December 23, 2008

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 - NRC LICENSE RENEWAL INSPECTION REPORT 05000334/2008007 & 05000412/2008007

Dear Mr. Sena:

On July 18, 2008, the U.S. Nuclear Regulatory Commission (NRC) completed the major onsite portion of the Region I team inspection of your application for license renewal of your Beaver Valley Power Station Units 1 and 2. The enclosed report documents the results of the inspection, which were discussed on November 12, 2008, with you and members of your staff in an exit meeting open for public observation in Pittsburgh, PA.

The purpose of this inspection was to examine, on a sampling basis, the plant activities and documents that support the application for a renewed license of the Beaver Valley Power Station Units 1 and 2. The inspection team reviewed the scoping of non-safety-related systems, structures, and components, as required in 10 CFR 54.4(a)(2). Further, the team determined whether the proposed aging management programs are capable of reasonably managing the effects of aging. These NRC inspection activities constitute one of several inputs into the NRC review process for license renewal applications.

The team concluded that the scoping of non-safety-related systems, structures, and components was implemented as required in 10 CFR 54.4(a)(2). Further, the team concluded that the aging management portion of the license renewal activities was conducted as described in the License Renewal Application. The team concluded that the documentation supporting the application was in an auditable and retrievable form. The team identified a number of areas that resulted in changes to the application.

Overall, the inspection results support a conclusion of reasonable assurance that actions have been identified and have been taken or will be taken to manage the effects of aging in the systems, structures, and components identified in your application and that the intended functions of these systems, structures, and components will be maintained in the period of extended operation.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of 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/

Richard J. Conte, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos. 50-334 and 50-412
License Nos. DPR-66, NPF-73

Enclosure: Inspection Report 05000334/2008007 and 05000412/2008007

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DATE	12/18/08		12/23/08		12/18/08		12/21/08			

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D. Spindler, RI
P. Garrett, Resident OA
ROPreportsResource@nrc.gov
Region I Docket Room (with concurrences)
D. Roberts, DRS
R. Conte, DRS
J. Richmond, DRS

U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos:	50-334, 50-412
License Nos:	DPR-66, NPF-73
Report Nos:	05000334/2008007 and 05000412/2008007
Licensee:	FirstEnergy Nuclear Operating Company (FENOC)
Facility:	Beaver Valley Power Station, Units 1 and 2
Location:	Post Office Box 4 Shippingport, PA 15077
Dates:	June 23 through July 18, 2008 November 12, 2008
Inspectors:	J. Richmond, Team Leader, Division of Reactor Safety (DRS) G. Meyer, Sr. Reactor Inspector, DRS M. Modes, Sr. Reactor Inspector, DRS S. Chaudhary, Reactor Inspector, DRS A. Dahbur, Reactor Inspector, DRS, Region III D. Tifft, Reactor Inspector, DRS M. Valentin-Olmeda, Training, DRS
Accompanied by:	E. Sayoc, NRR
Observer:	Y. Chung, Korea Institute of Nuclear Safety
Approved By:	Richard J. Conte, Chief Engineering Branch 1 Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000334/2008007 and 05000412/2008007; June 23 – July 18, 2008; Beaver Valley Power Station Units 1 and 2; Scoping of Non-Safety Systems and the Proposed Aging Management Programs for the Beaver Valley Application for Renewed License.

This inspection of license renewal activities was performed by six regional office inspectors. The inspection was performed in accordance with NRC Manual Chapter 2516 and NRC Inspection Procedure 71002. This inspection did not identify any findings as defined in NRC Manual Chapter 0612. The inspection team concluded scoping of non-safety related systems, structures, and components was implemented as required in 10 CFR 54.4(a)(2). Further, the team concluded the aging management program portions of the license renewal activities were conducted as described in the License Renewal Application. The team concluded the documentation supporting the application was in an auditable and retrievable form. The team identified a number of areas that resulted in changes to the application.

Overall, the inspection results support a conclusion of reasonable assurance that actions have been identified and have been taken or will be taken to manage the effects of aging in the systems, structures, and components identified in your application and that the intended functions of these systems, structures, and components will be maintained in the period of extended operation.

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Report Details

4. OTHER ACTIVITIES (OA)

4OA2 Other - License Renewal

a. Inspection Scope (IP 71002)

This inspection was performed by NRC regional inspectors to evaluate the thoroughness and accuracy of the scoping of non-safety-related systems, structures, and components, as required in 10 CFR 54.4(a)(2) and to evaluate whether aging management programs will be capable of managing identified aging effects in an appropriate manner.

The inspectors selected a number of systems, components, and structures for review to determine if the methodology applied by FENOC appropriately addressed the non-safety systems affecting the safety functions of a system, structure, or component within the scope of license renewal.

The inspectors selected a sample of aging management programs to verify the adequacy of FENOC guidance, implementation activities, and documentation. The selected aging management programs were reviewed to determine whether the proposed aging management implementing processes would adequately manage the effects of aging.

The inspectors reviewed supporting documentation and interviewed FENOC personnel to confirm the accuracy of the license renewal application conclusions. For a sample of plant systems and structures, the inspectors performed visual examinations of accessible portions of the systems to observe aging effects.

b.1 Scoping of Non-safety-related Systems, Structures, and Components

For scoping, the inspectors reviewed FENOC program guidance procedures and summaries of scoping results for Beaver Valley (BV) to assess the thoroughness and accuracy of the methods used to bring systems, structures, and components within the scope of license renewal into the application, including non-safety-related systems, structures, and components, as required in 10 CFR 54.4 (a)(2). The inspectors determined FENOC procedures to be consistent with the NRC accepted guidance in Sections 3, 4, and 5 of Appendix F to Nuclear Energy Institute (NEI) 95-10, Rev. 6, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54," (Section 3: non-safety-related systems, structures, and components within scope of the current licensing basis; Section 4: non-safety-related systems, structures, and components directly connected to safety-related systems, structures, and components; and Section 5: non-safety-related systems, structures, and components not directly connected to safety-related systems, structures, and components).

The inspectors reviewed the set of license renewal drawings for Units 1 and 2 submitted with the BV License Renewal Application (LRA), which had been color-coded to indicate systems and components in scope for license renewal and the basis for their inclusion (functional, spatial, and structural). The inspectors interviewed personnel, reviewed

license renewal program documents, and independently inspected numerous areas within Units 1 and 2 to confirm that appropriate systems, structures, and components had been included within the license renewal scope; that systems, structures, and components excluded from the license renewal scope had an acceptable basis; and that the boundary for determining license renewal scope within the systems, including seismic supports and anchors, was appropriate. FENOC excluded the Turbine Buildings and their equipment from license renewal, and the inspectors confirmed the appropriateness of this scoping based on reviews and in-field inspection and walkdowns.

The in-plant areas reviewed included the following:

- Units 1 & 2 Turbine Buildings
- Intake Structure
- Alternate Intake Structure
- Units 1 & 2 Diesel Generator Rooms
- Security Generator
- Unit 1 Service Building
- Unit 2 Dedicated Auxiliary Feedwater Pump Room
- Unit 1 Main Steam Valve Area & Cable Vault
- Service Water Valve Pit

For systems, structures, and components selected regarding spatial interaction (failure of non-safety-related components adversely affecting adjacent safety-related components), the inspectors determined that the in-plant configuration had been accurately and acceptably categorized within the license renewal program documents. The inspectors determined the personnel involved in the process were knowledgeable and appropriately trained.

For systems, structures, and components selected regarding structural interaction (seismic design of safety-related components dependent upon non-safety-related components), the inspectors determined that structural boundaries had been accurately determined and categorized within the license renewal program documents. The inspectors determined that FENOC had reviewed applicable isometric drawings to determine the seismic design boundaries and had correctly included the applicable components in the license renewal application, based on the inspectors' independent review of a sample of the isometric drawings and the seismic boundary determinations.

In summary, the inspectors concluded that FENOC had implemented an acceptable method of scoping of non-safety-related systems, structures, and components and that this method resulted in accurate scoping determinations.

b.2 New Aging Management Programs

External Surfaces Monitoring Program

The External Surfaces Monitoring Program is a new program that will be implemented prior to the period of extended operation. The program will manage the effects of aging

by performing periodic visual inspections of components subject to aging management. The program is also credited with managing loss of material from internal surfaces for situations in which internal and external material and environment combinations are the same, such that external surface condition is representative of internal surface condition.

The inspectors reviewed the program description, program basis documents, proposed implementing procedures, system health reports, and condition reports. In addition, the inspectors performed a walkdown inspection of river water and service water valve pits and the auxiliary river water intake structure with system and design engineers.

The inspectors noted that the proposed program was unclear as to the inspection requirements and inspection frequency of inaccessible areas. FENOC subsequently enhanced this program in BV LRA Amendment 24, dated September 25, 2008, to clarify this item. As amended, the inspectors concluded this program is consistent with the ten elements of an aging management program, as recommended in NUREG-1801, Rev. 1, XI.M36, "External Surfaces Monitoring."

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. As amended in program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

<u>One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program</u>

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program is a new program that will be implemented prior to the period of extended operation. The program will manage the aging affect of cracking of stainless steel American Society of Mechanical Engineers (ASME) Code Class 1 piping less than 4 inches nominal pipe size (NPS 4), which includes pipes, fittings, and branch connections. These pipe sizes and fittings are excluded from ASME Code jurisdiction under the current license because the failure of a pipe or component of that size would not jeopardize the ability of the operator to safely shut-down of the plant.

The program will manage this aging effect by performing one-time volumetric examinations for selected ASME Code Class 1 small-bore butt welds located in piping, fittings, and branch connections less than NPS 4. It should be noted that socket welds are excluded from this program. The program will include locations that are susceptible to cracking and will include measures to verify that unacceptable degradation is not occurring in Class 1 small bore piping. The program is confirmatory because the goal of the program is to validate the effectiveness of the Water Chemistry Program to mitigate aging-related degradation. The program will confirm that no additional aging management programs are needed during the period of extended operation to manage the aging affects in small bore piping. The program will utilize volumetric non-destructive examinations qualified on small bore piping.

The sample selection will be based on susceptibility, inspectability, personnel radiation exposure considerations, operating experience, and limiting conditions. The sample selection will focus on the bounding components most susceptible to cracking as

detailed in Electric Power Research Institute (EPRI) Report 1000701, "Interim Thermal Fatigue Management Guideline (MRP-24)." Subsequent to NUREG-1800, Rev. 1, "Generic Aging Lessons Learned (GALL) Report," the final guidance, acceptable to the NRC, was issued for the Materials Reliability Project (MRP) in MRP-146, for the determination of susceptible welds. This program was implemented at BV, and identified a small population of susceptible welds.

The inspectors reviewed the proposed non-destructive testing techniques and the sample locations beyond those identified in their MRP-146 program, including considerations for subsequent guidance such as MRP-29, 32, 23, 132, and 138. The inspectors reviewed current program elements and compared them with the existent guidance.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. In program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program that will be implemented prior to the period of extended operation. The program will identify CASS components subject to service conditions above 250 degrees Centigrade. There is a potential for loss of fracture toughness when a CASS component is subject to lengthy exposure to stress above this temperature, which could result in a loss of service function due to cracking. By identifying the components and taking appropriate actions, such as a component-specific flaw tolerance evaluation, the effects of aging due to cracking will be managed.

The inspectors reviewed the scoping of the components to evaluate the rigor of the scoping method used to identify CASS components. The inspectors then reviewed the screening criteria and analysis to determine the appropriateness of the established thresholds. Supporting documentation was reviewed, and the analysis was evaluated 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 concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. In program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

One-Time Inspection Program

The One-Time Inspection Program is a new program that will be implemented prior to the period of extended operation. The program will verify the effectiveness of other aging management programs, including Water Chemistry, Fuel Oil Chemistry, and

Lubricating Oil Analysis Programs, by reviewing various aging effects for impact. Where corrosion resistant materials and/or non-corrosive environments exist, the One-Time Inspection Program is intended to verify that an aging management program is not needed during the period of extended operation by confirming that aging effects are not occurring or are occurring in a manner that does not affect the safety function of systems, structures, and components. Non-destructive examinations will be performed by qualified personnel using procedures and processes consistent with the approved plant procedures and appropriate industry standards.

The inspectors reviewed the program description and program implementing procedures, discussed the planned activities with the responsible staff, and reviewed a sample of corrective action program documents for applicable components.

The inspectors noted that the application specified a "representative sample size" of components to be inspected but did not provide any details as to how the sample size would be determined. The program implementing procedure specified a sample size based on a 90% confidence that 90% of the total population has not experienced degradation. Nonetheless, the inspectors noted that many material-environment populations existed within the total population and that degradation could exist in one material-environment population but be overlooked within the total population sampling plan. FENOC committed to enhance the program sample selection to ensure a 90% confidence that 90% of each individual material–environment population had not experienced degradation. FENOC subsequently revised this program in BV LRA Amendment 23, dated September 8, 2008, to resolve this issue. As enhanced, the inspectors concluded this program is consistent with the ten elements of an aging management program, as recommended in NUREG-1801, Rev. 1, XI.M32, "One-time inspection Program."

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. As amended in program-level documents FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Selective Leaching of Materials Inspection Program

The Selective Leaching of Materials Inspection Program is a new plant-specific program that will be implemented prior to the period of extended operation. The program is credited with managing the aging of components made of cast iron, bronze, brass, and other alloys exposed to raw water, treated water, soil, or other environments that may lead to selective leaching of material constituents. The program will include a one-time visual inspection and hardness measurement test of selected components that may be susceptible to selective leaching to determine whether loss of material due to selective leaching is occurring, and whether the leaching process will affect the ability of the components to perform their intended function during the period of extended operation. In addition, gray cast iron fire water pipe will be periodically tested to identify selective leaching damage, before a loss of component function can occur. The program as described above, replaced the initial non-plant specific program (BV LRA Amendment 24), as a result of this inspection.

The inspectors reviewed the program description, program basis documents, condition reports and material history, approved station procedures and proposed implementing procedures, and discussed the planned activities with the responsible staff.

The inspectors identified that corrective action program documents and material history for cast iron fire water pipe showed numerous examples of pipe degradation or pipe failure due to selective leaching. In addition, during interviews, station personnel also acknowledged fire water piping failures, due to leaching damage. The inspectors noted that, in general, FENOC assumed that site specific operating experience for a new program would be negligible and would be adequately addressed by the industry operating experience review embedded in the recommendations of NUREG-1801, Rev. 1, XI.M33, "Selective Leaching Of Materials." The inspectors noted that the initially proposed program implemented a one-time inspection to verify that no aging effect requiring management was present. The inspectors concluded it was inappropriate to use a one-time inspection program to verify no aging effect for fire water pipe, because there was ample plant-specific operating experience which showed such degradation had occurred in the buried gray cast iron fire water pipe.

As a result of inspector observations regarding selective leaching damage to fire water piping, FENOC committed to replace the initially proposed non-plant specific program with a plant-specific program. In addition to the one-time inspection activities previously proposed, the new plant-specific program will also perform periodic testing of buried fire water piping to ensure that selective leaching is identified before a loss of component intended function can occur. FENOC subsequently revised this program in BV LRA Amendment 24, dated September 25, 2008, to resolve this issue. As amended, the inspectors concluded this plant-specific program is consistent with the generic ten elements of an aging management program, as recommended in NUREG-1801.

The inspectors also reviewed FENOC's operating experience review for this program. FENOC's review did not identify a history of selective leaching damage to in-scope components, and incorrectly concluded that plant-specific operating experience demonstrated the effectiveness of the initially proposed one-time inspection program. For buried gray cast iron fire water pipe, the inspectors concluded FENOC's operating experience review for this proposed program was inconsistent with the actual plant-specific operating experience. FENOC entered this deficiency into the BV corrective action program as condition report (CR) 08-43594.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. As amended in program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Electrical Cable Connections not Subject to 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection Program

The Non-environmental Qualification (Non-EQ) Bolted Cable Connections Program is a new plant-specific program that will be implemented prior to the period of extended operation. The program is credited with managing the aging effects in bolted cable

connections. The purpose of the program is to inspect bolted cable connections for loosening of the connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation. High-voltage (e.g., > 35 kilovolt (kV)) connections are not included in this program, which is consistent with the recommendations of NUREG-1801, Rev. 1, XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements." A representative sample of in-scope connections will be tested to confirm that the loosening of cable connections is not an aging issue that requires a periodic aging management program. The program as described above, replaced the initial non-plant specific program (BV LRA Amendment 23), as a result of this inspection.

The inspectors walked down portions of the electrical switchyard, interviewed plant personnel, and reviewed aging management program documents, condition reports, and existing procedures to assess the proposed program and its capability to identify aging effects. The inspectors identified that the initial proposed program was based on an early draft of the NRC proposed License Renewal Interim Staff Guidance (ISG) LR-ISG-2007-02, which clarifies XI.E6, and, as such, was not consistent with the final version issued for public comment. FENOC committed to revise the proposed program to be consistent with the current version of ISG LR-ISG-2007-02. FENOC subsequently revised this program in BV LRA Amendment 23, dated September 8, 2008, to resolve this issue. As amended, the inspectors concluded this plant-specific program is consistent with the ten elements of an aging management program, as recommended in ISG LR-ISG-2007-02.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. In program-level documents, FENOC provided adequate guidance, as amended, to ensure aging effects are appropriately identified and addressed.

Electrical Cables and Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Program

The Non-EQ Cables and Connections Program is a new program that will be implemented prior to the period of extended operation. The program is credited with managing the aging effects of insulated cables and connections exposed to adverse localized environments caused by heat, radiation, and moisture. The aging effects are managed by periodic visual inspections of a representative sample of in-scope cables and connections for jacket surface anomalies. The technical basis for a representative sample will be determined using appropriate industry standards. Visual inspections will be performed at lease once every 10 years.

The inspectors performed walkdown inspections, interviewed plant personnel, and reviewed aging management program documents, condition reports, and existing procedures to assess the proposed program and its capability to manage aging effects. The inspectors reviewed EPRI TR-109619, "Guideline for the Management of Adverse Localized Equipment Environments," the guidance document that FENOC proposed to use to develop the BV program procedures to identify adverse localized environments and methods of inspections.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. In program-level documents, FENOC provided adequate guidance to ensure that aging effects are appropriately identified and addressed.

Inaccessible Medium-Voltage Cables Suitable for Submergence and Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program

The Non-EQ Inaccessible Medium-Voltage Cable Program is a new plant-specific program that will be implemented prior to the period of extended operation. The program is credited with managing the aging effects of inaccessible (e.g., in conduit or direct-buried) medium-voltage cables within the scope of license renewal that are exposed to significant moisture simultaneously with applied voltage. FENOC determined that all in-scope medium-voltage cables are suitable for operation in a submerged water environment. Therefore, no aging effect requiring management was identified for those cables. The purpose of this aging management program is to confirm the aging effects caused by moisture and voltage stress are not occurring, to ensure the cables will perform their intended function during the period of extended operation. The program includes a commitment to test these cables at least once every ten years to provide an indication of the condition of the conductor insulation. The specific type of test 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. In addition, periodic visual inspections will be performed on the accessible portions of cables (i.e., in manholes) for water induced damage. These inspections will be performed at least once every two years, with the first inspection to be completed prior to the period of extended operation. The program as described above, replaced the initial non-plant specific program (BV LRA Amendment 23), as a result of this inspection.

The inspectors performed walkdown inspections, and reviewed program documents, condition reports, aging management documents, and existing procedures to assess the proposed program and its capability to manage aging effects. The inspectors also interviewed the engineer responsible for the non-EQ inaccessible medium-voltage cable program regarding implementation of particular test procedures to be developed under the program.

On June 25, 2008, FENOC opened four manholes for NRC inspection,1EMH8A, 1EMH8B, 1EMH15, and 1EMH19A. Manholes 1EMH8A and 1EMH8B contained in-scope safety-related 4 kV cables associated with river water and service water pumps, and 1EMH15 contained an in-scope non-safety-related cable for the Emergency Response Facility. Manhole 1EMH19A did not contain any in-scope medium-voltage cables, but was chosen to indirectly evaluate local area conditions, for other nearby in-scope manholes, which were not available to be opened or directly inspected during the time period the inspectors were on-site. The inspectors observed standing water in all four manholes. Water level was found to be above the level of the cable trays in 1EMH8A, 1EMH8B and 1EMH15. Minimal water was found in manhole 1EMH19A, and

all cable trays were visible and above water. FENOC entered these issues into the BV corrective action program as CR 08-42380. The manholes were de-watered, and the cables and cable trays were determined to be acceptable.

In follow-up to the walkdown inspections, the inspectors reviewed results of previous manhole inspections performed in 2004, 2006, and 2008. The inspectors identified that water was typically found above the level of the cable trays in the three in-scope manholes. NUREG-1801, Rev. 1, XI.E3, "Inaccessible Medium-Voltage Cables not Subject to 10 CFR 50.49 Environmental Qualification Requirements," recommended periodic actions be taken to prevent cables from being exposed to significant moisture, such as inspection for water collection in cable manholes, and draining water, as needed. However, FENOC's initial proposed program credited manhole inspections once every two years as acceptable to maintain the cables dry. Based on direct observations and review of historical records (e.g., plant-specific operating experience), the inspectors concluded that FENOC's initial proposed program was inconsistent with XI.E3, in that a two year inspection frequency would not provide adequate assurance to prevent cables from being exposed to significant moisture.

During the inspection, FENOC evaluated the in-scope medium-voltage cables and determined that the cables were suitable by design for usage in a continuously wetted and continuously energized environment. As a result, FENOC concluded that the cables do not meet the LR scoping criteria to be included in an aging management program, but committed to periodic cable testing as recommended by XI.E3. The NRC Office of Nuclear Reactor Regulation (NRR) is currently reviewing FENOC's determination that the cables are suitable for submergence (Request for Additional Information Question B.2.21-3, ML081700652), as part of the license renewal application review.

As a result of inspector observations regarding manhole water conditions, FENOC replaced the initially proposed non-plant specific program with the plant-specific program described above, in BV LRA Amendment 23, dated September 8, 2008, to resolve this issue. As amended, the inspectors concluded this plant-specific program is consistent with the generic ten elements of an aging management program, as recommended in NUREG-1801.

The inspectors also reviewed FENOC's operating experience review for this program. FENOC's review did not identify a history of water in the manholes, and incorrectly concluded that plant-specific operating experience demonstrated the effectiveness of the proposed two year manhole inspection to maintain the cables dry. The inspectors concluded FENOC's operating experience review for this proposed program was inconsistent with the actual plant-specific operating experience. FENOC entered this deficiency into the BV corrective actions program as CR 08-43594.

Pending NRR's review of the cable qualifications for submergence, the inspectors preliminarily concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. As amended in program-level documents, FENOC provided adequate guidance to ensure that aging effects are appropriately identified and addressed.

Buried Piping and Tanks Inspection Program

The Buried Piping and Tanks Inspection Program is a new program that will be implemented prior to the period of extended operation. The program is credited with managing the effects of external corrosion on the pressure-retaining capability of buried components constructed of steel and stainless steel in a soil environment. The aging effects will be managed by preventive measures, in accordance with standard industry practice for maintaining external coatings and wrappings, to mitigate corrosion, and by visual inspections during planned excavations. The program requires performing at least one inspection for each unit, within the 10 year period prior to the period of extended operation, either during an excavation for other purposes or during an excavation planned for this inspection. An additional inspection will also be performed during the first 10 years of extended operation. The program will provide inspection and acceptance criteria, and will require evaluation of the inspection results. Inspections will be performed in accordance with approved station procedures.

The inspectors reviewed relevant license renewal program documents, implementing procedures, corrective action program documents, and interviewed station personnel. The inspectors also reviewed design specifications to further evaluate the wrappings and coatings that were required to be installed on buried piping.

The inspectors identified an inconsistency between the proposed program and a recently installed section of river water piping. The new piping was unwrapped and uncoated AL6XN alloy. However, the proposed program was described as consistent with NUREG-1801, Rev. 1, XI.M34, "Buried Piping and Tanks Inspection," which recommended that all buried piping be coated or wrapped. FENOC provided an adequate technical basis to demonstrate that AL6XN alloy was not required to be wrapped or coated to adequately manage the aging effect of external corrosion. FENOC subsequently revised this program in BV LRA Amendment 23, dated September 8, 2008, to clarify this issue. As amended, the inspectors concluded this program is consistent with the ten elements of an aging management program, as recommended in XI.M34.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. In program-level documents, FENOC provided adequate guidance to ensure the aging effects are appropriately identified and addressed.

b.3 Existing Aging Management Programs

Open-Cycle Cooling Water System Program

The Open-Cycle Cooling Water System Program is an existing program that will be enhanced prior to the period of extended operation. The program is credited with managing the effects of aging of internal protective coatings and piping, as well as the prevention of excessive macro-fouling and biofouling, associated with the open cycle river water (Unit 1) and service water (Unit 2) systems, including the intake structure and alternate intake structure. The aging effects of material loss (corrosion) and fouling are

managed by a condition and performance monitoring program (e.g., visual inspections and/or non-destructive examinations), and control techniques (e.g., chemical treatment), as recommended by NRC Generic Letter 89-13. The program includes piping and components in the river water and service water systems, emergency diesel generator system, containment cooling, and the main control room heating, ventilation and air conditioning system.

The inspectors reviewed the existing program, approved plant procedures, trending reports, intake structure inspection records, river and service water piping through-wall leakage logs, and river and service water system health reports to evaluate the effectiveness of the existing program. The inspectors interviewed the system engineer and the engineer responsible for the associated program, and performed field walkdown inspections to independently assess the material condition of the river and service water systems, and to identify inconsistencies between the as-built plant configuration and the aging management evaluations and programs.

The inspectors identified that the post accident heat exchanger had been omitted from the scope of the program. FENOC committed to add the heat exchanger into the existing program to resolve this issue.

The inspectors identified an inconsistency between the proposed program and the recommendations of NUREG-1801, Rev. 1, XI.M20, "Open Cycle Cooling Water." This inconsistency was not identified as an exception, and no technical basis was provided in the program basis documents. Specifically, XI.M20 recommends periodic flushing of infrequently used lines, but several infrequently used lines were not periodically flushed, such as the backup water sources to the auxiliary feedwater pumps and the spent fuel pools. FENOC subsequently provided an adequate technical basis to not flush the associated lines, and committed to enhance the existing program to clarify this issue.

The inspectors identified an apparent inconsistency between the proposed program and the recommendations of XI.M20, that was not identified as an exception, and no technical basis was provided in the program basis documents. Specifically, XI.M20 recommends inspection or testing of piping for wall thinning, but FENOC had not included the buried piping within the scope of the program inspection or test activities, and no technical basis was provided in the program basis documents. FENOC committed to enhance the existing program to assess the internal condition of buried piping during periodic removal of expansion joints and valves in below ground valve and pipe pits.

FENOC subsequently revised this program in BV LRA Amendment 23, dated September 8, 2008, to resolve these issues. As amended, the inspectors concluded this program is consistent with the ten elements of an aging management program, as recommended in XI.M20.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. As amended in program-level documents, FENOC provided adequate guidance to ensure the aging effects are appropriately identified and addressed.

Metal Fatigue of Reactor Coolant Pressure Boundary

The Metal Fatigue of Reactor Coolant Pressure Boundary Program is a time-limited aging analysis (TLAA) of fatigue in select components in the reactor coolant pressure boundary. The design basis metal fatigue analyses for the reactor coolant pressure boundary are considered time-limited aging analysis for the purposes of license renewal. This program provides an analytical basis for confirming the number of cycles, established by the analysis of record, will not be exceeded before the end of the period of extended operation. The components include the reactor vessel and control rod drive mechanisms, the main coolant loop piping, including the surge line, the reactor vessel internals, the pressurizer, the steam generators, the reactor coolant pumps, and the loop stop isolation valves. In addition, Unit 2 includes the Class 1 portions of various systems which are integral with the reactor coolant system, such as residual heat removal, chemical and volume control, and safety injection systems. The Unit 2 reactor head vent and the reactor vessel level indicating system (RVLIS) piping are also ASME Class 1, but are exempt from full fatigue analysis because they are 1 inch in diameter, or less. The principal inputs to the fatigue analysis are determined by using the number of stress evolutions on each component acquired by tracking, and by evaluating contributing plant events. The program monitors operating transients and calculates up-to-date fatigue usage factors. The effect on cracking is then monitored and trended.

The inspectors reviewed the program, including the basis calculations, on-going monitoring, corrective actions, limiting components, and current cumulative usage factors for the limiting components. The inspectors had extensive discussions with the responsible program management at Beaver Valley, including multiple iterations with NRC fatigue experts. The industry position on vibration, or mechanically induced fatigue, was explored extensively as it affects the changing endurance limits during power up-rate or other modifications.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. In program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Reactor Vessel Integrity Program

The Reactor Vessel Integrity Program (i.e., protection against pressurized thermal shock) is an existing program credited with managing the loss of fracture toughness due to neutron embrittlement in reactor materials exposed to a neutron fluence exceeding 1.0 E+17 n/cm2 (E > 1.0 MeV). The aging effects are managed by periodically evaluating the amount of reactor vessel embrittlement through the examination of a series of surveillance test capsules. The test capsules are inserted into high neutron fluence fields, while the reactor is at power, and removed on a schedule designed to develop an accelerated embrittlement aging curve.

In preparation for the evaluation of this program, the inspectors reviewed the requirements stipulated in 10 CFR 50, Appendix H, "Reactor Vessel Material Surveillance Requirements," and ASTM Standard E 185-82, "Standard Practice for

Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels," incorporated by reference into 10 CFR 50, and Appendix H, NRC Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence." It should be noted that reactor vessel embrittlement values are used to determine pressure-temperature limits, minimum temperature requirements, and end-of-life Charpy upper-shelf energy, in order to determine the vessel's integrity in accordance with 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock," and 10 CFR 50 Appendix G, "Fracture Toughness Requirements."

The inspectors interviewed the responsible engineers and reviewed selected plant-specific surveillance calculations such as Westinghouse WCAP-16527-NO Rev. 0, "Analysis of Capsule X from BV Unit 2 Reactor Vessel Radiation Surveillance," and WCAP-15571 Supplement 1, Rev. 0, "Analysis of Capsule Y from BV Unit 1 Reactor Vessel Radiation Surveillance Program." The veracity of these analyses was compared with the standards referenced above.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. In program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Fuel Oil Chemistry Program

The Fuel Oil Chemistry Program is an existing program that will be enhanced prior to the period of extended operation. The program is credited with managing the affects of aging for loss of material (corrosion) and fouling in fuel oil systems. The aging effects are managed by a combination of periodic chemistry sampling and analysis, and periodic fuel oil tank cleaning and inspection.

The inspectors reviewed the existing fuel oil monitoring program, the described enhancements, associated chemistry procedures for sampling and tank cleaning, and recent fuel oil analysis results to evaluate the effectiveness of the existing program. The inspectors reviewed tank inspection records to verify the results were within the acceptable range. In addition, the inspectors interviewed engineering and chemistry personnel, and performed field walkdown inspections of the emergency diesel generators, security diesel generator, diesel fire pump, and Unit 2 standby instrument air diesel to independently assess the material condition of the fuel oil systems and identify inconsistencies between the as-built plant configuration, and the aging management evaluations and programs. The inspectors also reviewed a sample of corrective action program documents related to fuel oil.

The inspectors identified an inconsistency between the proposed program enhancements and the recommendations of NUREG-1801, Rev. 1, XI.M30, "Fuel Oil Chemistry." This inconsistency was not identified as an exception, and no technical basis was provided in the program basis documents. Specifically, XI.M30 recommends ultrasonic thickness measurements of tank bottom surfaces be performed to ensure that significant degradation is not occurring. However, the initially proposed program

enhancement only specified periodic or conditional visual inspection of internal surfaces, and approved station procedures specified ultrasonic thickness measurements as optional, at the discretion of system engineering.

The inspectors concluded that this thickness measurement approach represented an exception to the recommendations of XI.M30. FENOC subsequently revised this program in BV LRA Amendments 23 and 26, dated September 8 and October 2, 2008, respectively, to resolve this issue. As amended, the inspectors concluded this program is consistent with the ten elements of an aging management program, as recommended in XI.M30.

The inspectors concluded FENOC had performed adequate evaluations, as well as industry experience and historical reviews, to determine aging effects. As amended, FENOC provided adequate guidance to ensure the aging effects will be appropriately identified and addressed.

ASME Section XI, Subsection IWL Program

The ASME Section XI, Subsection IWL is an existing program. The program is credited with managing the effects of aging of the primary containment, which is a reinforced concrete structure, without post tensioning. The IWL program is required by 10 CFR 50.55a, and is consistent with the ASME Section XI, Subsection IWL, 1992 edition, with the 1992 Addenda. The program consists of periodic visual examinations of the reinforced concrete containment structures within scope of license renewal.

The program specifies that all accessible surfaces receive a visual examination. The procedure for visual containment inspection also requires that inaccessible areas requiring inspection be separately identified. Painted surfaces are examined for evidence of flaking, blistering, peeling, discoloration, and other signs of distress. Non-coated areas are examined for evidence of cracking, discoloration, wear, pitting, excessive corrosion, gouges, surface discontinuities, dents and other signs of surface irregularities.

The inspectors reviewed the program description, program basis documents, and results of recent examinations, including a review of how those results were dispositioned. As evidence of adequate program implementation, FENOC provided sufficient documentation for the inspectors to evaluate the program's effectiveness.

The inspectors noted that containment conditions with a potential to affect the intended functions are required to be evaluated and any identified degraded conditions are required to be entered into the BV corrective action program. The inspectors concluded this program is consistent with the ten elements of an aging management program, as recommended in NUREG-1801, Rev. 1, XI.S2, "ASME Section XI, Subsection IWL."

The inspectors identified that the 2006 IWL engineering report had not yet been prepared and issued, as of June 23, 2008, and that the existing program did not specify any due date requirements for the report preparation or approval. FENOC entered this observation into the BV corrective action program as CR 08-43318, to enhance the

administrative controls for the IWL report generation. The 2006 IWL inspection report was subsequently prepared, approved, and issued on June 29, 2008.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. In program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Bolting Integrity Program

The Bolting Integrity Program is an existing program. The program is credited with managing the effects of aging for loss of preload, cracking, and loss of material due to corrosion, for structural and mechanical bolts within scope of license renewal. For pressure retaining and structural bolting, this program implements the recommendations of NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," EPRI NP-5769, "Degradation and Failure of Bolting in Nuclear Power Plants," as well as the maintenance recommendations of EPRI TR-104213, "Bolted Joint Maintenance & Application Guide."

The inspectors reviewed the program description and supportive documents for this program. This program is implemented through the External Surfaces Program, the ASME Section XI In-service Inspection Subsections IWB, IWC, IWD, IWE, and IWF Programs, and the Structures Monitoring Program. The inspectors focused their attention on inspection reports, condition reports, site procedures, drawings, and related references used to manage the aging effects related to most of the programs mentioned above. The inspectors reviewed sufficient documentation for maintenance work related to bolting practices in structural and mechanical elements. The inspectors noted that bolting issues with a potential for affecting the intended bolting functions are required to be entered into the BV corrective action program for evaluation and correction. The inspectors concluded this program is consistent with the ten elements of an aging management program, as recommended in NUREG-1801, Rev. 1, XI.M18, " Bolting Integrity."

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. In program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Masonry Wall Program

The Masonry Wall Program is an existing program that will be enhanced prior to the period of extended operation. The program is credited with managing the effects of aging of in-scope masonry walls by inspecting for deterioration to assure that the established basis for each wall remains valid during the period of extended operation. The scope of the program includes all masonry walls that are in-scope for 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and perform intended functions in accordance with 10 CFR 54.4. The program is based on the requirements and recommendations in NRC Bulletin 80-11, "Masonry

Wall Design," Information Notice 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to Bulletin 80-11," and 10 CFR 50.65. This program is included as a part of the Structural Monitoring Program.

The inspectors reviewed the program description, program basis documents, condition reports, approved station procedures, drawings, related references used to manage the aging effects on the masonry walls, and the results of prior inspections. The inspectors interviewed FENOC supervisory and technical personnel responsible for this program.

The inspectors identified that the existing program did not have the administrative controls, as recommended in NUREG-1801, Rev. 1, XI.S5, "Masonry Wall Program," to ensure the results of masonry wall inspections would be trended. FENOC committed to enhance the existing program to incorporate masonry wall inspection results into a plant inspection report, to ensure inspection results will be trended. FENOC subsequently revised this program in BV LRA Amendment 23, dated September 8, 2008, to clarify this item. As amended, the inspectors concluded this program is consistent with the ten elements of an aging management program, as recommended in XI.S5.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. As amended in program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Structures Monitoring Program

The Structural Monitoring Program is an existing program that will be enhanced prior to the period of extended operation. The program is credited with managing the effects of aging for structures and structural components, within the scope of license renewal. The program is based on the requirements in 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and the recommendations in NUMARC 93-01, Rev. 2, "Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and Regulatory Guide 1.160, Rev. 2, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The scope of this program also includes condition monitoring of masonry walls.

To assess the effectiveness of the current program, the inspectors reviewed the program description, program basic documents, condition reports and maintenance history, approved station procedures and drawings, results of prior inspections and follow-up of inspections findings, and current inspection schedules. In addition, the inspectors also interviewed cognizant personnel, and walked through visual examinations of the accessible structural items, including reinforced concrete and structural steel members, components, and systems to access the effectiveness of the current program. The frequency for structural inspections is every 5 years for accessible areas, and every possible opportunity for normally inaccessible areas.

The inspectors identified that the existing program did not have the administrative controls, as recommended in NUREG-1801, Rev. 1, XI.S6, "Structures Monitoring Program," in the areas of established and approved acceptance criteria, trending of

inspection results, inspection report preparation and approval, and retrieval of inspection results. FENOC committed to enhance the existing program to incorporate additional administrative controls. FENOC subsequently revised this program in BV LRA Amendment 23, dated September 8, 2008, to resolve these issues. As amended, the inspectors concluded this program is consistent with the ten elements of an aging management program, as recommended in XI.S6.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. As amended in program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Fire Protection Program

The Fire Protection Program is an existing program that will be enhanced prior to the period of extended operation. The program is credited with managing the aging effects in the fire barrier system, the diesel-driven fire pump, and the halon and carbon dioxide fire suppression systems. The aging effects are managed by periodic inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors; and periodic inspection and testing of fire rated doors. Aging effects are also managed by the periodic inspection and testing of the diesel-driven fire pump to ensure that the fuel supply line can perform its intended function.

The inspectors reviewed the program description, program basic documents, and approved station procedures, and performed walkdown inspections of selected fire barriers, and halon and carbon dioxide fire suppression systems, to evaluate the effectiveness of the existing program. In addition, the inspectors performed a walkdown inspection of the diesel-driven fire pumps and accessible portions of the associated fuel supply line. Surveillance procedures were reviewed for completeness and compliance with applicable codes. The inspectors also interviewed station personnel responsible for the fire protection program.

The inspectors verified that FENOC had performed adequate historic reviews of plant-specific and industry experience to determine aging effects. The inspectors also reviewed the exceptions to the recommendations of NUREG-1801, Rev. 1, XI.M26, "Fire Protection Program," that were stated in BV LRA and verified that they are consistent with current industry practice. The program enhancements were reviewed for adequacy and completeness.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. In program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Boric Acid Corrosion Program

The Boric Acid Corrosion Prevention Program is an existing program. The program is credited with managing the effects of aging for structures and components that are

susceptible to boric acid corrosion. The aging effects are managed by performing periodic visual inspections of systems containing borated water and adjacent structures, components, and supports for leakage, and implementing appropriate corrective actions.

The inspectors reviewed relevant license renewal program documents, implementing procedures, the boric acid leakage database, corrective action program documents, and interviewed the boric acid program coordinator. Additionally, the inspectors performed a walkdown inspection of the Unit 1 and Unit 2 charging pump rooms.

The inspectors identified an inconsistency between NOP-ER02001, Rev. 6, "Boric Acid Control Program," and SPEAP-2,1 Rev. 5, "System Engineer Walkdown." FENOC entered this item into the BV corrective action program as CR 08-41479.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. In program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Flow-Accelerated Corrosion Program

The Flow-Accelerated Corrosion Program is an existing program. The program is credited with managing the effects of aging for wall thinning due to flow-accelerated corrosion in all carbon steel and low alloy steel components in systems containing high-energy fluids carrying two-phase or single-phase high energy fluid greater than 2% of plant operating time. The aging effects are managed by performing non-destructive examinations (e.g., ultrasonic testing) to detect wall thinning and by predicting wear rates to support proactive pipe replacement. In addition, the program provides for the performance of follow-up inspections to confirm predictions and to determine the need for repairs or replacements, as necessary.

The inspectors reviewed relevant license renewal program documents, implementing procedures, calculations, past flow-accelerated corrosion reports, and condition reports generated during previous inspections. In addition, with the engineer responsible for the flow-accelerated corrosion program, the inspectors performed a walkdown inspection of past inspection points and scheduled inspection points to confirm the configuration matched the plant drawings.

The inspectors concluded FENOC had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. In program-level documents, FENOC provided adequate guidance to ensure aging effects are appropriately identified and addressed.

b.4 System Reviews

Unit 1 Dedicated Auxiliary Feedwater Pump

The inspectors selected the Unit 1 dedicated auxiliary feedwater pump for a focused review to determine whether the aging management programs, collectively, were

adequate to effectively manage aging effects related to this system. The aging effects requiring management for the dedicated auxiliary feedwater pump are loss of material and cracking. The following aging management programs are credited with managing aging effects of the dedicated auxiliary feedwater pump: Boric Acid Corrosion; One-Time Inspection; Bolting Integrity; External Surfaces Monitoring; Lubricating Oil Analysis; and Water Chemistry.

The inspectors interviewed the system engineer responsible for the Unit 1 dedicated auxiliary feedwater pump, performed walkdown inspections, and reviewed a sample of aging management program documents to verify that the existing programs credited with managing the effects of aging in the auxiliary feedwater system have been comprehensive and effective. The inspectors reviewed system health reports, condition reports, and plant procedures.

For the dedicated auxiliary feedwater pump, the inspectors concluded that the physical condition of the system and the results of tests and inspections of the various existing aging management programs demonstrated that aging effects on the dedicated auxiliary feedwater pump have been appropriately identified and addressed. Also, the inspectors concluded that the dedicated auxiliary feedwater pump was appropriately addressed within the applicable aging management programs.

Security Diesel Generator System

The inspectors selected the security diesel generator for a focused review to determine whether the aging management programs, collectively, were adequate to effectively manage aging effects related to this system. The aging effects requiring management for the security diesel generator are loss of material, cracking, cumulative fatigue damage, and reduction of heat transfer. The TLAA for fatigue and the following aging management programs are credited with managing aging effects of the security diesel generator: Bolting Integrity; Buried Piping and Tanks Inspection; Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components; Lubricating Oil Analysis; One-Time Inspection; External Surfaces Monitoring; Closed-Cycle Cooling Water System; Selective Leaching of Materials; and Fuel Oil Chemistry.

The inspectors interviewed the system engineer responsible for the security diesel generator, performed a walkdown of the security diesel generator, and reviewed a sample of aging management program documents credited with managing the effects of aging in the security diesel generator are effective. The inspectors reviewed system health reports, condition reports, and plant procedures.

For the security diesel generator, the inspectors concluded that the physical condition of the system and the results of tests and inspections of the various existing aging management programs demonstrated that aging effects on the security diesel generator have been appropriately identified and addressed. Also, the inspectors concluded that the security diesel generator was appropriately addressed within the applicable aging management programs.

b.5 Operating Experience Review

The inspectors determined that FENOC procedures for operating experience review were consistent with the NRC accepted guidance in Sections 3, 4, and 5 of Appendix F to NEI 95-10, Rev. 6. NEI 95-10, Rev. 6, is endorsed without exceptions in Regulatory Guide 1.188 Rev. 1, "Standard Format And Content For Applications To Renew Nuclear Power Plant Operating Licenses," as providing methods that the NRC staff considers acceptable for complying with the requirements of 10 CFR 54 for preparing a license renewal application.

Aging affects have been determined generically and included within the aging management program recommendations in NUREG-1801, Rev. 1, "Generic Aging Lessons Learned (GALL) Report." NUREG-1801 is based upon industry operating experience prior to its date of issue. Each applicant should supplement this by evaluating industry operating experience after the issue date of NUREG-1801, and by performing a plant-specific operating experience review to identify aging effects requiring management that are not identified by the generic review incorporated into NUREG-1801. This supplementary review consists of three parts:

Operating Experience - Aging Effects Requiring Management
A plant-specific operating experience review should assess the operating and maintenance history for the prior five to ten years.

The program used by BVPS searched principal sources, such as site documents and databases, for aging management specific information. The inspector reviewed the program and sources of information used. FENOC searched the BV Condition Report Evaluation and Status Tracking system database, from the year 2000 forward, using key words related to aging such as "crack," "creep," "damage," "duct," "rust," etc. The search was conducted on more than 169,400 records. The inspectors reviewed the reported corrective actions on selected key words. Specific corrective action reports were selected for detailed review.

Operating Experience with Aging Management Programs
Plant-specific operating experience with existing programs should be considered.

FENOC reordered the above data into specific aging management programs. The applicable corrective action reports were then reviewed in order to evaluate whether the aging management programs were effective. The inspectors reviewed the aging management operating experience summary reports and selected the Unit 2 valve pit settlement analysis for a detailed review because

this corrective action resulted in the submittal of a time limited aging analysis (TLAA) as part of the license renewal application.

Industry Operating Experience
Industry operating experience and its applicability should be assessed to determine whether it changes plant-specific determinations. Because NUREG-

1801 is based upon industry operating experience prior to its date of issue, operating experience after the issue date of NUREG-1801 should be evaluated and documented as part of the aging management review.

FENOC reviewed the Institute for Nuclear Power Operations operating experience databases and NRC licensee event report (LER) database, for relevant operating experience after the issue date of NUREG-1801. The inspector reviewed the results of FENOC's searches. The results did not change any plant-specific determinations.

Further, during reviews of two new proposed aging management programs, the inspectors identified that FENOC had overlooked relevant plant-specific operating experience. For the specific details, see the discussion in this report (above) on the Selective Leaching of Materials Inspection Program, and the Non-EQ Inaccessible Medium-Voltage Cable Program. In both instances, when FENOC considered the plant-specific operating experience identified by the inspectors, FENOC made significant changes to its proposed program, from a non-plant specific program, described as consistent with the recommendations of NUREG-1801, to a plant-specific program. FENOC entered these deficiencies into the BV corrective action program as CR 08-43594.

In follow-up, FENOC performed an apparent cause evaluation and an extent of condition review. FENOC determined that no plant-specific operating experience reviews had been performed for new programs because the guidance in NEI 95-10, Section 4.4 stated "Plant-specific operating experience with existing programs should be considered." FENOC had interpreted that guidance to mean that no operating experience reviews were needed for "new" programs. The extent of condition reviews did not identify any additional items that required program changes or enhancements. FENOC committed to confirm the effectiveness of new programs based on incorporation of operating experience by performing a program self assessment of all new programs, prior to the period of extended operation. FENOC subsequently revised the BV LRA in Amendment 21, dated August 22, 2008, to add this commitment. As amended, the inspectors concluded FENOC's plant-specific operating experience reviews were adequate.

FENOC's operating experience reviews, as amended, were consistent with NRC and industry guidance. The inspectors concluded FENOC had conducted an adequate operating experience review in order to determine aging effects that would potentially require an aging management program. FENOC provided adequate guidance and implemented a program that ensures aging effects are appropriately identified.

c. Overall Conclusions

Overall, the inspection results support a conclusion that the proposed activities will reasonably manage the effects of aging in the systems, structures, and components identified in the application; and that the intended functions of these systems, structures,

and components will be maintained in the period of extended operation. The inspection concluded that the documentation supporting the application was in an auditable and retrievable form.

40A6 Meetings, Including Exit Meeting

The inspectors presented the inspection results to Mr. Pete Sena, Site Vice President, and members of his staff in an exit meeting that was open for public observation on November 12, 2008, in Pittsburgh, PA. FENOC had no objections to the NRC observations and made no presentation. NRC slides from the exit meeting are located in ADAMS within package ML083450475.

No proprietary information is present in this inspection report.

ATTACHMENT

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

S. Buffington, Mechanical Engineering
C. Custer, License Renewal Project Manager
T. Dometrovich, Regulatory Affairs Engineer
S. Dort, License Renewal Project
D. Grabski, Programs Engineering
J. Hester, License Renewal Project
L. Hinkle, Mechanical Engineering
D. Kosloff, License Renewal Project
G. Lauck, Electrical Engineering
T. Levi, Program Development Lead, License Renewal Project
J. Miller; Fire Protection Engineer
G. Ritz, Civil/Structural Engineer
L. Stahl, License Renewal Project
J. Thomas, Technical lead, License Renewal Project
J. Tweddell, Electrical Design Engineer
K. Woessner, License Renewal Project

NRC Personnel

D. Werkheiser, Senior Resident Inspector, Beaver Valley
D. Spindler, Resident Inspector, Beaver Valley
K. Howard, License Renewal Project Manager, NRR

LIST OF DOCUMENTS REVIEWED

License Renewal Program Documents

1/2-ADM-[BV.E3], Inaccessible Medium-Voltage Cables Suitable for Submergence, Rev 0
1/2-ADM-[BV.E6], Non-EQ Electrical Cable Connections One-Time Inspection, Rev 0
1/2-ADM-[XI.E1], Non-EQ Electrical Cables and Connections, Rev 0
1/2-ADM-[XI.E3], Inaccessible Medium-Voltage Cables, Rev 0
1/2-ADM-[XI.M12], Thermal Aging Embrittlement of CASS Program, Rev 0
1/2-ADM-[XI.M18], Bolting Integrity Program, Rev 0
1/2-ADM-[XI.M30], Fuel Oil Chemistry Program, Rev 0
1/2-ADM-[XI.M32], One-Time Inspection Program, Rev 0
1/2-ADM-[XI.M33], Selective Leaching of Materials inspection Program, Rev 0
1/2-ADM-[XI.M34], Buried Piping and Tanks Inspection Program, Rev
1/2-ADM-[XI.M35], One-Time Inspection of ASME Code Class 1 Small-Bore Piping, Rev 0
1/2-ADM-[XI.M36], External Surfaces Monitoring Program, Rev 0
LRBV-AMPB-001, Aging Management Programs Common Information, Rev 1
LRBV-AMR-05-845F, BV-1 Security Diesel Generator Design Review, Rev 3
LRBV-EAMR-001, Aging Management Review of Electrical Systems, Rev 5
LRBV-MAMR-011, Aging Management Review of Safety Injection System, Rev 7
LRBV-MAMR-24B, Aging Management Review of Auxiliary Feedwater System, Rev 7
LRBV-MAMR-45F, Aging Management Review of the Security Diesel Generator System, Rev 7
LRBV-MAMR-006, Aging Management Review of Reactor Coolant System, Rev 8
LRBV-MAMR-030-1, Aging Management Review of River Water System, Rev 5
LRBV-MAMR-030-2, Aging Management Review of Service Water System, Rev 6
LRBV-OE-001, Operating Experience Review Report, Rev 3
LRBV-OE-002, Industry Experience Review and LER Results and Summary, Rev 2
LRBV-PED-BV.E3, Inaccessible Medium-Voltage Cables Suitable for Submergence, Rev 0
LRBV-PED-BV.E6, Non-EQ Electrical Cable Connections One-Time Inspection, Rev 2 & 3 & 4
LRBV-PED-BV.M1, Reactor Vessel Integrity Program, Rev 1
LRBV-PED-X.M1, Metal Fatigue of Reactor Coolant System Pressure Boundary, Rev 2
LRBV-PED-XI.E1, Non-EQ Electrical Cables and Connections, Rev 3 & 4
LRBV-PED-XI.E3, Inaccessible Medium-Voltage Cables Suitable for Submergence, Rev 3
LRBV-PED-XI.M10, Boric Acid Corrosion Program, Rev 5
LRBV-PED-XI.M12, Thermal Aging Embrittlement of CASS Program, Rev 3
LRBV-PED-XI.M17, Flow-Accelerated Corrosion Program, Rev 4
LRBV-PED-XI.M18, Bolting Integrity Program, Rev 2
LRBV-PED-XI-M20, Open Cycle Cooling Water Program, Rev 6 & 7
LRBV-PED-XI-M26, Fire Protection Program, Rev 4
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LRBV-PED-XI.M32, One-Time Inspection Program, Rev 5 & 6
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LRBV-PED-XI.M34, Buried Piping and Tanks Inspection Program, Rev 7 & 8
LRBV-PED-XI.M35, One-Time Inspection of ASME Code Class 1 Small-Bore Piping, Rev 4 & 5
LRBV-PED-XI.M36, External Surfaces Monitoring Program, Rev 5 & 6
LRBV-PED-XI.S2, ASME Section XI, Subsection IWL Program, Rev 5
LRBV-PED-XI.S5, Masonry Wall Program, Rev 3 & 4
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Complete set of License Renewal Application Scoping and Boundary Drawings

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1-24-1, Feedwater System, Rev 2
1-24-2, Feedwater System, Rev 1
2-24-2A, Auxiliary Feedwater System, Rev 1
1-24-3, Feedwater System, Rev 1
1-45-F, Security Diesel Generator System, Rev 1
LR 2-30-1, Service Water System, Rev 4
LR 2-30-1A, Service Water System, Rev 4
LR 2-30-2, Service Water System, Rev 4
LR 2-30-3, Service Water System, Rev 4
LR 1-24-2, Feedwater System, Rev 4
LR 1-20-1, Fuel Pool Cooling, Rev 3
LR 1-30-1, River Water System, Rev 5
LR 1-30-2, River Water System, Rev 4
LR 1-30-3, River Water System, Rev 5
LR 1-30-4, River Water System, Rev 4

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1-PMP-M-36-001, Security Diesel Preventative Filter Maintenance & Oil Change, Rev 0
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2-CHM-SAM-3.62, EDG FO Day Tank, Rev 5
2-OM-30.5A.26, Main Intake Structure Inspection, Rev 0
2-OM-30.5A.27, Alternate Intake Structure Inspection, Rev 0
1/2-ADM-0801, Section XI Repair/Replacement Program, Rev 5
1/2-ADM-2016, General Area Structural Inspections, Rev 1 & 2
1/2-ADM-2054, Reactor Vessel Integrity Program, Rev 4
1/2-ADM-2106, River/Service Water System Control & Monitoring Program, Rev 2
1/2-ADM-2114, Maintenance Rule Program Administrative Procedure, Rev 3
1/2-ADM-2115, Fatigue Cycle Monitoring Program, Rev 1
1/2-ADM-2205, Flow-Accelerated Corrosion Program, Rev 1
1/2-MI-75-MANHOLE-1E, Inspection of Manholes for Induced Damage, Rev 5 & 6
1/2-OST-30.19A-D, Main Intake Structure A-D Bay Silt Check and Bay Cleaning, Rev 8
1/2-OST-30.19E-F, Alternate Intake Structure E-F Bay Silt Check and Bay Cleaning, Rev 5
1/2-OST-33.5, Fire Door Inspections, Rev 13
1/2-PMP-33FP-FIRE DOORS-1M, Periodic Inspection of Fire Doors, Rev 4
1/2-PMP-E-75-001, 4160 VAC Motor Inspection and Lubrication, Issue 4, Rev 8
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BV Primary Containment Inspection Program Plan, Rev 0
BV-2 Reactor Vessel Radiation Surveillance Program, Rev 0
CM-4.21A, Water Removal ERF/Security, Rev 3
ES-M-032, River/Service Water Inspection Monitoring Program, Rev 3
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NOP-ER-2001, Boric Acid Corrosion Control Program, Rev 7
NOP-ER-2005, Flow Accelerated Corrosion Management Program, Rev 1
SPEAP-2.1, Performance of System Walkdowns, Rev 5

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BACC Program Quarterly Health Report, 1st Quarter 2008
BACC Program Quarterly Health Report, 4th Quarter 2007
BV-1 River Water System Quarterly Health Report, 2nd Quarter 2007 to 1st Quarter 2008
BV-2 Service Water System Quarterly Health Report, 2nd Quarter 2007 to 1st Quarter 2008

Condition Reports (CRs)
* = CRs written as a result of the NRC inspection

97-02299	98-01229	99-03395	99-03521	00-00688	00-00689
00-00690	00-00691	00-00692	00-00693	00-00883	00-00884
00-00929	00-00930	00-00946	00-00947	00-00948	00-00688
00-00883	00-04183	01-00108	01-01611	01-03993	01-04272
01-04645	01-04646	01-06374	01-06822	01-06896	02-00004
02-01226	02-01316	02-01904	02-01959	02-02348	02-02488
02-02591	02-02782	02-03024	02-03191	02-03986	02-05771
02-06568	02-07185	02-07860	02-08187	02-08285	02-08392
02-09258	02-09459	02-09608	02-10048	02-10156	02-10572
02-11074	02-11342	02-11357	02-11738	03-02561	03-02843
03-04970	03-05901	03-08294	03-08966	03-09459	03-09782
03-11204	04-00690	04-03545	04-03876	04-03877	04-07993
04-09449	05-00769	05-01616	05-02141	05-03186	05-04300
05-04414	05-04498	05-05458	05-06422	05-06693	05-07412
05-07465	06-00957	06-00254	06-02119	06-03297	06-04528
06-04704	06-06305	06-06739	06-09619	06-10068	06-11490
07-13752	07-13938	07-16391	07-19436	07-25326	07-29612
08-33361	08-34422	08-35322	08-40064	08-41328	08-42372*
08-42380*	08-42454*	08-42456*	08-42458*	08-42519*	08-42630
08-42631	08-43013	08-43270*	08-43318*	08-43363*	08-43594*

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1/2-OST-30.19A, Main Intake Structure Silt Check, 5/29/2007
1/2-OST-30.19A, Main Intake Structure Silt Check, 12/11/2007
1/2-OST-30.19A, Main Intake Structure Silt Check, 5/30/2008
1/2-OST-30.19B, Main Intake Structure Silt Check, 7/10/2007
1/2-OST-30.19B, Main Intake Structure Silt Check, 2/22//2008
1/2-OST-30.19B, Main Intake Structure Silt Check, 6/18/2008
1/2-OST-30.19C, Main Intake Structure Silt Check, 12/5/2007
1/2-OST-30.19C, Main Intake Structure Silt Check, 5/20/2008
1/2-OST-30.19D, Main Intake Structure Silt Check, 7/3/2007
1/2-OST-30.19D, Main Intake Structure Silt Check, 12/18/2007
1/2-OST-30.19E, Alternate Intake Structure Silt Check, 6/17/2008

Structural Inspection Reports
BV-1 Visual Examination of IWL, 11/16/2006
BV-2 Visual Examination of IWL, 10/31/2006
BV-1&2 IWL Inspection of Containment Report, 2001
BV-1&2 IWL Inspection of Containment Report, 2006
ECP 08-0124, Masonry Wall Inspection Report, 2/2008
LRBV-WKDN-010, Walkdown Report, 01/31/2006
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TER-5308-0-2, Engineering Study of BV-1 Concrete Block Walls, 9/1999

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1-DBD-24B, Design Basis Document for Auxiliary Feedwater System, Rev 8
1/2-DBD-M-001, Design Basis Document for Fatigue Analysis, Rev 0
2-BVS-58, Specification for Shop Fabricated Piping, 09/30/1986
2-BVS-920, Specification for Field Fabrication and Erection of Piping, 10/31/1987
2-BVS-939, Specification for Piping Engineering and Design, 09/14/1987
2-BVS-359, Specification for Field Fabrication and Erection of Piping, Rev 2
COLR 18-3, Unit 1 Pressure and Temperature Limits Report, Rev 3
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1/2-DBD-M-001, Fatigue Analysis, Rev
1R17 FAC Report, May 3, 2006
1R18 FAC Report, October 30, 2007
2R12 FAC Report, November 13, 2006
2R13 FAC Report, June 4, 2008
2006 Annual Environmental operating Report, 1/08/2007

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BV-SA-04-142, Focused Self-Assessment, Boric Acid Corrosion Control Program, 01/14/2005
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GL 88-05, Boric Acid Corrosion of Reactor Pressure Boundary Components, Rev 0
NUREG-1801, Generic Aging Lessons Learned (GALL) Report, Rev 1
NUREG/CR-5704, ANL-98/31, Fatigue Design Curves of Austenitic Stainless Steels, Rev 0
NUREG/CR-6260, INEL-95/0045, Application of Interim Fatigue Curves, Rev 0
NUREG/CR-6583, ANL-97/18, Fatigue Design Curves of Carbon and Low-Alloy Steels, Rev 0
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ASME Boiler & Pressure Vessel Code, Section XI, Subsection IWL, 1992 Edition
EPRI NP-5769*, Degradation and Failure of Bolting in Nuclear Power Plants, 04/1988
EPRI Report 1000701*, Interim Thermal Fatigue Management Guideline (MRP-24), 01/2001
EPRI Report 1010639, Non-Class 1 Mechanical Guideline and Mech. Tools, Rev 4
EPRI Report 1012017, MRP-47 Guidelines for Fatigue Environmental Effects in License Renewal Applications, Rev 1
EPRI TR-104213*, Bolted Joint Maintenance & Application Guide, 12/1995
EPRI TR-109619*, Guideline for the Management of Adverse Localized Equipment Environments, 06/1999
NEI 95-10, Guidelines for Implementing the Requirements of 10 CFR Part 54, Rev 6

LIST OF ACRONYMS

ADAMS	Agencywide Documents Access and Management System
ASME	American Society of Mechanical Engineers
BV	Beaver Valley
CASS	Cast Austenitic Stainless Steel
CR	Condition Report
DRS	Division of Reactor Safety
EPRI	Electric Power Research Institute
EQ	Environmental Qualification (i.e., 10 CFR 50.49)
FAC	Flow-Accelerated Corrosion
FENOC	FirstEnergy Nuclear Operating Company
GALL	Generic Aging Lessons Learned [NUREG-1081]
IP	[NRC] Inspection Procedure
ISG	Interim Staff Guidance
ISI	Inservice Inspection
kV	Kilovolts
LER	[NRC] Licensee Event Report
LRA	License Renewal Application
MRP	[EPRI] Materials Reliability Project
NEI	Nuclear Energy Institute
NPS	Normal Pipe Size
NRC	US Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation, NRC
OA	Other Activity
PARS	[NRC] Publicly Available Records
PM	Preventive Maintenance
RVLIS	Reactor Vessel Level Indicating System
TLAA	Time-limited Aging Analysis