



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION I
2100 RENAISSANCE BLVD., SUITE 100
KING OF PRUSSIA, PA 19406-2713

October 27, 2015

Mr. Eric A. Larson
Site Vice President
First Energy Nuclear Operating Company
Beaver Valley Power Station
P. O. Box 4
Shippingport, PA 15077-0004

SUBJECT: BEAVER VALLEY POWER STATION UNIT 1 – INSPECTION REPORT
05000334/2015009

Dear Mr. Larson:

On September 17, 2015, the U.S. Nuclear Regulatory Commission (NRC) completed a team inspection at the Beaver Valley Power Station, Unit 1 subsequent to Unit 1 entering the period of extended operation at midnight January 29, 2016. The enclosed inspection report documents the inspection results, which were discussed on September 17, 2015, with you and members of your staff.

The inspection verified your compliance with the license conditions added as part of the renewed operating license. The inspection verified your staff implemented regulatory commitments, selected aging management programs, and time limited aging analyses in accordance with Title 10 of the *Code of Federal Regulations* Part 54, "Requirements for the Renewal of Operating Licenses for Nuclear Power Plants." The inspection verified the Updated Final Safety Analysis Report includes any newly identified systems, structures, and components that should have been within the scope of the license renewal program and subject to an aging management review or time limited aging analysis evaluation, pursuant to 10 CFR 54.37(b).

The inspection verified the description of the aging management programs are contained in the Updated Final Safety Analysis Report (UFSAR) and the description is consistent with the programs being implemented. The inspection verified that changes to the Updated Final Safety Analysis Report supplement were implemented in accordance with Title 10 of the *Code of Federal Regulations* Part 50.59. The inspection further verified that changes to regulatory commitments were managed in accordance with applicable regulatory requirements.

E. Larson

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Sincerely,

/RA/

Mel Gray, Chief
Engineering Branch 1
Division of Reactor Safety

Docket No. 50-334
License No. DPR-66

Enclosure:
Inspection Report 05000334/2015009
w/Attachment: Supplementary Information

cc w/encl: Distribution via ListServ

E. Larson

- 2 -

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

Docket No. 50-334

License No. DPR-66

Report No. 05000334/2015009

Licensee: FirstEnergy Nuclear Operating Company (FENOC) Facility
Beaver Valley Power Station, Unit 1
Location: Shippingport, PA 15077

Dates: May 11 – 14 and July 31 - September 17, 2015

Inspectors: M. Modes, Sr. Reactor Engineer
P. Kaufman, Sr. Reactor Engineer
T. O'Hara, Reactor Engineer
S. Chaudhary, Reactor Engineer

Approved By: Mel Gray, Chief
Engineering Branch 1
Division of Reactor Safety

SUMMARY

IR 05000334/2015009; May 11 – 14 and July 31 - September 17, 2015; Beaver Valley Power Station, Unit 1; IP71003 Post Renewal Commitments Inspection

The inspection verified compliance with the license conditions added as part of the renewed operating license. The inspection verified that First Energy Nuclear Operating Company (FENOC) implemented regulatory commitments, selected aging management programs, and time limited aging analyses in accordance with Title 10 of the *Code of Federal Regulations* Part 54, "Requirements for the Renewal of Operating Licenses for Nuclear Power Plants." The inspection verified the Updated Final Safety Analysis Report (UFSAR) included any newly identified systems, structures, and components that should have been within the scope of the license renewal program and subject to an aging management review or time limited aging analysis evaluation, pursuant to 10 CFR 54.37(b). The inspection verified the description of the aging management programs are contained in the UFSAR and the description of the programs is consistent with the programs being implemented. The inspection verified that FENOC staff managed changes to the UFSAR supplement in accordance with Title 10 of the *Code of Federal Regulations* Part 50.59; and manage changes to regulatory commitments, in accordance with Nuclear Energy Institute 99-04, "Guidelines for Managing NRC Commitment Changes" as endorsed by Regulatory Issue Summary 2000-017.

No findings were identified. The NRC determined that the commitments reviewed associated with the license renewal application (LRA) had been appropriately implemented.

REPORT DETAILS

4. OTHER ACTIVITIES

4OA5 Post-Approval Site Inspection for License Renewal (IP 71003)

.1 Sample Selection Process

FirstEnergy Nuclear Operating Company (FENOC) submitted a License Renewal Application in accordance with Title 10, Part 54, of the *Code of Federal Regulations*, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants", by letter dated August 27, 2007. FENOC requested renewal of the Unit 1 operating license DPR-66 for a period of 20 years beyond the current expiration at midnight January 29, 2016.

The reviewed commitments, license conditions, and enhanced aging management programs were selected based on several attributes including the results of previous license renewal audits and inspections of aging management programs; the complexity in implementing a commitment; and the extent to which the baseline inspection programs will inspect attributes of the commitment, license condition or aging management program. Consideration was given to the amount of time since the renewed license was granted and beginning of the period of extended operation.

The commitments reviewed by this inspection are recorded in "Safety Evaluation Report Related to the License Renewal of Beaver Valley Power Station, Units 1 and 2", NUREG-1929, Volume 2b, (ML093020275), Appendix A, with additional commitments recorded in "Safety Evaluation Report Related to the License Renewal of Beaver Valley Power Station, Units 1 and 2", NUREG-1929, Supplement 1, (ML093140250), Appendix A. For each commitment the inspectors reviewed supporting documents including completed surveillances, conducted interviews, performed visual inspection of structures and components and observed selected activities described below to verify FENOC staff completed the necessary actions to comply with the license conditions or commitments.

The inspectors selectively verified FENOC implemented the aging management programs included in the NRC license renewal safety evaluation report, in accordance with Title 10 of the *Code of Federal Regulations* Part 54, "Requirements for the Renewal of Operating Licenses for Nuclear Power Plants." The inspectors verified a sample of corrective actions that were the result of license renewal activities.

During this inspection the inspectors verified that changes, if any, to these commitments were identified and properly reviewed and approved. Because no changes were made prior to the beginning of this inspection, the inspectors reviewed the procedures developed by the FENOC staff to insure that commitment revisions followed the guidance in NEI 99-04, "Guidelines for Managing NRC Commitment Changes," for the license renewal commitment change process, including the elimination of commitments. The inspectors determined whether the process would properly evaluate, report, and approve where necessary, changes to license renewal commitments listed in the Updated Final Safety Analysis Report in accordance with 10 CFR 50.59. The inspectors also reviewed the FENOC commitment tracking program to evaluate its effectiveness.

On a sampling basis, the inspectors verified that FENOC had completed the necessary actions to comply with the license conditions that are a part of the renewed operating license, and had implemented the aging management programs included in the NRC staff's license renewal safety evaluation report. The following commitments, license conditions, and enhanced programs were reviewed.

.2.0 License Conditions

a. Inspection Scope

Renewed Facility Operating License No. DPR-66 is hereby issued to FENOC and FirstEnergy Nuclear Generation, LLC to read as follows:

2. F. License Renewal Commitments - The UFSAR supplement, as revised, submitted pursuant to 10 CFR 54.21 (d), describes certain future activities to be completed prior to and/or during the period of extended operation. FENOC shall complete these activities in accordance with Appendix A of NUREG-1929, Safety Evaluation Report Related to the Beaver Valley Power Station, Units 1 and 2, dated October 2009, and Supplement 1 of NUREG-1929, dated October 2009, and shall notify the NRC in writing when activities to be completed prior to the period of extended operation are complete and can be verified by NRC inspection.

The NRC inspectors verified the UFSAR Revision 26, contained a description of the activities to be completed prior to the period of extended operation. The description is contained in Section 16 and corresponds with the Appendix A of NUREG-1929, and Supplement 1, for Unit 1. At the time of this inspection FENOC had not completed all the actions necessary to support a notification to the NRC. The NRC inspection however, was able to verify the actions were completed or were planned to be taken by FENOC in compliance with the condition.

2. H. Capsule Withdrawal Schedule - For the renewed operating license term, all capsules in the reactor vessel that are removed and tested must meet the test procedures and reporting requirements of American Society for Testing and Materials (ASTM) E 185-82 to the extent practicable for the configuration of the specimens in the capsule. Any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the NRC prior to implementation.

The inspectors noted Beaver Valley Power Station Procedure 1/2-ADM-2054, Revision 2, January 30, 2014, Section 7.1 Surveillance Capsule Management, stipulated the schedule for capsule withdrawal is established by ASTM E 185-82. The inspectors noted the procedure referenced the license renewal commitment management process and underscored provisions that are connected to the renewed license.

.2.1 Application of 10 CFR 54.37(b)

The license renewal rule in 10 CFR 54.21(d) requires that an applicant include in its license renewal application (LRA) a supplement to its FSAR that contains a summary description of the programs and activities credited for managing the effects of aging and the evaluation of time-limited aging analyses (TLAA).

The existing regulatory process, existing licensee oversight activities, and the additional regulatory controls associated with placing a summary description of aging management activities in the FSAR, provide assurance that changes that could decrease the overall effectiveness of programs to manage the effects of aging or evaluation of TLAAs receive appropriate review by the licensee. In 10 CFR 54.37(b), the license renewal rule requires the following:

After the renewed license is issued, the FSAR update required by 10 CFR 50.71(e) must include any systems, structures, and components newly identified that would have been subject to an aging management review or evaluation of time-limited aging analyses in accordance with § 54.21. This FSAR update must describe how the effects of aging will be managed such that the intended function(s) in § 54.4(b) will be effectively maintained during the period of extended operation.

The intent of 10 CFR 54.37(b) is to capture those systems, structures and components (SSC) that, if they had been identified at the time of the license renewal application, would have been subject to an aging management review or evaluation of TLAAs. In the context of 10 CFR 54.37(b), newly identified SSCs that should be included in the next FSAR update required by 10 CFR 50.71(e) are those SSCs that meet one of the two following conditions:

- (1) There is a change to the current licensing basis (CLB) that meets the following criteria: The change impacts SSCs that were not in scope for license renewal when the NRC approved the license renewal application. The SSCs would have been in the scope of license renewal based on the CLB change if 10 CFR 54.4(a) were applied to the SSCs.
- (2) SSCs were installed in the plant at the time of the license renewal review that, in accordance with the CLB at the time, should have been included in the scope of license renewal per 10 CFR 54.4(a) but were not identified as in scope until after issuance of the renewed license. SSCs that are plant additions or modifications installed after the renewed license is issued are not subject to the provisions of 10 CFR 54.37(b).

The inspectors noted that evaluations were conducted utilizing Section 4.7 of FENOC Procedure NOBP-ER-3015, Revision 00, July 14, 2014, "License Renewal Implementation Guidelines." This procedure directed that FENOC staff review the following:

- Engineering Change Packages Design Interface Evaluation forms;
- Fire Protection Program Change Evaluation forms;
- Procedure cross-discipline change forms;
- UFSAR changes;
- Asset Equipment List Station Blackout Indicator and,
- License Renewal Interim Staff Guidance for which the NRC has determined that back fit applies under 10 CFR 50.109.

The inspectors noted that FENOC staff completed evaluations of the changes at Beaver Valley Power Station Unit 1 for refueling cycles 1R20, 1R21, and 1R22. At the time of this inspection the review of 1R23 was not completed.

The inspectors noted the following results:

- During the 1R20 Refueling Cycle no newly-identified components requiring UFSAR inclusion per 10 CFR 54.37(b) were identified;
- During the 1 R21 Refueling Cycle there was one change which resulted in a newly identified SSC. The inspectors reviewed the resultant evaluation order 200452706, operation 0020. The evaluation resulted in UFSAR change 12-095 adding the description of the main transformer as a source of off-site power. This addition identified the iso-phase bus between the main and unit transformers, up to the generator links as components requiring an aging management review. This resulted in the Unit 2 aging management program for buses;
- During the 1 R22 Refueling Cycle there were no newly-identified components requiring UFSAR inclusion per 10 CFR 54.37(b).

b. Findings

No findings were identified.

.3 Verification of Selected Commitments (IP71003, Phase I Inspection)

a. Inspection Scope

The inspectors observed license renewal related activities being implemented during a site visit May 11-14, 2015, while a refueling outage was being performed. During this inspection tank bottom testing and remediation was observed as a result of the Aging Management Program B.2.30: "One-Time Inspection Program." The inspectors reviewed the status of the Aging Management Program B.2.36: "Selective Leaching of Materials Program", and the results of the inspections related to the program. In addition the inspectors observed inspections being performed under the Aging Management Program B.2.2: "ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD Program."

b. Findings

No findings were identified.

.4 Verification of Selected Commitments (IP71003, Phase II Inspection)

a. Scope of Inspection

Commitment 1

"Implement the Buried Piping and Tanks Inspection Program as described in LRA Section B.2.8." Section B.2.8 indicates the Beaver Valley Power Station (BVPS) Buried Piping and Tanks Inspection Program includes preventive measures to mitigate corrosion and inspections to manage the effects of corrosion on the pressure-retaining capability of buried components constructed of steel and stainless steel."

The preventive measures will maintain external coatings and wrappings and the buried components are inspected when excavated for maintenance or a planned inspection. This program has been implemented prior to the period of extended operation.

The BVPS buried piping and tanks program was previously inspected by the NRC, in accordance with Temporary Instruction (TI) 2515/182, Review of Implementation of the Industry Initiative to Control Degradation of Underground Piping and Tanks as documented in NRC Inspection Report 05000334/2012002 and 05000334/2013005. The inspectors reviewed the commitment to conduct one opportunistic examination or focused inspection of buried piping before entering the period of extended operation and one planned inspection within the first 10 years of operation under the revised license. The inspectors reviewed five guided wave inspections of buried piping systems that met the opportunistic inspections of buried piping based on potential leaking locations and documented the results in NRC Inspection Report 05000334/2013005.

During this inspection the inspectors reviewed the BVPS Buried Piping and Tanks Program documented in Procedure NOP-ER-2007, Underground Piping and Tanks Integrity Program, Revision 5, and the FENOC "Action Plan to Develop a Strategy for Managing Buried Piping at Beaver Valley Power Station." The plan provided milestones that FENOC completed to meet the License Renewal commitments on inspection of buried piping and tanks. The inspectors also reviewed Beaver Valley Power Station Cathodic Protection Study, Report No. 1300105.402, dated February 23, 2015, and Work Order 200512558, As-Found Buried/Underground Piping Examination Report, 24" WR-101-301-Q3, River Water System, July 7, 2015.

The inspectors concluded that BVPS developed a buried piping and tanks inspection program that met the industry initiative contained in NEI 09-14, Guidance for the Management of Underground Piping and Tank Integrity, Revision 1.

Commitment 2

"Enhance the Closed-Cycle Cooling Water System to:

- Add the diesel-driven fire pump (Unit 1 only) to the program;
- Detail performance testing of heat exchangers and pumps, and provide direction to perform visual inspections of system components;
- Identify closed-cycle cooling water system parameters that will be trended to determine if heat exchanger tube fouling or corrosion product buildup exists;
- Control performance tests and perform visual inspections at the required frequency."

The inspectors reviewed the Closed-Cycle Cooling Water Program that includes preventive measures to minimize corrosion and periodic system and component performance testing. The program also includes inspections to monitor the effects of corrosion and confirm that intended functions are met. The program manages loss of material, cracking and reduction of heat transfer for components exposed to closed cooling water systems.

These include the Reactor/Primary Plant Component Cooling Water, Chilled Water, Diesel-Driven Fire Pump Engine Cooling Water, Security Diesel Generator Cooling Water and Emergency Response Facility Diesel Generator Cooling Water Systems.

The inspectors reviewed BVPM-CHEM-0003, "Closed Loop and Raw Water Systems Strategic Water Plan", Revision 2, and BVPM-ER-3204, "In-service Testing (IST) Program Administration," Revision 5. The plan was revised to include the diesel-driven fire pump, performance testing of heat exchangers and pumps, provides direction to perform visual inspections of system components, and controls the performance tests and visual inspections at the required frequency. The component parameters trended are monitored by system walk downs, operator rounds, computer points, or operations surveillance tests. FENOC also initiated administrative preventive maintenance per Notification 600937634 to review the Closed-Cycle Cooling Water parameters for adverse trends on a 1 year frequency. The first review was completed per Order 200624930 and the commitment to review parameters was planned at a 52-week frequency.

Commitment 3

"Implement the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection Program as described in LRA Section B.2.10.

Prior to implementation of the program, evaluate the program against the final approved version of NRC License Renewal Interim Staff Guidance LR-ISG-2007-02, "Changes To Generic Aging Lesson Learned (GALL) Report Aging Management Program (AMP), XI.E6, 'Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements', when issued, and revise the program to be consistent with the NRC Interim Staff Guidance."

The Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements program One Time Inspection program that inspects and tests the metallic parts of the cable connections is a new program. A representative sample of the electrical cable connection population subject to aging management review is tested. Electrical connections covered under the Environmental Qualification Program, or connections inspected or tested as part of a preventive maintenance program, are excluded from aging management review.

The sampling program provides a one-time inspection to confirm that the loosening of cable connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation is not an aging issue that requires a periodic aging management review.

The design of these in scope connections accounts for the stresses associated with ohmic heating, thermal cycling, and dissimilar metal concerns. Therefore, these stressors or mechanisms should not be a significant aging issue. However, confirmation of the lack of aging effects is required. The factors for sample selection are voltage level (medium and low voltage), circuit loading (high loading), and location (high temperature, high humidity, and vibration, etc.). Any unacceptable conditions found during the inspections will be evaluated through the FENOC Corrective Action Program (CAP).

FENOC had developed Beaver Valley Power Station Unit 1 Procedure 1/2-ADM-2092, "Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection", 09/09/2014, to accomplish testing of a sample of electrical connectors. This procedure uses thermography or contact resistance testing to perform the tests and contains test acceptance criteria for each type of test. The inspectors reviewed IEPSON Report NE-13-39, Revision 0, completed in May 2015, which documented the successful completion of 188 connection inspections at the Beaver Valley facility. The inspectors also reviewed Work Order #0378777 which controlled the testing of the connectors. The inspectors further determined FENOC staff verified that their program conformed to ISG LR-ISG-2007-02 to implement this commitment.

Commitment 4

"Implement the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program as described in LRA Section B.2.11."

The Electrical Cables and Connections not subject to 10 CFR 50.49 Equipment Qualification Requirements Program, is a new program intended to provide reasonable assurance that the intended components, insulated cables and connections exposed to adverse localized environments caused by heat, radiation and moisture can be maintained consistent with the current licensing basis through the period of extended operation. The program will be implemented prior to the period of extended operation.

FENOC has committed that a representative sample of accessible insulated cables and connections within the scope of license renewal and located in adverse localized environments will be visually inspected at least once every 10 years for cable and connection jacket surface anomalies, such as embrittlement, discoloration, cracking or surface contamination. This program will require the first inspection to be completed prior to the period of extended operation. Lepson consulting performed a full site walk down to identify adverse localized environments in accordance with Procedure NOBP-ER-3103, Revision 0, on 6/19/13. IEPSON Report NE-12-36-2, Revision 0, documents the walk down and the results of the first inspection.

The inspectors determined FENOC developed Procedure 1/2-ADM-2147, Revision 1, "Electrical Cables and Connections Not Subject To 10 CFR 50.49 Environmental Qualification Program", to provide guidance for this program. FENOC also generated Work Order #200378792 to control and track future performance of inspections under this program.

Commitment 5

"Implement the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program as described in LRA Section 8.2.12."

The Electrical Cable and Connections not subject to 10 CFR 50.49 Equipment Qualification Requirements Used in Instrumentation Circuits is a new aging management program to monitor aging effects in Electrical Cables and connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation circuits. The program is intended to demonstrate that sensitive (high voltage – low current applications) instrument

cables and connections susceptible to aging effects from exposure to adverse localized environments caused by heat, radiation, and moisture will be adequately managed so that there is reasonable assurance that the cables and connections will perform their intended function. This program will be implemented prior to the period of extended operation. An “adverse localized environment” is an environment that is significantly more severe than the specified service condition for the cable. This aging management program requires a review of non-EQ instrumentation circuit calibration results at least once every 10 years, with the initial performance of this program to occur prior to the start of the period of extended operation. Further, FENOC will incorporate into the program the appropriate technical information and guidance provided in industry documents.

The inspectors determined implementation of the commitment is directed by FENOC Procedure 1/2-ADM-2305, “Electrical Cables and Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits”, 9/18/14, and is implemented via Unit 1 Work Order 200378793. Future implementation is as directed by the Repetitive Task Maintenance Plan 232561/Item 342636.

Commitment 6

“Implement the External Surfaces Monitoring Program as described in LRA Section B.2.15.”

The inspectors reviewed the LRA, safety evaluation report, and FENOC implementation plan and results binder, and discussed this commitment with FENOC system engineering staff. The inspectors reviewed the external surfaces monitoring methodology documented in LRBV-PED-XI. M36. The program contains a listing of systems and/or structures that are managed for aging effects and a matrix that displays the guidelines for each of the 10 program elements from NUREG-1801.

The inspectors reviewed FENOC Procedure 1/2-ADM-2098, “System Walkdowns”, that provides guidance to System Engineers on conducting periodic walk downs for this program.

The inspectors reviewed a sample of the periodic inspections that are conducted looking for degradation and leakage for metal components, hardening, and loss of strength and/or cracking through physical manipulation for elastomer components, and diesel engines and diesel-driven equipment radiators (fins and tubes) are inspected for build-up of dust, dirt, and debris.

FENOC enhanced the program by adding diesel engines and diesel-driven equipment to the program in order to manage the reduction of heat transfer of the Emergency Response Facility (ERF) diesel generator jacket water radiator fins and new acceptance criteria was added for steel components and inspecting elastomers.

Commitment 9

“Enhance the Flux Thimble Tube Inspection Program to include a requirement in the program procedure to state that, if a flux thimble tube cannot be inspected over the tube length (tube length that is subject to wear due to restriction or other defect), and cannot be shown by analysis to be satisfactory for continued service, the thimble tube must be removed from service to ensure the integrity of the Reactor Coolant System pressure boundary.”

The Flux Thimble Tube Inspection Program is a new aging management program that manages the loss of material due to thinning/wear of the flux thimble tube wall materials through eddy current inspections of the thimble tube wall thickness and measurement and calculation of flux thimble tube wear rates. The flux thimble tube forms part of the reactor coolant system pressure boundary. This program is consistent with NUREG-1801 and NRC Bulletin 88-09. This program will conduct baseline inspections of the flux thimble tubes during 1R25 (Fall 2017) for Unit 1 and 2R24 (Spring 2020) for Unit 2, using inspection methods, such as phased array eddy current testing, to be implemented throughout the period of extended operation.

Flux Thimble Tubes are subject to loss of material at locations in the reactor vessel where flow induced fretting causes wear at discontinuities in the path from the reactor vessel instrument nozzle to the fuel assembly instrument guide tube. The Flux Thimble Tube Program will measure and trend the flux thimble tubing wall thickness (primary coolant pressure boundary) measurements and wear rates. Subsequent inspections will be scheduled based upon wear rate evaluations and/or tube replacements to ensure the intended function of the reactor coolant system pressure boundary is maintained throughout the period of extended operation. The inspectors reviewed the FENOC procedure for conducting the flux thimble tube inspections, and reviewed two recent inspection reports from Unit 1 and Unit 2 thimble tube inspections. The inspectors verified the procedure was revised to provide guidance to remove from service thimble tubes that cannot be inspected or shown to be satisfactory for continued service due to insufficient wall thickness.

Commitment 10

“Enhance the Fuel Oil Chemistry Program to: A.1.20 January 29, 2016 FENOC.

- Revise the implementing procedure for sampling and testing the diesel-driven fire pump fuel oil storage tank (Unit 1 only) to include a test for particulate and accumulated water, in addition to the test for sediment and water;
- Generate a new implementing procedure for sampling and testing the security diesel generator fuel oil day tank (Common) for accumulated water, particulate contamination, and sediment/water; and,
- Revise implementing procedures to perform Ultrasonic Test (UT) thickness measurements of accessible above-ground fuel oil tank bottoms at the same frequency as tank cleaning and inspections to ensure that significant degradation is not occurring. For inaccessible tank bottoms, determine tank bottom thickness using an appropriate NDE technique if inspections indicate the presence of significant corrosion.”

The inspectors reviewed Procedure 1-CHM-SAM-3.59, “Diesel Fire Water Pump FP-P-2 Fuel Oil Storage Tank [1FP-TK-2]”, Revision 3, and Procedure 1-CHM-SAM-3.40C, “Security Diesel Fuel Oil Day Tank [1NHS-TK-2]”, Revision 2, for sampling and testing fuel oil storage tanks to verify that they include a test for particulate and accumulated water in addition to the test for sediment and water.

The inspectors reviewed Procedure 1/2-ADM-1713, "Fuel Oil Chemistry Program", Revision 5, to perform ultrasonic testing thickness measurements of accessible above-ground fuel oil tank bottoms at the same frequency as tank cleaning and inspections to ensure that significant degradation is not occurring. For inaccessible tank bottoms, determine tank bottom thickness using an appropriate Non-Destructive-Examination technique if inspections indicate the presence of significant corrosion. The inspectors reviewed visual examination records of underground tanks of diesel generator fuel oil storage tank BV-1EE-TK-1B, security diesel fuel oil day tank 1NHS-TK-1, and ultrasonic test examination data records of these diesel fuel oil day tanks.

Commitment 11

"Implement the Inaccessible Medium-Voltage Cables Suitable for Submergence and Not Subject to 10 CFR B.2.21 50.49 Environmental Qualification Requirements as described in LRA Section B.2.21. BVPS commits to implement one of the following prior to entering the period of extended operation:

- (1) Adopt an acceptable methodology that demonstrates that the in-scope, continuously submerged, inaccessible, medium-voltage cables will continue to perform their intended function during the period of extended operation; or,
- (2) Implement measures to minimize cable exposure to significant moisture through dewatering manholes. Incorporate operating experience obtained from dewatering frequency to minimize cable exposure to significant moisture. [Significant moisture is defined as periodic exposures to moisture that last more than a few days (e.g., cable in standing water). Periodic exposures to moisture that last less than a few days (i.e., normal rain and drain) are not significant.]; or,
- (3) Replace the in-scope, continuously submerged medium-voltage cables with cables designed for submerged service."

The Inaccessible Medium Voltage Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Aging Management Program is a new program that manages the aging of inaccessible medium voltage cables exposed to significant moisture simultaneously with significant voltage. For this program "significant moisture" exposure is defined as periodic exposure to moisture that lasts more than a few days (e.g., cable in standing water). Periodic exposure to moisture which lasts less than a few days (i.e., normal rain and drain) is not significant. "Significant voltage" exposure is defined as being subjected to system voltage for more than twenty-five percent (25%) of the time. The organic polymer materials of the cable insulation are subject to an adverse localized environment (standing water). The program provides for managing localized damage and breakdown of insulation leading to moisture intrusion and water trees.

The inspectors determined FENOC conducted walkdowns of Manholes, at Beaver Valley Unit 1, for Water Damage per Procedure 1/2 MI-75-MANHOLE-1E, Issue 4, Revision 10, 8/18/14, to determine applicable cables to include in this program.

This program is implemented through periodic inspections, at least once every two (2) years, of cables and cable vaults containing in-scope medium voltage cables to ensure they are free

of standing water; and periodic cable testing to provide an indication of the condition of the conductor insulation for in scope cables. The frequency of cable vault inspections are determined by operating experience to ensure that the cables are not subjected to standing water, not to exceed a two year period. The specific type of cable test to be performed will be determined prior to the initial test, and is to be a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, or other testing that is state of the art at the time the test is performed. Testing is conducted at least once every ten (10) years, with initial testing completed prior to the period of extended operation.

Also, periodic visual inspections are performed on the accessible portions of cables (i.e. in the manholes) for water induced damage. These inspections are performed at least once every two (2) years, with the first inspection completed prior to the period of extended operation.

The inspector observed Maintenance Plans were created to monitor the inspection of the cables in the manholes. The plans are: 110557 (26 week frequency); 98984 (104 week frequency); 215835 (52 week frequency); and 220910 (26 week frequency).

Also, the following preventative maintenance evolutions have been initiated to control the inspection, and preventative maintenance evolutions to perform applicable electrical testing on the cables: 37856; 37893; 37921; 37928; 57998; 58006; 35193; 35199; 35225. These preventative maintenance processes have a frequency of 6 years.

Commitment 12

Implement the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program as described in LRA Section B.2.22.

The inspectors reviewed inspections of the ongoing surveillance program for internal surfaces. The inspections are performed and tracked in accordance with 1/2-ADM-2100, "Inspections of Internal Surface Program", Revision 2. A scope list was created in BVRM-ENGR-0004, Unit 1 "Inspection of Internal Surfaces Program Components", Revision 0, to separate components into material and environmental populations, and specify a minimum sample size for each population to be inspected at a 10 year frequency. The inspectors reviewed Work Order 200535030, "Perform Internal Inspection 1VS-D-40-1E, Outside Air Minimum Volume Damper", completed October 21, 2014, and WO 200545644, "Perform Internal Inspection WR-507, Pipeline from WR-500 to WR-508."

Commitment 13

"Enhance the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling System Program to:

- Include guidance in the program administrative procedure to inspect for loss of material due to corrosion on Unit 2 crane and trolley structural components and rails; and include guidance in the crane and hoist inspection procedures to inspect for loss of material due to corrosion in Unit 2 crane and trolley structural components and rails or extendable arms, as appropriate";

- Include guidance in the crane and hoist inspection procedures to inspect for loss of material due to corrosion on Unit 1 crane and trolley structural components and rails or extendable arms, as appropriate.”

The inspectors observed FENOC committed to enhance the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program to include: (1) guidance in the program administrative procedure to inspect for loss of material due to corrosion on Unit 1 crane and trolley structural components and rails. FENOC also committed to include guidance in the crane and hoist inspection procedures to inspect for loss of material due to corrosion on the Unit 1 crane and trolley structural components and rails or extendable arms, as appropriate.

The inspectors verified that the applicable procedure revisions were made as listed in operation steps of SAP Order 200379207 and samples of completed inspections were available electronically for review.

Commitment 14

“Enhance the Masonry Wall Program to (1) include in program scope additional masonry walls identified as having aging effects requiring management for license renewal; and (2) include a requirement in program procedures to incorporate the results of the Masonry Wall Program inspection and document the condition of the walls in the inspection report.”

FENOC committed to enhance the existing Masonry Wall Program by including masonry walls identified as how aging effects to be covered by aging management for license renewal, and to enhance their program procedures to include the results of wall inspections into an inspection report.

The inspectors verified that FENOC staff revised their masonry Wall Procedure Unit 1/2-ADM-2016, Revision 5, Section 7.3.4 to include additional identified walls in the scope of the license renewal aging management program. Requirements were added to Section 7.3.4 for describing any changes to configuration of walls. Guidance was also added to establish how reports would be prepared and submitted as records.

Commitment 15

“Regarding activities for managing the aging of nickel alloy components and nickel-alloy clad components susceptible to primary water stress corrosion cracking - PWSCC (other than upper reactor vessel closure head nozzles and penetrations), BVPS commits to develop a plant-specific aging management program that will implement applicable:

- 1 NRC Orders, Bulletins and Generic Letters; and,
- 2 Staff-accepted industry guidelines.”

The inspectors reviewed Nuclear Operating Procedure NOP-ER-2003, Revision 03, January 24, 2013, "Alloy 600/690 Management Program", Program RTL#: A5.800B, Beaver Valley Power Station, Unit 1/2 - ADM-2096, Revision 13, September 30, 2014, "Alloy 600/690 Management Program", and the Repair/Replacement Program NOP-CC-5703, Revision 03, February 8, 2015 "FirstEnergy Nuclear Operating Company (FENOC) ASME Section XI, Repair and Replacement Program". These program documents implement a nickel-alloy aging management program that addresses NRC Orders, Bulletins and Generic Letters, and NRC staff accepted industry guidelines. The inspectors noted 1/2-ADM-2096, "Alloy 600/690 Management Program", Appendix D listed, by FENOC tracking number, each of the applicable mandatory Code Cases, and Appendix E listed each of the NEI/EPRI Materials Reliability Program guidance documents made mandatory by FENOC's agreement to abide by NEI 03-08.

Commitment 16

"Implement the One-Time Inspection of ASME Code Class I Small-Bore Piping Program as described in LRA Section B.2.31."

The one-time Inspection of American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section III, Class 1 Small Bore Piping aging management program is a new program that manages cracking due to thermal and mechanical loading or intergranular stress corrosion in stainless steel American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section III, Class 1 piping, fittings, and branch connections less than 4 inches nominal pipe size and greater than or equal to NPS 1 (Table IWB-2500-1, Examination Category B-J, Examination Category B-J, Item No. B9.21).

FENOC has completed phased array and simple shear wave ultrasonic nondestructive examinations of 14 small bore piping sample inspections during the Spring 2015 refueling outage. The selection of inspection samples included six Unit 1 and two Unit 2, American Society of Mechanical Engineers, Boiler and Pressure Vessel B&PV Code, Section III, Class 1 socket welds classified as high safety significance.

The inspectors determined a one-time Ultrasonic Test (UT) examination was successfully completed for 3 two-inch diameter socket welds classified as high safety significance for seal injection to the reactor coolant pumps, and 3 two-inch diameter socket welds in the hot leg of the high head safety supply line in Unit 1.

In addition there are two 0.75-inch diameter socket welds on lines that connect to the flow element in the reactor coolant system. These socket welds have been historically inspected visually at operating temperature and pressure at each refueling outage (every 18 months). The inspectors reviewed program documentation, qualified inspection procedures, and reviewed the phased array ultrasonic test inspection procedure for the phased array ultrasonic examination methodology for these inspections, and discussed the status of implementation of the commitment with FENOC technical and management personnel.

During 1R23 (Spring 2015) ultrasonic examinations were performed on four (4) Class 1 small-bore butt welds in accordance with 1/2-ADM-0900. All examinations met the acceptance criteria. Additionally, in response to relevant operating experience, the program, was expanded to include volumetric examination of Class 1 socket welds.

Phased Array ultrasonic test methodology was employed on the socket welds. Ten (10) socket welds were examined during 1R23. All ten examinations met the acceptance criteria. This work was completed under Work Order: 200588415, Four (4) Butt Welds: UT-15-1053, 1054, 1055, 1026; and Ten (10) Socket Welds: UT-15-1062 through 1071.

Commitment 18

“Regarding activities for managing the aging of Reactor Vessel internal components and structures, BVPS commits to:

- 1 Participate in the industry programs applicable to BVPS Unit 1 for investigating and managing aging effects on reactor internals;
- 2 Evaluate and implement the results of the industry programs as applicable to the BVPS Unit 1 reactor internals; and,
- 3 Upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for the BVPS Unit 1 reactor internals to the NRC for review and approval.”

The inspectors reviewed FENOC Procedure NOP-CC-5004, Revision 0, "Pressurized Water Reactor Vessel Internals Program", effective on October 20, 2011.

The inspectors noted this procedure is the reactor vessel internals management program for Beaver Valley Unit 1 which resulted from participation in the industry Material Reliability Project initiative and contains the specific commitment implementation:

- Attachment A identifies the primary components required to be examined and the time for examination;
- Attachment B identifies the expansion components and the frequency of inspection required in the event an expansion component must be inspected;
- Attachment C identifies the components associated with the Reactor Vessel Internals program that are already being inspected under the ASME B&PV Code Section XI;
- Attachment D identifies the examination and acceptance criteria for the reactor vessel internals components

FENOC submitted two reports to the NRC, on January 27, 2014, (ADAMS ML14030A131) detailing the reactor vessel internals aging management program plan for BVPS Unit 1. This submittal was 24 months and two days prior to the beginning of the extended period of operation.

Commitment 20

“Enhance the Structures Monitoring Program to:

- Include in program scope additional structures and structural components identified as having aging effects requiring management for license renewal;
- Include inspection guidance in program implementing procedures to detect significant cracking in concrete surrounding the anchors of vibrating equipment;
- Include a requirement in program procedures to perform opportunistic inspections of normally inaccessible below grade concrete when excavation work uncovers a significant depth;
- Include a requirement in program procedures to perform periodic sampling of groundwater for pH, chloride concentration, and sulfate concentration;
- Include a requirement in program procedures to monitor elastomeric materials used in seals and sealants, including compressible joints and seals, waterproofing membranes, etc., associated with in-scope structures and structural components for cracking and change in material properties;
- Include a requirement in program procedures to perform specific measurements and/or characterizations of structural deficiencies, based on the results of previous inspections and guidance from ACI 349.3R-96, Section 5.1.1, and ACI 201.1 68;
- Include a requirement in program procedures to document in the program inspection report a comparison of the results of the program inspections with the results of the previous program inspection;
- Include a requirement in program procedures to file the Structures Monitoring Program inspection reports in the BVPS document control system so that inspection results can be more effectively monitored;
- Include a requirement in program procedures to apply inspection acceptance criteria based on the results of past inspections and guidance from ACI 349.3R 96, Section 5.1.1, and ACI 201.1-68; and,
- Include a requirement in program procedures that noted deficiencies will be reported using the Corrective Action Program.”

The inspectors determined Beaver Valley Power Station Procedure 1/2-ADM-2016 was revised to include this report's requirements of Commitment Number 20, as follows:

- 1 Section 2.2 addressed the additional structures and structural components requirement;
- 2 Section 7.3.3.2 addressed the requirement for detecting cracking in concrete surrounding vibrating equipment;
- 3 Section 7.3.2 addressed the opportunistic inspection for uncovered concrete;
- 4 Section 7.1.5 addressed the requirements for chemistry sampling of groundwater on a 5 year interval;
- 5 Section 7.3.3.12 added a requirement to monitor elastomeric materials;
- 6 Sections 7.3.3.1, 7.4.1, and 7.5.3 added guidance for the characterization of structural deficiencies and described how the results of inspections should be compared to the results of previous inspections for characterization;
- 7 Section 7.4.3.2 addressed how the inspection reports should be submitted to BVPS document control;
- 8 The use of the Corrective Action Program to document deficiencies was discussed in Section 7.7.1

The inspectors further determined these activities were being tracked by SAP Order 200379312.

Commitment 22

"Implement the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as described in LRA Section 8.2.41."

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program was a new program at the time the application for a renewed license was submitted. The program identifies CASS components subject to service conditions above 250°C. There is a potential for loss of fracture toughness when a CASS component is subject to lengthy exposure to stress above this temperature and this may result in a loss of service function due to cracking (NUREG/CR-7184 ANL-12/56, "Crack Growth Rate and Fracture Toughness Tests on Irradiated Cast Stainless Steels." July 2015). By identifying the components and taking appropriate actions such as a component-specific flaw tolerance evaluation the effects of aging due to cracking can be reasonably managed.

The inspectors reviewed supporting documentation for the screening of CASS components the critical fracture calculation compared against the established NRC screening criteria as set forth in the letter dated May 19, 2000, from Christopher I Grimes, Nuclear Regulatory Commission, to Douglas J. Walters, Nuclear Energy Institute, License Renewal Issue No. 98-0030, *Thermal Aging Embrittlement of Cast Stainless Steel Components*.

The inspectors reviewed the program, being currently implemented, against the criteria established in NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants", Appendix A, "Aging Management Review - Generic (Branch Technical Position RLSB-1)."

The inspectors noted that flaws detected in the coolant pressure boundary, in CASS components, will be evaluated in accordance with ASME Section XI, IWB-2400, or IWB-2400, as applicable.

Commitment 24

"Prior to exceeding the PTS screening criteria for BVPS Unit 1, FENOC will select a flux reduction measure to manage PTS in accordance with the requirements of 10 CFR 50.61. A flux reduction plan will be submitted for NRC review and approval."

The inspectors reviewed Condition Report CR-2015-09669, July 16, 2015, "BVPS-1 Reactor Vessel RTNDT Values Found to be Overly Conservative" documenting the results of Westinghouse evaluation MCOE-LTR-15-15, "Determination of Unirradiated RTNDT Values of the Four Beaver Valley Unit 1 Reactor Vessel Beltline Plate Materials Using a Hyperbolic Tangent Curve Fit", dated July 6, 2015. Based on this curve refit the limiting lower shell plate B6903-1 went from a transition temperature of 27° F on the original hand-drawn fit to a value of 13.1° F utilizing the computer generated fit.

This temperature change resulted in end of life Pressurized Thermal Shock (PTS) value, per the requirements of 10 CFR 50.61, at 50 Effective Full Power Years (EFPY) (60 years of operation) dropping below the screening limit of 270° F to approximately 260° F. The data was extrapolated and it was determined that the screening limit for lower shell plate B6903-1 will not be reached until approximately 83 EFPY. This value is well beyond an anticipated end-of-life of 80 years.

This result is due, in part, to the existing flux reduction program implemented in Cycle 11 during 1995. This flux management plan included hafnium rods in the peripheral fuel bundles and low leakage core loading pattern. On February 3, 2010, 10 CFR 50.61a, "Alternate Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events" was included in the Federal Register to provide fracture toughness requirements for protection against PTS events for PWR pressure vessels that are less burdensome than the requirements of the PTS rule. On July 30, 2013, FENOC submitted letter L-13-223, "License Amendment Request to Implement 10 CFR 50.61a, Alternative Fracture Toughness Requirements for Protection against Thermal Shock Events" requesting NRC approval for use of the alternative requirements.

Commitment 25

“Enhance the Metal Fatigue of the Reactor Coolant Pressure Boundary Program to:

Add a requirement that fatigue will be managed for the NUREG/CR-6260 locations. This requirement will provide that management is accomplished by one or more of the following:

- 1 Further refinement of the fatigue analyses to lower the predicted Cumulative Usage Factors (CUFs) to less than 1.0;
- 2 Management of fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection Intervals to be determined by a method' acceptable to the NRC); or,
- 3 Repair or replacement of the affected locations
 - Add a requirement that provides for monitoring of the Unit 1 RHR activation transient and establishes an administration limit of 600 cycles for the transient;
 - Add a requirement to monitor Unit 1 transients where the 60 year projected cycles are used in the environmental fatigue evaluations, and establish an administration limit that is equal to or less than the 60-year projected cycles number.”

Per SAP Order 200379373, Procedure 1/2-ADM-2115, “Fatigue Cycle Monitoring Program” was revised to include the commitment requirements. The inspectors verified that 1/2-ADM-2115, Revision 2, 5/10/10, “Fatigue Cycle Monitoring Program”, Paragraph 7.1.1, included, verbatim, bullet one and parts 1 to 3 above.

The inspectors noted the requirement to monitor Unit 1 transients where the 60 year projected cycles are used was added only after the relevant calculations were implemented and approved.

Commitment 26

“Evaluate Unit 1 Extended Power Uprate operating experience prior to the period of extended operation for license renewal aging management program adjustments.”

This program is a new program established by FENOC for continuing evaluation of the Unit 1 Extended Power Uprate (EPU) operating experience prior to the period of extended operation. FENOC has evaluated the Beaver Valley EPU operating experience and industry operating experience and reviewed the license renewal aging management programs for potential areas for adjustments/enhancements of the license renewal aging management programs to reinforce the aging management programs with lessons from plant operating experience. These reviews were conducted under Work Order 200379629.

FENOC completed an evaluation of the Unit 1 Extended Power Uprate operating experience to determine if adjustments were warranted to the Unit 1 license renewal aging management programs. Following review of the Unit 1 License Renewal Aging Management Programs, FENOC considered the following changes:

- Calculation DMC-3551 was developed regarding support upgrades associated with power uprate vibration issues. This calculation examined the capability of numerous fluid systems to withstand vibrational loading at EPU conditions. Changes were not warranted to these systems for license renewal aging management programs;
- Flow Accelerated Corrosion (FAC) Checworks analytical model updates were completed based on extended power uprate and Low Pressure Turbine replacement. These updates did not result in any additional changes to license renewal aging management programs;
- FAC Program 'baseline' exams and subsequent re-examinations were performed on components that are expected to have higher flow velocities and increased wear rates due to uprate conditions. This evaluation did not result in any additional changes to license renewal aging management programs;
- Because this is an ongoing program, future evaluations/adjustments will be completed if future operating experience identifies the need for changes to the license renewal aging management programs to fulfill their intended functions.

Commitment 27

"As part of the Reactor Vessel Integrity Program, FENOC will store and maintain Unit 1 standby surveillance capsules, in a condition that would permit their future use through the end of the period of extended operation."

The inspectors noted that FENOC Procedure 1/2- ADM-2054, "Reactor Vessel Integrity Program", Revision 2, effective January 30, 2014, 7.2.2.7 states: "Return irradiated specimens (testing specimens) to Beaver Valley for storage or arrange for capsule storage at the vendor's facility."

Commitment 28

"With the exception of underground GeoFlex @ fuel oil piping; prior to the period of extended operation, FENOC will perform repetitive maintenance tasks to replace, or to test and replace on condition, mechanical system polymer components that would otherwise be subject to aging management review. Subsequent frequencies of the repetitive tests/replacements will be based on manufacturer recommendations and applicable operating experience."

The inspectors reviewed Work Order 200380060, "U1 LR Commitment #28 Polymer Components" and the polymer replacement spreadsheet used to track mechanical system polymer replacement Work Order completion status, completed July 29, 2015.

All of the polymer replacements were scheduled and completed prior to the period of extended operation. Subsequent frequencies of the repetitive replacements have been established based on manufacture recommendations and applicable operating experience.

Commitment 30

“Enhance the Open-Cycle Cooling Water System Program to:

Include in program scope the Post-Accident Sample System heat exchanger (PAS-E-1) credited with a leakage boundary function and assess the internal condition of buried piping by opportunistic inspections of header piping during removal of expansion joints and inline valves in the headers. Evaluation of inspection results will be documented and trended.”

The Open-Cycle Cooling Water System Program implements FENOC commitments in response to NRC Generic Letter 89-13, “Service Water System Problems Affecting Safety-Related Equipment”, including Supplement 1. This program manages the aging effects on the open-cycle cooling water systems such that the systems will be able to fulfill their intended function during the period of extended operation. The program includes surveillance and control techniques to manage aging effects caused by biofouling, corrosion, erosion, protective coating failures, and silting in the Unit 1, River Water System or structures and components serviced by the system. During the NRC triennial heat sink inspection documented in NRC Inspection Report 05000334/2013003, inspectors reviewed the methods (inspection, cleaning, maintenance, and performance monitoring) used to ensure heat removal capabilities for safety-related heat exchangers and compared them to FENOC’s commitments made in response to Generic Letter (GL) 89-13, “Service Water System Problems Affecting Safety-Related Equipment”.

The inspectors reviewed BVPM, “Closed Loop and Raw Water Systems Strategic Water Plan”, Revision 2, and 1/2-ADM-2106, “River/Service Water System Control and Monitoring Program”, Revision 6, to verify that the post-accident sample system heat exchanger is contained in the Open-Cycle Cooling Water System program and includes assessment of internal condition of buried piping by opportunistic inspections of header piping internals during removal of expansion joints and inline valves in the headers and the inspection results are documented, evaluated and trended.

The inspectors reviewed internal surface inspection As-Found Component Examination Report per Work Order 200545644, BV-WR-507, completed June 4, 2013, BV-1RW-225 Unit 1 auxiliary river water system piping which is an opportunistic inspection credited in the Open-Cycle Cooling Water System program.

Commitment 32

“Supplemental volumetric examinations will be performed on the Unit 1 containment liner prior to the period of extended operation. A minimum of seventy-five (one foot square) randomly selected (as described in FENOC Letter L-09-205) sample locations will be examined (as described in FENOC Letter L-09-243). If degradation is identified, it will be addressed through the corrective action program (as described in FENOC Letter L-09-243).”

Inspectors verified that FENOC completed 100% visual inspection of the accessible portions of the Unit 1 containment liner, ultrasonic test examination of the repaired area of the liner, and ultrasonic test volumetric examination of 38 random and 8 non-random sample-locations during the 1R20 outage. NRC inspectors also performed direct inspection of the Unit 1 containment liner and reviewed various random and non-random ultrasonic test examination data records, ultrasonic test examination record of the liner plate replaced to remove a defect where a through-wall hole was discovered in April 2009, and record review of test results from the 100% general visual inspection of accessible liner area. All of the sample liner locations examined were successfully completed with no evidence of loss of material and met the design nominal liner thickness as documented NRC Inspection Report 05000334/2010005.

While conducting a Unit 1 containment coatings inspection during 1R22 outage, a paint blister was identified that was subsequently interrogated and a through-wall hole was identified in the containment liner plate on October 4, 2013. The hole was located about 7 inches above the containment basement floor between columns 9 and 9.5 near instrument rack 108. Visual examination of 100% of accessible areas of the Unit 1 containment liner was performed with no additional deficiencies identified. In addition, FENOC staff performed ultrasonic thickness measurements of 8 supplemental examination locations in the lower elevation of the Unit 1 containment building corresponding to the through-wall hole spaced approximately equidistant around the containment and no evidence of liner wall loss was identified. This inspection is documented in NRC Inspection Report 05000334/2013005.

The inspectors verified that FENOC completed 100% general visual inspection of the accessible portions of the Unit 1 containment liner, ultrasonic test examination of the repaired area of the liner, and volumetric examination of 75 sample locations, volumetric examination of a minimum of 8 non-randomly sample locations and documented summary results for each phase of the volumetric examinations in letters to the NRC.

Commitment 33

“Supplemental volumetric examinations will be performed on the Unit 1 containment liner. A minimum of 8 non-randomly selected locations will be examined, focusing on areas most likely to experience degradation based on past operating experience (as described in FENOC Letter L-09-242). If degradation is identified, it will be addressed through the corrective action program.”

NRC inspectors reviewed FENOC’s inspection plan to conduct two of eight non-random samples to ultrasonically measure the liner thickness of the Unit 1 containment liner. The two areas selected for examination were located near the personnel airlock door. FENOC conducted ultrasonic examination (UT) of two non-random sample locations to measure the liner thickness of the Unit 1 containment liner on May 7, 2010. The lowest measured wall thickness was 0.406 inches and the design nominal wall thickness is 0.375 inches, as documented in NRC Inspection Report 05000334/2010003.

FENOC completed ultrasonic test examination of 8 non-random sample-locations of the Unit 1 containment liner during the 1R20 outage and all the locations examined showed no evidence of loss of material and met the design nominal liner thickness as documented NRC Inspection Report 05000334/2010005, therefore, FENOC has met the commitment to complete volumetric examination of a minimum of 8 non-randomly sample locations.

Commitment 34

“A summary of results for each phase of volumetric testing (described in Unit 1 Commitments No. 32 and No. 33) will be documented in a letter to the NRC.”

The inspectors reviewed the Unit 1 containment liner summary results for each phase of volumetric testing as described in Unit 1 Commitments No. 32 and No. 33 that were documented in FENOC Letters L-09-242 and L-09-245 to the NRC. FENOC has met the commitment to submit the Unit 1 Containment liner summary volumetric testing results to the NRC.

Commitment 35

“FENOC will evaluate if an appropriate/applicable statistical method exists to gain additional insight into potential liner degradation. Data gathered will be evaluated and used to determine the general state of the liner.”

The inspectors reviewed the statistical evaluation report documented in letter RT-LTR-14-70, dated December 8, 2014, which utilized the ultrasonic testing results of the Unit 1 containment liner obtained during 1R20 and 1R21 refueling outages. The statistical evaluation demonstrated that with 95% confidence, 95% of the lowest (thinnest) areas within any square foot over the entire containment liner will meet or exceed the 90% acceptance criteria.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

On August 18, 2015, the inspectors presented the inspection results to E. Larson, Site Vice President, and members of the Beaver Valley Power Station staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

ATTACHMENT: SUPPLEMENTARY INFORMATION

**SUPPLEMENTARY INFORMATION
KEY POINTS OF CONTACT**

Licensee Personnel

E. Larson	Site Vice President
C. McFeaters	Site Operations Director
R. Boyle	Superintendent, Construction Services
G. Buck	ISI/NDE, Level III Contractor
A. Delmonico	Mechanical Maintenance Supervisor
P. Deluca	Maintenance Mechanic
M. Dugovich	Plant Operator
J. Earle	Advanced Nuclear Specialist
R. Ferrie	Electrical Maintenance Supervisor
M. Gorham	System Engineer
D. Grabski	ISI Coordinator
T. Heimel	ISI/NDE, Level III Contractor
P. Johnson	Safety & Human Performance Manager
R. Klindworth	Maintenance Manager
D. Jones	IST Coordinator
L. Kalkstein	RCP Shutdown Seal Engineer
M. Kienzle	System Engineer
J. Kunz	Instrumentation and Control Superintendent
D. Meskel	Component Engineer
J. Ostroski	Heat Exchanger Engineer
A. Reardon	System Engineer
B. Sepelak	Regulatory Compliance Supervisor

LIST OF DOCUMENTS REVIEWED

NDE Guidance and Inspection Procedures:

Beaver Valley Power Station, Unit 1/2-ADM-2305, "Electrical Cables and Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Used In Instrumentation Circuits", 9/18/14

Electric Power Research Institute, Report IR-2010-402, Volumetric Examination of Small Bore Socket-to-Pipe Welds Areva Inservice Inspection Nondestructive Examination, Procedure Qualification 10/27/14

ABB Report Package, Flux Thimble Thermocouple Ultrasonic Profilometry and Eddy Current Encircling Coil Inspection of Stored Thimble Tubes, July – August 1993, Public Service Electric & Gas Salem Nuclear Power Station Unit 1

ASME Code Case N-716-1, Alternative Classification and Examination Requirements Section XI, Division 1

ASME Code Case N-578-1, Risk-Informed Requirements for Class 1, 2, or 3 Piping, Method B, Section XI, Division 1

A-2

- Alternative Classification and Examination Requirements Section XI, Division 1 Volumetric Inspection of Socket Welds Subject to Thermal Fatigue, ASME Section XI Working Group on Risk-Informed Activities, WCAP-12866, Bottom Mounted Instrumentation Wear, January 1991
- US Nuclear Regulatory Commission Bulletin 88-09: Thimble Tube Thinning in Westinghouse Reactors, 7/26/1988 NRC Letter Dated April 15, 1994, to PSEG: SUBJECT: Evaluation of Supplemental Response To NRC Bulletin No. 88-09, Thimble Tube Thinning in Westinghouse Reactors, Salem Nuclear Generating Station, Units 1 and 2 (TAC NOS. M88472 AND M88473 FirstEnergy Nuclear Operating Company, Beaver Valley Power Station Unit 2, Transmittal of Flux Thimble Eddy Current Evaluation and RAD-Screen – 2R16 Flux Thimble Eddy Current Services, 10/17/12
- FirstEnergy Nuclear Operating Company, Beaver Valley Power Station Unit 2, Transmittal of Flux Thimble Eddy Current Evaluation and RAD-Screen – 2R14 Flux Thimble Eddy Current Services, 10/30/2009
- FirstEnergy Nuclear Operating Company, Beaver Valley Power Station Unit 1, Transmittal of Flux Thimble Eddy Current Evaluation and RAD-Screen – 1R21 Flux Thimble Eddy Current Services, 05/31/2012
- FirstEnergy Nuclear Operating Company, Beaver Valley Power Station Unit 1, Transmittal of Flux Thimble Eddy Current Evaluation and RAD-Screen – 1R21 Flux Thimble Eddy Current Services, 05/08/2015
- Westinghouse, Nuclear Services Field Service Procedure, MRS-GEN-1304, Revision 4, Generic Flux Thimble Eddy Current (FTEC) Field Procedure Using the Corestar System, 7/30/14 Westinghouse FLUX THIMBLE EDDY CURRENT (FTEC) INSPECTION EXAMINATION TECHNIQUE SPECIFICATION SHEETS (ETSS), 4/22/15
- Curtiss-Wright Phased Array Ultrasonic Examination Report, Beaver Valley Power Station; 5/2/15:
Weld CH-1-2C-F-2C Report No. UT-15-1055 (RC-104-S-2-10)
Weld CH-96-7-S-01
Weld CH-97-5-S-04
Weld CH-97-5-S-01 - Report No. UT-15-1026 (S1-102-1-S-04)
Weld CH-98-7-S-02
Weld RC-72-5-S-10 - Report No. UT-15-1026 (S1-102-1-S-04)
Weld RC-15-2-S-04:
Weld RC-41-S-5A - Report No. UT-15-1026 (S1-102-1-S-04)
Weld RC-41-1A-S-4A
Weld RC-61-1A-S-05 - Report No. UT-15-1026 (S1-102-1-S-04)
Weld RC-107-1-S-05 - Report No. UT-15-1053(RC-107-1-S-05)
Weld RC-104-2-S-09 - Report No. UT-15-1054(RC-104-2-S-09)
- Beaver Valley Power Station Unit 1 - ADM-0900, One Time Inspection of ASME Code Class 1 Small-Bore Piping, Revision 1, 7/18/14

LIST OF ACRONYMS

ADAMS	Agencywide Documents Access Management System
ASTM	American Society for Testing and Materials
BVPS	Beave Valley Power Station
CAP	Corrective Action Program
CASS	Cast Austenitic Stainless Steel
CFR	<i>Code of Federal Regulations</i>
CLB	Current Licensing Basis
CUF	Cumulative Usage Factor
EPU	Extended Power Uprate
ERF	Emergency Response Facility
FAC	Flow Accelerated Corrosion
FENOC	FirstEnergy Nuclear Operating Company
FSAR	Final Safety Analysis Report
GALL	Generic Aging Lesson Learned
GL	Generic Letter
IST	In-Service Testing Program
LRA	License Renewal Application
NRC	U.S. Nuclear Regulatory Commission
TLAA	Time-Limited Aging Analyses
UFSAR	Updated Final Safety Analysis Report
UT	Ultrasonic Examination