FENOC
FirstEnergy Nuclear Operating Company

Beaver Valley Power Station
P.O. Box 4
Shippingport, PA 15077-0004

Lew W. Myers
Senior Vice President

412-393-5234
Fax: 724-643-8069

June 2, 2000
L-00-073

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

**Subject: Beaver Valley Power Station, Unit No. 1 and No. 2**
**BV-1 Docket No. 50-334, License No. DPR-66**
**BV-2 Docket No. 50-412, License No. NPF-73**
**Reply to Notice of Violation**

In response to NRC correspondence dated May 3, 2000, and in accordance with 10 CFR 2.201, the attached reply addresses the Notice of Violation transmitted with the letter.

The cited events were discussed in NRC Inspection Report Nos. 50-334/99-10, 50-412/99-10, 50-334/00-01, 50-412/00-01, 50-334/00-02 and 50-412/00-02 and also during a Predecisional Enforcement Conference held on April 13, 2000.

We understand the significance of these violations and recognize that we missed opportunities to correct these deficiencies in a more timely manner. Specifically,

1. The deformed expansion joint event was a culmination of inadequate preventive maintenance and untimely corrective actions that resulted in one service water train being inoperable.

2. The change in our use of filtered water was inadequately assessed and resulted in binding of two river water pumps.

3. Our test program did not efficiently assess the performance of our safety-related river water pump seal water supply strainers.

Our actions to prevent another occurrence are comprehensive and aggressive. We are committed to improving our overall performance and will maximize the lessons learned from these significant issues.

IE07

If there are any questions concerning this matter, please contact Mr. Thomas S. Cosgrove, Manager, Licensing at 724-682-5203.

Sincerely,

Lew W. Myers

c: Mr. D. S. Collins, Project Manager
Mr. D. M. Kern, Sr. Resident Inspector
Mr. H. J. Miller, NRC Region I Administrator

**Subject:** **Beaver Valley Power Station, Unit No. 1 and No. 2**
**BV-1 Docket No. 50-334, License No. DPR-66**
**BV-2 Docket No. 50-412, License No. NPF-73**
**Reply to Notice of Violation dated May 3, 2000**

I, Lew W. Myers, being duly sworn, state that I am Senior Vice President of FirstEnergy Nuclear Operating Company (FENOC), that I am authorized to sign and file this submittal with the Nuclear Regulatory Commission on behalf of FENOC, and that the statements made and the matters set forth herein pertaining to FENOC are true and correct to the best of my knowledge and belief.

FirstEnergy Nuclear Operating Company

Lew W Myers

Lew W. Myers
Senior Vice President - FENOC

COMMONWEALTH OF PENNSYLVANIA

COUNTY OF BEAVER

Subscribed and sworn to me, a Notary Public, in and for the County and State above named, this 2nd day of June, 2000.

Sheila M. Fattore

My Commission Expires:

Notarial Seal
Sheila M. Fattore, Notary Public
Shippingport Boro, Beaver County
My Commission Expires Sept. 30, 2002
Member, Pennsylvania Association of Notaries

FIRSTENERGY NUCLEAR OPERATING COMPANY
Beaver Valley Power Station, Unit Nos. 1 and 2

**Reply to Notice of Violation**
**Letter dated May 3, 1998**

I. VIOLATION ASSOCIATED WITH INADEQUATE CORRECTIVE ACTIONS FOR SW VACUUM BREAK CHECK VALVES

10 CFR 50, Appendix B, Criterion XVI "Corrective Action," requires, in part, that conditions adverse to quality be promptly identified and corrected. The cause of significant conditions adverse to quality must be identified and corrective actions taken to preclude recurrence.

Unit 2 Technical Specification (TS) 3.7.4.1 requires that with less than two service water (SW) subsystems supplying safety related equipment OPERABLE, at least two SW subsystems are to be returned to OPERABLE status within 72 hours, or the plant must be in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Contrary to the above, between 1991 and December 1999, the licensee failed to correct and prevent recurrence of a significant condition adverse to quality involving mechanical binding of the river water (RW) (Unit 1) /service water (SW) (Unit 2) pump vacuum break check valves. Specifically, as early as 1991, the licensee identified that the RW and SW pump vacuum break check valves occasionally stuck open due to corrosion binding. Failure of the check valves to close could flood the affected intake structure cubicle making one RW and one SW pump inoperable. The licensee failed to recognize, as evidenced by the lack of procedural direction to verify proper RW/SW vacuum break check valve performance during equipment operation, that failure of the check valve to open due to corrosion binding could also have an adverse effect on the systems. Failure of the vacuum break check valve to open as designed could cause a water hammer in the SW or RW system. The licensee's corrective actions to resolve the degraded condition were not timely or effective as evidenced by the following:

- In 1993, the licensee initiated an annual preventive maintenance (PM) task to clean and inspect the check valves. However, the procedures for implementing the associated PM tasks were incomplete in that they did not contain sufficient instruction to ensure the effects of the valve failure mechanism (corrosion binding) had been corrected. Specifically, the SW PM did not contain instructions to lubricate the collar/hinge pin interface and the RW PM did not verify free valve movement. The RW and SW pump vacuum break check valves continued to exhibit degraded performance within the prescribed PM periodicity.

- In 1995, the vacuum break check valve for the "C" RW pump failed to open and the licensee failed to modify the PM task or implement other corrective actions necessary to preclude recurrent failure of the RW/SW vacuum break check valves.

- Design change requests to replace the check valves were initiated in 1996; however, as of November 9, 1999, the check valves had not been replaced.

- From June to December 1999, PM tasks for safety related Unit 1 RW pump vacuum break check valves and Unit 2 SW pump vacuum break check valves were rejected/rescheduled beyond their periodicity without the required documented technical evaluations or manager approvals.

Consequently, on November 9, 1999, the vacuum break check valve for the "C" SW pump failed to open, causing a water hammer event. The water hammer caused deformation of an expansion joint downstream of the "C" SW pump which rendered the pump inoperable. Subsequently, on November 15, 1999, the "B" SW pump was taken out of service for maintenance, and was not declared operable until November 22, 1999. Therefore, since the "C" SW pump was being relied upon during this time to support operability of the "B" SW train, the "B" SW train was inoperable. As a result, only the "A" SW train was operable with the plant in Mode 1. This condition lasted longer than 72 hours, contrary to Technical Specification 3.7.4.1.

This is a Severity Level III violation (Supplement I).

Reasons for the Violation

The root causes of the violation were:

- The implementation of the preventative maintenance (PM) program was inadequate due to: lack of rigor in adherence to the program, inadequate management attention and inadequate expectations for adherence to the program. The failure to perform the PM task on the "C" service water (SW) pump vacuum break check valve (VBCV) prior to its limit date resulted in the failure of the valve to open which caused the water hammer which deformed the expansion joint.

- The corrective actions to resolve the binding of the river water (RW)/SW pumps VBCVs by the previous licensee were inadequate. An annual PM task for the VBCVs was established in 1993; however, it was not performed at its scheduled periodicity or evaluated for effectiveness. In

addition, the design change to upgrade the VBCVs was not implemented in a timely manner.

- There was a lack of understanding of the consequences of a failure of the RW/SW pump VBCVs. The VBCV binding and seat leakage was accepted as a housekeeping issue, without adequately questioning the consequences if the valve stuck in the open or closed positions.

Corrective Actions Taken and Results Achieved

1. After discovery of the deformed expansion joint, the "C" SW pump and the "B" SW train were declared inoperable and the appropriate technical specification requirements were followed. Condition Report 993279 was initiated and the problem was evaluated under the corrective action program.

2. An inspection of the affected piping, pipe supports and the remaining SW pump expansion joints was performed. The affected piping, pump and valves were also evaluated for potential over-stress conditions prior to returning the "C" SW pump to service.

3. The deformed expansion joint was replaced. The defective "C" SW pump VBCV was replaced with a new style nozzle check valve that is less susceptible to corrosion and binding. The remaining Unit 2 SW pump VBCVs and the Unit 1 reactor and turbine plant river water pump VBCVs were also replaced with the new style check valve.

4. The manual isolation valves for the VBCVs for the Unit 1 RW pumps and Unit 2 SW pumps were inspected, and repaired or replaced as needed.

5. This event was reviewed in Operations shift briefings along with other examples of operating experience involving water hammer events to emphasize the importance of having a questioning attitude of equipment deficiencies as well as observing those passive components that support component operability.

6. A multi-disciplined analysis team (MDAT) was formed to review the preventative maintenance program. Included in the MDAT assessment was a review of PM tasks that were beyond their limit date. An engineering review was conducted for these tasks to determine the impacts to operability. Each item was determined to be acceptable and documented or the PM was performed.

7. The event was reported as Licensee Event Report (LER) 50-412/99-011, including Supplement 1.

Corrective Actions to Prevent Further Violations

1. The event was also reviewed during licensed and non-licensed operator retraining. The training discussed symptoms of water hammer occurrence, management expectations regarding a questioning attitude, and required actions if a water hammer is suspected.

2. A six-month preventive maintenance (PM) frequency for the new style VBCV was established. The PM task includes removal of the valve, measurement of the as-found pressure needed to open the valve and cleaning of the valve internals. The initial PM performances have revealed that the new VBCVs remain in excellent condition.

3. A site-wide communication letter was issued by the Senior Vice President that provided management expectations for performing preventative maintenance and the management authorizations necessary to permit a preventative maintenance item to enter the grace period or to exceed its limit date. Each employee at the Beaver Valley Power Station was required to sign the letter stating that they read and understood the policy. The PM program administrative procedure was also revised to reflect these requirements. Since the implementation of these controls, the performance of PMs by their scheduled date has improved and the expectations are being fulfilled.

Date When Full Compliance will be Achieved

Full compliance was achieved with the replacement of the RW/SW pump VBCVs which eliminated a long standing material deficiency.

II. VIOLATION ASSOCIATED WITH INADEQUATE TEMPORARY MODIFICATION OF RW PUMP SEAL WATER SUPPLY SYSTEM

10 CFR 50, Appendix B, Criterion III, requires, in part, that measures shall be established for the selection and review for suitability of application of equipment that is essential to the safety-related function of the system.

Contrary to the above, prior to February 5, 2000, the licensee failed to adequately review the suitability of a temporary modification to the Unit 1 RW pump seal water supply system, which resulted in elevated seal water temperature and led to failure of two RW pumps. Specifically, on February 5, 2000, operators implemented temporary operating procedure (TOP) 90-17, "River Water (RW) Supply to the Six Way Flow Splitting Box," Rev. 3, which altered the RW pump seal injection temperature to river temperature differential to a value outside of the pumps' critical performance attributes. As a result, thermal expansion of the pump internals caused the "B" and "C" RW pumps to mechanically bind, making the "B" RW train inoperable.

This is a Severity Level III violation (Supplement I).

Reason for the Violation

The root cause of the violation was inadequate knowledge/technical information of the temperature effects of seal water on the thermal expansion of a non-operating pump shaft. Specifically, there was no available information which discussed the critical characteristics of the seal water temperature. Without this knowledge or information, the likelihood of detection of the reactor plant river water (RPRW) pump seal water supply design deficiency prior to implementation of Temporary Operating Procedure (TOP) 90-17 was very low. While the temperature of the seal water being supplied to the RPRW pumps after TOP 90-17 implementation was higher than the seasonal norm, it was still within the normal temperature range of both the filtered water system and RW systems. The RPRW pump binding was caused by the temperature differential between the seal water temperature and the low river water (RW) temperature during the time of the event.

Corrective Actions Taken and Results Achieved

1. After the "B" RPRW pump failed to start, the "B" RW train was declared inoperable and the appropriate technical specification requirements were followed.

2. Condition Reports 00-0528 and 00-0531 were initiated respectively for the failure of the "B" and "C" RPRW pumps to start. A multi-disciplinary Event Response Team (ERT) was also convened to investigate the event, and determine the root cause and corrective actions.

3. The operating "A" RW train was protected by restricting access to the "A" intake structure cubicle and, later, by stationing an operator at the pump to secure the filtered water supply in case the pump would trip. The auxiliary RW pumps were also verified to freely rotate and were available to supply cooling water if needed.

4. The "B" and "C" RPRW pumps were quarantined to preserve the as-found conditions.

5. As a precautionary measure, operators reviewed the procedures for loss of river water.

6. Controls were implemented to preclude the use of filtered water as a seal water supply to the RPRW pumps, after the ERT investigation determined that the pump binding was caused by the differential temperature between the river water and seal water temperature.

Corrective Actions to Prevent Further Violations

1. The vendor technical information for the Unit 1 RPRW pumps and the Unit 2 SW pumps were revised to reflect the seal water temperature effects on these pumps.

2. The use of filtered water to supply seal water to the RPRW pumps was discontinued. Seal water to these pumps is now self-supplied through safety-related cyclone separators which were installed and tested during the 1R13 refueling outage. The self supply of seal water to the RPRW pumps ensures that the pump's seal water temperature is not significantly different from the river water temperature.

3. This event was reported to the industry as an INPO operating experience report and also as Licensee Event Report (LER) 50-334/2000-002, including Supplement 1.

Date When Full Compliance will be Achieved

Full compliance was achieved with the installation and testing of the new safety related seal water supply to the RPRW pumps prior to Unit 1 restart from the 1R13 refueling outage.

III. VIOLATIONS ASSOCIATED WITH DESIGN DEFICIENCIES AND INADEQUATE TESTING OF SEAL COOLING WATER

A. 10 CFR 50, Appendix B, Criterion III, requires, in part, that measures shall be established for the selection and review for suitability of application of equipment that is essential to the safety-related function of the system.

Contrary to the above, in 1975 and 1976, measures for the selection and suitability of the seal water supply to the Unit 1 river water (RW) pumps were inadequate. Specifically:

- The safety-related self supply seal water strainers for the RW pumps had insufficient capacity to provide an uninterrupted seal cooling flow to the pumps during all river conditions. The safety-related self supply seal water strainers were undersized and susceptible to fouling during conditions of high river silt. In fact, on February 19, 2000, during a period of increased river water level, the safety-related seal water strainer for the "B" RW pump clogged causing low seal water pressure to the pump. Additionally, on March 3, 2000, the "C" RW pump seal water strainer clogged immediately after pump start, reducing seal flow below that required for continued pump operation.

- The filtered water system which provided the normal seal water supply to the RW pumps was not suitable for the application in that the potential existed for the seal water temperature to be higher than river water temperature which could cause thermal expansion of the pump internals. Thermal expansion of the pump internals could result in mechanical binding when starting an idle pump which would prevent the pump from performing its safety-related function. During installation of filtered water as the normal source of seal water to the RW pumps, the licensee failed to recognize that differential temperature was a critical attribute to pump performance. Consequently, the licensee failed to consider that seal water could be supplied from the filtered water storage tank at a higher temperature than river water.

B. 10 CFR 50, Appendix B, Criterion III requires that design control measures provide for verifying the adequacy of design by performance of design reviews, calculational methods, or a suitable test program. Where a test program is used to verify the adequacy of a specific design feature, it shall include suitable qualification testing under the most adverse design conditions.

10 CFR 50, Appendix B, Criterion XI, requires in part, that all testing required to demonstrate that systems will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements contained in applicable design documents. Additionally, the test is to be performed under suitable environmental conditions.

Contrary to the above, since initial plant operation in 1976, RW pump testing did not demonstrate that the RW system would perform satisfactorily in service under the most adverse design and environmental conditions. Specifically, the test program, including original system acceptance testing and periodic surveillance testing, required by Technical Specifications, failed to verify the safety-related self supply seal water strainers were adequate to provide RW pump seal and motor cooling following start of an idle RW pump during all river conditions, including high silt levels.

These violations constitute a Severity Level III problem (Supplement 1).

Reasons for the Violations

The design and testing of the Unit 1 RPRW pump seal water supply was inadequate due to the following reasons:

- The design of the safety-related seal water strainers was deficient in that the strainers were insufficiently sized to reliably filter river water when high silt levels in the river water existed or when an idle RPRW pump was started after river silt accumulated near the pump's intake.

- The design deficiency with the RPRW pump safety-related seal water supply strainers was masked since initial unit operation in 1976 by the use of nonsafety-related filtered water as the normal supply to the RPRW seals.

- The use of filtered water as the seal water supply to the RPRW pumps was implemented in 1976 without knowledge of the differential temperature effect on pump shaft length or adequate consideration of other potential common mode failure modes.

- The pre-operational testing of the Unit 1 RPRW pumps focused on pump performance and utilized the non-Class 1E powered self-cleaning strainer WR-S-2 as the pump's seal water supply. The test also did not contain

acceptable criteria to verify the performance of the RPRW pump's safety-related strainers.

- The periodic surveillance testing of the Unit 1 RPRW pumps was inadequate in that the pumps were not started with only their safety-related seal water supply in service. The safety-related seal water supply was established during quarterly testing to verify flow and pressure capability; however, this was done after the pumps were already started using the nonsafety-related filtered water system to supply seal water to the pumps.

Corrective Actions Taken and Results Achieved

1. The ERT which was formed to investigate the RPRW pump binding event also reviewed the design of the seal water supply to the RPRW pumps, including the filtered water supply to these pumps. The ERT also investigated the condition reports generated for the February 19, 2000 and March 3, 2000 fouling of the RPRW safety-related strainers.

2. Controls were implemented to preclude the use of filtered water as a seal water supply to the RPRW and SW pumps after the ERT investigation determined that the pump binding was caused by the temperature differential between the river water and seal water temperature.

3. The ERT investigation of the condition reports involving the safety-related strainer fouling determined that the existing strainers were not sufficiently reliable, and that the safety-related seal water supply to the RPRW pumps needed to be upgraded. The resolution of the RPRW pump seal water supply problem was designated as a Mode 4 hold for unit restart from the 1R13 refueling outage.

4. A review of the seal water or bearing lube water supply for safety-related pumps at both Unit 1 and 2 was performed to determine if a change in seal water temperature could occur and cause a problem similar to the RPRW pump binding. No issues were identified other than the previously identified issue regarding the RW and SW pumps susceptibility to seal water temperature changes.

5. A sampling review of surveillance test procedures at both units associated with the emergency diesel generators, containment quench spray and recirculation spray, auxiliary feedwater, and high head and low head safety injection systems was performed to determine if non-safety grade support systems were being inappropriately relied upon during surveillance testing.

The review concluded that no non-safety grade equipment was being inappropriately relied upon in the test procedures reviewed.

6. The Unit 1 RPRW pump and Unit 2 SW pump surveillance procedures have been revised to periodically start the pumps with the seal water supply in a lineup that is comparable with the pumps accident lineup with a loss of offsite power.

7. The operating manual procedure for river flooding has been revised to check the intake bays for a buildup of silt, sludge and river debris and to clean the bays if necessary.

8. An ISEG-led assessment of the Unit 1 RW system was conducted using a vertical slice technique to review the areas of operations, maintenance, surveillance testing, design and system engineering and programs. Based on the evaluation results, the assessment team concluded that the Unit 1 RW system is capable of performing its intended functions. Issues identified by the assessment team were entered into the corrective action program for disposition.

Corrective Actions Taken to Prevent Further Violations

1. The vendor technical information for the Unit 1 RPRW pumps and the Unit 2 SW pumps were revised to reflect the seal water temperature effects on these pumps.

2. A design change was implemented during the 1R13 refueling outage to upgrade the Unit 1 RPRW pump self-supplied seal water system. This design change replaced the inadequately sized strainers with cyclone separators that continuously blowdown while in service to prevent fouling of the seal water supply to the RPRW pumps. A prototype cyclone separator was field tested prior to the installation of the design change to ensure that the system would function over a range of river water silting conditions. Post modification testing was also performed to verify that acceptable seal water was being supplied to the RPRW pumps. The self supply of seal water to the RPRW pumps also ensures that the pumps' seal water temperature is not significantly different from the river water temperature.

3. The Independent Safety Evaluation Group (ISEG) will perform a sampling review of surveillance test procedures at both units associated with safety-related components to independently determine if non-safety grade support systems are being inappropriately relied upon during testing. This review

will be completed by July 15, 2000. Issues identified from this review will be dispositioned by the corrective action program.

Date When Full Compliance will be Achieved

Full compliance was achieved with the installation and testing of the new safety-related seal water supply to the RPRW pumps prior to the Unit 1 restart from the 1R13 refueling outage.