April 15, 2006. Accordingly, the licensee determined that the estimated containment leakage rate was within the maximum allowable leakage rate specified in the BVPS Unit 1, Technical Specifications. The inspector reviewed the assumptions, bases, and methodology used by licensee to arrive at this conclusion; and determined that the calculation was reasonable and technically sound.

2.5 Review of Corrective Actions (IP 71111.08)

a. Inspection Scope

The inspector observed a sample of the implemented corrective actions and reviewed the proposed corrective actions to verify that these actions resolve the BVPS Unit 1 degraded containment liner condition and appropriately address the cause of the liner corrosion pitting.

Corrective action processes were reviewed to verify suitability of materials applied for repair activities, the adequacy of welding processes, the effectiveness of non-destructive examination methods, and the effectiveness of work processes and procedures, and the application of ASME Code, Section XI requirements relative to testing and acceptance standards.

b. Findings and Observations

No findings of significance were identified.

The implemented and proposed corrective actions were found acceptable and considered sufficient to address the identified BVPS Unit 1 degraded containment liner condition. The completion of these corrective actions is tracked through the BVPS corrective action program.

The affected area of the Reactor Building Containment (RBC) liner was acceptably repaired by effectively grouting the void, created by the wood removal, with Masterflow 713 grout material and assuring proper curing of the material; and replacing the affected portion of the liner with steel plate having the same design and material characteristics.

Backing plates were installed behind the containment liner hole opening and the replacement plate was welded into place using suitable materials and weld techniques.

Upon welding the replacement steel liner plate into place, Magnetic Particle and volumetric Ultrasonic Test (UT) inspections were effectively performed to verify the quality of the repair effort. Subsequent local leak rate testing of the liner plate repair was properly performed in accordance with ASME Section XI Code requirements; and the protective white epoxy coating to the repaired liner area was restored to specification.

Additional inspection and follow-up commitments include, but are not limited to, the following:

The licensee will perform a UT inspection of the repaired area of the containment liner during the next Unit 1 Refueling Outage (1R20) to confirm that the repair performed in 1R19 has not introduced an unacceptable wall-thickness degradation mechanism.

The licensee will perform a containment liner IWE exam (100% General Visual Inspection of accessible liner area) during the next Unit 1 Refueling outage (1R20) and the next Unit 2 Refueling outage (2R14). As demonstrated during 1R19, the general visual inspection was effective in identifying surface discontinuities or blistered coating that may indicate accelerated corrosion in the liner plate.

2.6 Review of Aging Management Program Implications

a. Inspection Scope

The inspector reviewed the NRC Safety Evaluation Report (SER), "Related to the License Renewal of Beaver Valley Power Station, Units 1 and 2 (ML091600216)," licensee's assessment and commitments relative to the Aging Management Program for the containment to determine the adequacy of changes considered to address the circumstances associated with the BVPS Unit 1 liner corrosion issues observed in refueling outages 1R17 and 1R19.

b. Findings and Observations

No findings of significance were identified.

In addition to the corrective actions previously identified in Section 2.5, Review of Corrective Actions, the licensee is committed to perform supplemental volumetric examinations on the Unit 1 and Unit 2 containment liners prior to the period of extended operation. A License Renewal commitment provided in Appendix A of the License Renewal Application (LRA) was made to perform these supplemental volumetric examinations. Specifically, the licensee has committed to perform volumetric UT examination of seventy-five (one foot square) sample locations at each unit, based on the sampling methodology described in EPRI Report TR-107514. If no degradation is found, this sample size is expected to provide 95% confidence that 95% of the liner is not degraded. If degradation is identified, the degraded area(s) will be evaluated and follow-up examinations will be performed to ensure the continued reliability of the containment liner. The NRC acknowledged that these corrective actions are not characterized as ASME XI, Subsection IWE augmented examinations.

The NRC concluded that the FENOC aging management program (AMP) incorporates the recent plant-specific operating experience. The modified procedures, along with the 100% General Visual Inspection of the liner plate during the next refueling outages and the supplemental volumetric examinations prior to entering the period of extended operation, provide reasonable assurance that the AMP is adequate to manage the aging effects for which it is credited in the LRA.

The NRC concluded that the ASME Section XI, Subsection IWE program was enhanced and the degraded areas do not fall under the IWE Examination Category E-C (i.e., augmented examination). The BVPS Unit 1 containment liner degradation discovered in 2006 was not discovered during an IWE examination; accordingly, corrective actions are not tracked under the IWE Aging Management Program. Relative to the 2009 degradation issue, since the defective area was replaced, IWE augmented examinations per IWE-2420 are not currently required.

4OA2 Identification and Resolution of Problems (IP 71152)

a. Inspection Scope

The inspector reviewed the issues that FENOC identified and entered into their corrective action program associated with the BVPS Unit 1 containment liner. The inspector reviewed these issues to verify an appropriate threshold for problem identification; and evaluate the effectiveness of corrective actions. In addition, CRs developed to document issues identified during the inspection were reviewed to verify adequate problem identification and incorporation into the corrective action system. The specific corrective action documents that were sampled and reviewed by the inspector are listed in Attachment A.

b. Findings

No findings of significance were identified.

4OA3 Event Follow-up (IP 71153)

(Closed) LER 05000334/2009-003-00, Containment Liner Through-Wall Defect Due to Corrosion. The inspector reviewed the above activities associated with the BVPS Unit 1 containment liner through-wall corrosion flaw and the LER associated with this event submitted on June 18, 2009 and did not identify any issues. No findings of significance were identified and no violation of NRC requirements occurred. This LER is closed.

4OA6 Meetings, Including Exit

On June 18, 2009, the inspector conducted a teleconference exit meeting to present the inspection results to Mr. Mark Manoleras and other members of the BVPS staff. FENOC acknowledged that some of the material reviewed by the inspector during the inspection was proprietary, but the content of this report includes no proprietary information. The proprietary information that was reviewed during the inspection was returned to FENOC or destroyed.

ATTACHMENT A
SUPPLEMENTAL INFORMATION
KEY POINTS OF CONTACT

Licensee Personnel:

Bill Etzel	Senior Consultant
David Grabski	Senior Consultant
David Gratta	Root Cause Team Leader
Sum Leung	Senior Nuclear Consultant
Carmen Mancuso	Manager, Design Engineering
Mark Manoleras	Director, Site Engineering
Neil Morrison	Superintendent, Maintenance Planning and Support
Jack Patterson	Staff Nuclear Engineer
Brian Sepelak	Regulatory Compliance Supervisor
Pete Sena	Site Vice President

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Closed

05000334/2009-003-00 LER Containment Liner Through-Wall Defect Due to Corrosion

LIST OF DOCUMENTS REVIEWED

In addition to the documents identified in the body of this report, the inspector reviewed the following documents and records:

Procedures

1BVT 1.47.1, Containment Structural Integrity Test, Rev. 10
1BVT 11.47.2, Containment Leakage Rate Testing Program, Rev. 7
1OST-1.47.2, Containment Integrity Verification, Rev. 0
Unit 1/2-ADM-2060, Containment Coatings Inspection and Assessment Program, Rev. 0
Unit 1/2-ADM-2099, Primary Containment ISI Program, Rev. 0
Unit 1/2-PIP-S05, Repair of Concrete, Rev. 3
1/2 PIP-S11, Painting for Containment Interior, Rev. 9
BVS-136, Specification for Shop Fabrication and Field Erection of Reactor Containment Steel Plate Liner, Rev. 4
NOBP-LP-2011, FENOC Cause Analysis, Rev. 9
NOP-LP-2001, Corrective Action Program, Rev. 21
NOP-LP-2100, Operating Experience Program, Rev. 3
MDAM-4.4, Foreign Material Control and Housekeeping Program, Rev. 0

Other Documents

Beta Laboratory Failure Analysis Report M09148, RBC Liner Deposits and Liner, Rev. 3
 8700-RV-1F, Reactor Containment Liner Details, Rev. 11
 8700-RC-15D, Exterior Conc. Details – Sheet 1 Reactor Containment
 8700-RC-15E, Exterior Conc. Details - Sheet 2 Reactor Containment
 NUREG 1493, Performance Based Containment Leak-Test Program, September 1995
 NUREG 1522, Assessment of Inservice Conditions of Safety-Related Nuclear Plant Structures, March 1995
 NUREG 1765, Basis Document for Large Early Release Frequency (LERF) Significance Determination Process (SDP), December 2002
 NUREG/CR-6595, An Approach for Estimating the Frequencies of Various Containment Failure Modes and Bypass Events, Rev. 1
 NUREG/CR-6706, Capacity of Steel and Concrete Containment Vessels with Corrosion Damage, February 2001
 NUREG/CR-6920, Risk-Informed Assessment of Degraded Containment Vessels
 WCAP-16378, Westinghouse Owners Group Definition for Large Early Release Frequency (LERF), Rev. 0
 Letter L-09-139, Reply to Request for Additional Information for the Review of the Beaver Valley Power Station, Units 1 and 2, License Renewal Application, and License Renewal Application Amendment No. 38, June 1, 2009
 Calculation 8700-DSC-0156W, Liner Minimum Wall Thickness
 Root Cause Analysis Report CR 09-57762, BV1 Containment Liner Plate Hole, June 4, 2009
 ECP 09-0365-001, Repair the Unit 1 Containment Liner, Rev. 1
 Work Order 200367239
 Work Order 200367242
 Weld Data Sheet, Weld Map No. 200367242-1, 4/29/2009
 Welder Performance Qualification Record, Welder ID 1506L, 04/07/2009
 BOP-UT-09-109, 1st, Manual-scan UT
 BOP-UT-09-116, Manual-scan UT
 BOP-UT-09-128, Auto-scan UT
 BOP-MT-09-031, Final MT examination after grinding
 BOP-UT-09-161 & 162, Final UT of weld 360 degrees
 BOP-VT-09-042, VT-1, Prior to pressure testing
 BOP-VT-09-43, VT-1, After pressure testing
 BOP-VT-09-44, VT-3, Before painting
 BOP-VT-09-46, VT-3, After painting
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 ANSI Leakage-Rate Testing of Containment Structures for Nuclear Reactors, March 16, 1972
 ASME Section XI, Subsection IWE, Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Plants
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LER 50-339/99-002-00, Containment Liner Through-Wall Defect due to Corrosion, October 21, 1999

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Technical Specification 3.6.1, Containment Integrity

UFSAR, Section 5.2.4, Liner

UFSAR, Section 5.2.7, Corrosion Protection and Coatings

UFSAR, Section 5.6, Containment Tests and Inspections

10 CFR 50.55a Relief Request Number BV1-IWE-2-2, FENOC Letter L-09-119, 4/28/2009

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Condition Reports

CR 06-01122	CR 09-58000
CR 09-57147	CR 09-58322
CR 09-57589	CR 09-58792
CR 09-57762	
CR 09-57966	

LIST OF ACRONYMS

ASME	American Society of Mechanical Engineers
AMP	Aging Management Program
ANSI	American National Standards Institute
BVPS	Beaver Valley Power Station
CAP	Corrective Action Program
CDF	Core Damage Frequency
CR	Condition Report
ESF	Emergency System Feature
FENOC	FirstEnergy Nuclear Operating Company
IMC	Inspection Manual Chapter
ILRT	Integrated Leak Rate Test
LERF	Large Early Release Frequency
LLRT	Local Leak Rate Test
LRA	License Renewal Application
NPSH	Net Positive Suction Head
OD	Operability Determination
OE	Operating Experience
PWR	Pressurized Water Reactors
RAI	Request for Additional Information
RCB	Reactor Containment Building
SDP	Significance Determination Process
SER	Safety Evaluation Report
UFSAR	Updated Final Safety Analysis Report
UT	Ultrasonic Testing

B-1

ATTACHMENT B



BEAVER VALLEY UNIT 1 LINER HOLE



BEAVER VALLEY UNIT 1 LINER REPAIR