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L-08-144

10 CFR 54

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

SUBJECT:
Beaver Valley Power Station, Unit Nos. 1 and 2
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
Reply to Request for Additional Information for the Review of the Beaver Valley Power Station, Units 1 and 2, License Renewal Application (TAC Nos. MD6593 and MD6594)

Reference 1 provided the FirstEnergy Nuclear Operating Company (FENOC) License Renewal Application for the Beaver Valley Power Station (BVPS). Reference 2 requested additional information regarding BVPS license renewal aging management programs in Sections B.2.6, B.2.19, and B.2.23 of the BVPS License Renewal Application.

The Attachment provides the FENOC reply to the U.S. Nuclear Regulatory Commission request for additional information.

There are no regulatory commitments contained in this letter. If there are any questions or if additional information is required, please contact Mr. Clifford I. Custer, Fleet License Renewal Project Manager, at 724-682-7139.

I declare under penalty of perjury that the foregoing is true and correct. Executed on April 25, 2008.

Sincerely,

Peter P. Sena III

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NRR

References:

1. FENOC Letter L-07-113, "License Renewal Application," August 27, 2007.
2. NRC Letter, "Request for Additional Information for the Review of the Beaver Valley Power Station, Units 1 and 2, License Renewal Application (TAC Nos. MD6593 and MD6594)," March 26, 2008.

Attachment:

Reply to Request for Additional Information Regarding Beaver Valley Power Station, Units 1 and 2, License Renewal Application, Sections B.2.6, B.2.19, and B.2.23.

cc: Mr. K. L. Howard, NRC DLR Project Manager
Mr. S. J. Collins, NRC Region I Administrator

cc: w/o Attachment
Dr. S. S. Lee, NRC DLR Acting Director
Mr. D. L. Werkheiser, NRC Senior Resident Inspector
Ms. N. S. Morgan, NRC DORL Project Manager
Mr. D. J. Allard, PA BRP/DEP Director
Mr. L. E. Ryan, PA BRP/DEP

Question RAI B.2.6-01

In the Beaver Valley Power Station license renewal application (LRA), the B.2.6 "Bolting Integrity Program" is stated to be consistent with the generic aging lessons learned (GALL) report with no exceptions or enhancements. It was found that there was in fact an exception taken to the GALL report program element "parameters monitored / inspected" in regards to the requirement that "high strength bolts (actual yield strength ≥ 150ksi) used in NSSS component supports are monitored for cracking." Please provide your technical basis for taking this exception.

RESPONSE RAI B.2.6-01

FENOC did not present this reviewer-identified difference as an exception to NUREG-1801 in the License Renewal Application. The technical basis for the difference is provided in the "Detection of Aging Effects" element evaluation in the BVPS Bolting Integrity Program Evaluation Document. The "Detection of Aging Effects" NUREG-1801 element provides additional detail regarding the specific topic of cracking of high strength bolts, and includes the option of waiving volumetric examination with adequate justification. The FENOC Bolting Integrity Program evaluation includes justification for waiving volumetric inspection of high strength structural bolting, and is consistent with the "Detection of Aging Effects" element. Since justification for the detailed "Detection of Aging Effects" element provided consistency, FENOC considered the BVPS Bolting Integrity Program to be consistent with the NUREG-1801 program for the management of cracking of high strength bolting, including the "Parameters Monitored / Inspected" program element.

Background:

In NUREG-1801, Section XI.M18, "Bolting Integrity Program," program element 4, "Detection of Aging Effects," the requirement to perform volumetric examinations for cracking in high strength bolts due to stress corrosion cracking (SCC) may be waived with adequate plant-specific justification.

According to the Electric Power Research Institute (EPRI) License Renewal Structural Tools, EPRI 1002950, "Aging Effects for Structures and Structural Components (Structural Tools)," Revision 1, the only aging mechanism for cracking that may be applicable to structural bolting and threaded fasteners is SCC. FENOC did not identify

cracking due to SCC of structural bolting or threaded fasteners as an aging effect requiring management.

The basis for not identifying SCC as an aging effect came from the use of the EPRI Structural Tools to identify aging effects. According to the Structural Tools, three parameters are required for SCC to occur: (1) a corrosive environment, (2) a susceptible material, and (3) tensile stresses greater than or equal to the yield strength of the material. Additionally, the Structural Tools state that no industry-reported failures of high strength bolts due to SCC occurred in bolts of less than 1.25 inch diameter. The Structural Tools recommend that only bolts or studs greater than 1-inch nominal diameter be considered.

FENOC identified four environments for structural bolts and threaded fasteners at BVPS, and, in each environment, SCC is not an applicable aging effect. The four environments and the considerations for each include:

- Threaded Fasteners Protected from Weather – The internal environments of in-scope structures at BVPS do not contain aggressive chemicals under normal operating conditions. Therefore, the corrosive environmental conditions necessary for SCC to occur do not exist. In addition, a review of plant-specific operating experience identified no occurrences of SCC on high strength structural bolting.
- Threaded Fasteners Exposed to Weather – As mentioned above, the EPRI Structural Tools state that no industry-reported failures of high strength bolts due to SCC occurred in bolts of less than 1.25 inch diameter. Since no high-strength bolts of 1-inch or larger diameter have been identified in outdoor structural applications at BVPS, cracking due to SCC is not an aging effect requiring management for threaded fasteners exposed to weather.
- Threaded Fasteners Exposed to Raw Water – No high-strength bolts of 1-inch or larger diameter have been identified in submerged structural applications. Therefore, cracking due to SCC is not an aging effect requiring management for high strength threaded fasteners exposed to raw water.
- Threaded Fasteners Exposed to Treated (Borated) Water – Structural threaded fasteners exposed to treated (borated) water are made of stainless steel at BVPS. The Structural Tools state that SCC very rarely occurs in austenitic stainless steels below a temperature of 140°F. Since structural threaded fasteners at BVPS are not exposed to temperatures above this threshold for cracking of stainless steel, cracking due to SCC is not an aging effect requiring management for threaded fasteners exposed to treated water.

Based on the application of the EPRI Structural Tools and evaluation of industry and plant-specific operating experience for each environment applicable to structural bolts and threaded fasteners, SCC is not an aging effect requiring management at BVPS.

This plant-specific justification supports waiving the NUREG-1801 volumetric examination requirements for cracking due to SCC of high strength structural bolts and fasteners.

Question RAI B.2.6-02

In the BVPS LRA, the B.2.6 "Bolting Integrity Program" is not clear in how it satisfies the GALL report program element "monitoring and trending." Specifically, the element requires bolting connections for pressure retaining components (not covered by ASME Section XI) to be "inspected daily. If the leak rate does not increase, the inspection frequency may be decreased to biweekly or weekly." BVPS credits their corrective action program for meeting this inspection frequency. However, it was not readily apparent how this is achieved. Please provide detailed plans for inspection frequency which satisfy this GALL element.

RESPONSE RAI B.2.6-02

The NUREG-1801 Section XI.M18 text for element 5, "monitoring and trending," states that, "If bolting connections for pressure retaining components (not covered by ASME Section XI) is reported to be leaking, then it may be inspected daily. If the leak rate does not increase, the inspection frequency may be decreased to biweekly or weekly." Leakage identified from bolted connections for pressure-retaining components not covered by ASME Section XI is dispositioned, monitored and corrected using the FENOC Corrective Action Program. Appropriate corrective actions, including plans for inspection frequency, are determined based on the system, component, fluid, location of the leak, leak rate, and effect on the system or component intended function.

The FENOC Corrective Action Program ensures that adverse conditions, such as failures, malfunctions, deficiencies, deviations, defective hardware and nonconformances, or human performance, programmatic, organizational, or management weaknesses, are identified and corrected in a timely manner. Within the Corrective Action Program, adverse conditions are identified and categorized as conditions adverse to quality (CAQs) or significant conditions adverse to quality (SCAQs) based on the significance and consequences of the specific problem identified. Management committees review condition reports to determine the proper categorization as well as the corrective actions initiated to resolve the issue. In the case of SCAQs, measures are implemented to ensure that the cause of the nonconformance is determined and that corrective actions preclude recurrence. In addition, the root cause of the SCAQ and the corrective actions implemented are documented and reported to senior levels of BVPS management.

The use of the FENOC Corrective Action Program to disposition, monitor, and correct leakage from bolted connections for pressure retaining components not covered by ASME Section XI provides reasonable assurance of timely detection of any aging effects, and ensures that intended functions will be maintained consistent with the current licensing basis.

Question RAI B.2.19-01

In the BVPS LRA, the B.2.19 "Flux Thimble Tube Inspection Program" is not clear in how it arrived at the wear limit specifications required as part of the GALL report program elements "parameters monitored / inspected" and "detection of aging effects." BVPS originally committed to a 45% wear limit when it responded to NRC Bulletin 88-09, however it now cites 70% as its flux thimble tube wear limit. Please provide the history of approvals and the technical basis for this change.

RESPONSE RAI B.2.19-01

In the FENOC response to NRC Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors," it was noted that the acceptance criteria of 45% wear allowance was subject to change based on the results of the Westinghouse Owners Group (WOG) program that was in development at that time.

The NRC acknowledged the fact that flux thimble tube wear limits were subject to potential future changes as noted in a NRC memorandum dated August 1, 1989, from Peter S. Tam to John F. Stoltz, stating, "The licensee also committed to perform future inspections in accordance with new information received from the Westinghouse Owners Group and plant-specific data gathered during previous inspections."

The original wear limit was based on an evaluation that recommended flux thimble tubes with 40% measured wear be repositioned, and tubes with 45% measured wear be capped or isolated. A finite element analysis associated with the evaluation showed that a wear limit of 60% was acceptable in an environment where the external pressure was 2250 psig. Application of an uncertainty value of 15% resulted in the 45% wear limit associated with the BVPS response to the NRC Bulletin.

In subsequent outages, BVPS evaluated changes to the initial flux thimble wear limit that were based on a combination of Westinghouse recommendations and plant-specific data through a series of 10 CFR 50.59 determinations. During this period, the uncertainty value also decreased from 15% to 10% based on improved eddy current test methods.

In January of 1991, the WOG released its flux thimble tube program, which recommended an 80% wear limit criterion. When a 10% uncertainty factor is applied, the resulting BVPS limit is 70%. Based on the overall performance of the Flux Thimble Tube Inspection Program to-date, the current wear limits provide reasonable assurance that aging effects will be adequately detected and meet the elements of the NUREG-1801 program.

Question RAI B.2.19-02

In the BVPS LRA, the B.2.19 "Flux Thimble Tube Inspection Program" describes an operating experience event which occurred in 2003, during refueling outage 1R15, where several flux thimble tubes which were replaced during 1R13 displayed elevated wall thinning. Of those with significant wall thinning, only two tubes were projected to exceed the BVPS 70% threshold for wall thinning. The BVPS staff stated in the aging management program (AMP) audit that this initial elevated wear was explained as an initial wear in period, after which wear rates would significantly slow down. Please provide the specific wall thicknesses measured and the technical basis to come to the conclusion that this was acceptable.

RESPONSE RAI B.2.19-02

Of the 18 thimble tubes replaced during the Unit 1 Cycle 13 refueling outage (1R13, February 15, 2000 – April 7, 2000), 16 thimbles exhibited wear scars after examination during the Unit 1 Cycle 15 refueling outage (1R15, March 8, 2003 – April 29, 2003).

The basis for acceptance was that all of the 18 thimble tubes replaced during 1R13 exhibited wear scars that were well below the program wear limit of 70% after examination during 1R15, and relevant data were available to provide confidence that the rate of wear would decrease during the subsequent two cycles. Specifically, the wear for the same 18 thimble tubes was projected through the Unit 1 Cycle 17 refueling outage (1R17, February 13, 2006 – April 19, 2006) by Westinghouse. Two locations were conservatively projected to exceed or be close to the program wear limit of 70%. These two thimble tubes, thimbles D-12 and E-05 (bold text in Table B.2.19-1, below), were repositioned during the Unit 1 Cycle 16 refueling outage (1R16, October 18, 2004 – November 14, 2004) in accordance with recommendations from Westinghouse.

Table B.2.19-1, below, shows the 1R15 and 1R17 eddy current examination results for the 18 thimble locations replaced during 1R13, and the data contained therein confirm that the rate of wear decreased and the projections were conservative.

Table B.2.19-1
Thimble Tube Location and Wear Percentage

Thimble	Location	1R15 Wear (%)	1R17 Wear (%)
B-05	LCP +0.00"	30.45	45.15
B-05	LCP +30.56"	NDD	14.70
B-05	CSP -6.44"	NDD	17.85
B-05	UTP +0.00"	NDD	22.05
B-05	CSP +4.54"	9.45	NDD
B-07	LCP +0.00"	22.05	19.95
B-08	LCP +0.00"	26.25	24.15
B-10	LCP +0.00"	37.80	50.40
B-10	UTP +0.00"	25.20	29.40
D-03	LCP +0.00"	14.70	15.75
D-03	CSP +5.77"	12.60	12.60
D-12	**LCP +0.00"**	**49.35**	**56.70**
D-12	UTP +0.00"	14.70	13.65
D-12	UTP +2.00"	NDD	23.10
E-05	**LCP +2.24"**	**47.25**	**39.90**
E-05	UTP +1.91"	13.65	18.90
F-04	LCP +0.00"	16.80	18.90
F-04	CSP -3.95"	26.25	34.65
F-04	UTP +0.00"	38.85	58.80
G-14	LCP +0.00"	21.00	29.40
H-01	LCP +0.00"	16.80	14.70
H-03	LCP +0.00"	23.10	19.95
H-03	UTP +0.00"	16.80	26.25
H-13	LCP +0.00"	11.55	12.60
H-13	UTP +0.00"	13.65	21.00
J-05	N/A	NDD	NDD
J-07	LCP +0.00"	39.90	35.70
J-15	LCP +0.47"	NDD	26.25
J-15	UTP +0.00"	NDD	16.80
L-04	LCP +0.00"	36.75	36.75
L-04	CSP +6.95"	17.85	34.65
L-14	LCP +0.00"	16.80	27.30
L-14	UTP +0.00"	NDD	13.65
N-07	LCP +0.00"	19.95	21.00
N-07	UTP +0.00"	NDD	19.95

The following abbreviations are used in Table B.2.19-1:

LCP – Lower Core Plate
CSP – Core Support Plate
UTP – Upper Tie Plate
NDD – No Detectable Degradation

Question RAI B.2.23-01

In the BVPS LRA, the B.2.23 "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program" program evaluation document credits their Maintenance Rule Program for meeting the GALL report program element "parameters monitored / inspected" to "evaluate the effectiveness of the maintenance monitoring program and the effects of past and future usage on the structural reliability of cranes." However, careful inspection of this AMP program showed no direct reference to the Maintenance Rule Program. Please provide documentation of direct reference in the AMP to the Maintenance Rule Program.

RESPONSE RAI B.2.23-01

The License Renewal Program Evaluation Document for the "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program" has been revised to clearly credit the site Maintenance Rule Program administrative procedure as the implementing document for the "parameters monitored / inspected" NUREG-1801 program element.

Additionally, the site Maintenance Rule Program administrative procedure has been added to the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program Evaluation Document attachment that identifies existing implementing procedures.

Question RAI B.2.23-02

In the BVPS LRA, the B.2.23 "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program" describes an operating experience event which occurred in 2003, when deficiencies and degraded crane material conditions relating to the lift of a high integrity container in the waste handling building led to a stop work order for radiological lifts. No additional details were provided describing additional corrective actions or enhancements driven by this event. A lack of response by the BVPS monitoring program would bring into question their ability to meet the GALL report program element, "detection of aging effects." Please provide additional details on this operating experience, as well as any additional actions, or program enhancements that resulted from this event.

RESPONSE RAI B.2.23-02

The Waste Handling Building Crane operating experience event that occurred in 2003 was documented in a condition report in the FENOC Corrective Action Program (CAP). The Nuclear Quality Assurance (NQA) group issued a stop work order due to:

1. Programmatic deficiencies, including crane operator training issues;
2. Material condition issues associated with the crane cameras and controls; and,
3. Material condition of the grapple for the High Integrity Container.

The Operations Shift Manager placed administrative controls on the crane to ensure that it would not be used for radiological lifts until appropriate corrective actions had been completed. FENOC personnel completed a Root Cause Analysis Report for the event, and, as a result of a Generic Implications review, an additional condition report was entered in the CAP to address other cranes where cameras and monitors did not function properly. Many additional actions were taken and several program enhancements were made in response to this event.

Twenty-one (21) corrective actions were developed for resolution of the original CAP condition report; the most significant of these corrective actions are summarized below:

- A CAP review was required to ensure that all issues specific to an earlier, related condition report were addressed in the response to this operating experience condition report. A new corrective action was developed to track those previous issues to closure.

- The Waste Handling Building Crane degraded materiel condition issues were resolved before the crane was used for radiological lifts. NQA verified that the work orders were completed and closed.

- Crane performance issues and deficiencies identified during performance of the crane Preventive Maintenance Procedure were resolved before placing the crane back in service.

- The crane electrical Preventive Maintenance Procedure was revised to include inspections of the crane cameras, monitors and controllers.

- A facilitated review of the CAP condition report and the associated Root Cause Report was conducted for selected crane Operations Support and Radiation Protection Personnel to ensure they had a full understanding of the issues, potential consequences, findings and corrective actions associated with the operating experience event.

- The crane operating procedure was revised prior to using the crane for radiological lifts. NQA verified that a prerequisite condition had been added to ensure proper functioning of the crane cameras before the crane could be used for radiological lifts.

- Operations Management reinforced the management expectation that equipment shall not be operated in a degraded materiel condition.

- The Operations Manager discussed the Waste Handling Building Crane issues with the Acting Operations Support Superintendent and took appropriate personnel actions.

- A copy of the Root Cause Analysis Report was provided to specific area Training Committee Chairmen with the recommendation that each Training Committee review the Report and make determinations for inclusions into the training program.

- The Training Department implemented a crane operation training program for Radwaste Personnel in accordance with the Systematic Approach to Training (SAT) Process. NQA verified that the training material met the development standards of the SAT process, including the development of On the Job Training and Task Performance Standards.

- Radwaste Personnel attended crane operator training and completed On the Job Training and Task Performance Standards to become qualified to operate the Waste Handling Building Crane.

- An Effectiveness Review (completed August 26, 2004) was performed six months after completion of the corrective actions. During the process for the implementation of the original corrective actions and during the use of the crane, additional issues were identified. These additional issues led to the development of additional condition reports and associated corrective actions. Therefore the initial Effectiveness Review was considered indeterminate, and a new corrective action was initiated to conduct another Effectiveness Review at the appropriate time following completion of the newly identified actions.

- A corrective action was generated to repair or replace the crane programmable logic controller in a timely manner, and another corrective action ensured that plant records were updated to include the specifications and operating details of the new programmable logic controller.

- A crane operating procedure was revised to include testing of the emergency stop switch function that had been installed by a temporary modification.

- Operations Management raised the site priority to resolve the Waste Handling Building Crane degraded materiel condition issue.

- The second Effectiveness Review, completed six months following completion of the additional corrective actions, concluded that the material condition of the crane was much improved and satisfactory; it also concluded that the established corrective actions had been effective.

As illustrated by the above history of corrective actions associated with this operating experience event, the responses were timely and comprehensive. While some additional issues were encountered during the timeline, these issues were appropriately addressed and resolved. Based on this summary, the FENOC Corrective Action Program provides reasonable assurance that aging effects will be detected and addressed in a timely manner.