February 22, 2000

Mr. L. W. Myers
Senior Vice President
Beaver Valley Power Station
Post Office Box 4
Shippingport, PA 15077

SUBJECT: BEAVER VALLEY 1 AND 2 - REVIEW OF THE RESPONSES FOR GENERIC LETTER 96-05, "PERIODIC VERIFICATION OF DESIGN-BASIS CAPABILITY OF SAFETY-RELATED MOTOR-OPERATED VALVES," (TAC NOS. M97015 AND M97016)

Dear Mr. Myers:

On September 18, 1996, the Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 96-05, “Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves,” requesting each nuclear power plant licensee to establish a program, or to ensure the effectiveness of its current program, to verify on a periodic basis that safety-related motor-operated valves (MOVs) continue to be capable of performing their safety functions within the current licensing bases of the facility.

On November 18, 1996, Duquesne Light Company (DLC) submitted a 60-day response to GL 96-05 as the then licensee for Beaver Valley notifying the NRC that it would implement the requested MOV periodic verification program at Beaver Valley Power Station, Units 1 and 2 (BVPS-1 and 2). On March 17, 1997, DLC submitted a 180-day response to GL 96-05 providing a summary description of the MOV periodic verification program planned to be implemented at Beaver Valley. In a letter dated April 13, 1998, DLC updated its commitment to GL 96-05. On March 19, 1999, DLC provided a response to a request for additional information regarding GL 96-05 forwarded by the NRC staff on January 14, 1999.

On the dates of the November 18, 1996, March 17, 1997, and March 19, 1999, letters, DLC was the licensed operator for BVPS-1 and BVPS-2. On December 3, 1999, DLC’s ownership interests in both BVPS-1 and BVPS-2 were transferred to the Pennsylvania Power Company, and DLC’s operating authority for BVPS-1 and BVPS-2 was transferred to FirstEnergy Nuclear Operating Company (FENOC). By letter dated December 13, 1999, FENOC requested that the NRC continue to review and act upon all items before the Commission which had been submitted by DLC. FENOC has made no changes to the commitments made by DLC regarding the program to verify periodically the design-basis capability of the safety-related MOVs at BVPS-1 and BVPS-2.

Accordingly, the NRC staff has completed its review of the licensee’s submittals and applicable NRC inspection reports for the MOV program at Beaver Valley. The NRC staff finds that FENOC has an acceptable program to verify periodically the design-basis capability of the safety-related MOVs at BVPS-1 and 2 through its commitment to all three phases of the Joint Owners Group (JOG) Program on MOV Periodic Verification and the additional actions described in the submittals. As discussed in the enclosed safety evaluation (SE), the NRC staff concludes that FENOC is adequately addressing the actions requested in GL 96-05. As part of

this review, the staff considers the licensee's approach for ranking MOVs by their safety significance, including identified exceptions, to be acceptable.

The NRC staff may conduct inspections at BVPS-1 and 2 to verify that implementation of the MOV periodic verification program is in accordance with the licensee's commitments; this NRC SE; the NRC SE dated October 30, 1997, on the JOG Program on MOV Periodic Verification; and the NRC SE dated April 14, 1998, on the Westinghouse Owners Group methodology for ranking MOVs by their safety significance.

Should you have any questions regarding this issue, please contact me at (301) 415-1427.

Sincerely,

/RA/

Daniel S. Collins, Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-334 and 50-412

Enclosure: Safety Evaluation

cc w/encl: See next page

this review, the staff considers the licensee's approach for ranking MOVs by their safety significance, including identified exceptions, to be acceptable.

The NRC staff may conduct inspections at BVPS-1 and 2 to verify that implementation of the MOV periodic verification program is in accordance with the licensee's commitments; this NRC SE; the NRC SE dated October 30, 1997, on the JOG Program on MOV Periodic Verification; and the NRC SE dated April 14, 1998, on the Westinghouse Owners Group methodology for ranking MOVs by their safety significance.

Should you have any questions regarding this issue, please contact me at (301) 415-1427.

Sincerely,

/RA/

Daniel S. Collins, Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-334 and 50-412

Enclosure: Safety Evaluation

cc w/encl: See next page

DISTRIBUTION:

File Center	MO'Brien	ACRS	PUBLIC	E. Adensam (e-mail)	
PEselgroth, RGN 1	PDI-1 r/f	OGC	TScarbrough		
DCollins	STingen	MGamberoni	DTerao		

OFFICE	PDI-1/PM	PDI-2/LA	EMEB	PDI-1/ASC	
NAME	DCollins	MO'Brien	SE dtd	MGamberoni	
DATE	1/19/00	1/20/00	01/03/00	2/9/00	

OFFICIAL RECORD COPY
DOCUMENT NAME: C:\LtrM97015BV.wpd

Beaver Valley Power Station, Units 1 and 2

Jay E. Silberg, Esquire
Shaw, Pittman, Potts & Trowbridge
2300 N Street, NW.
Washington, DC 20037

First Energy Nuclear Operating Company
Licensing Section
Mark S. Ackerman, Manager (2 Copies)
Beaver Valley Power Station
PO Box 4, BV-A
Shippingport, PA 15077

Commissioner Roy M. Smith
West Virginia Department of Labor
Building 3, Room 319
Capitol Complex
Charleston, WV 25305

Director, Utilities Department
Public Utilities Commission
180 East Broad Street
Columbus, OH 43266-0573

Director, Pennsylvania Emergency
Management Agency
Post Office Box 3321
Harrisburg, PA 17105-3321

Ohio EPA-DERR
ATTN: Zack A. Clayton
Post Office Box 1049
Columbus, OH 43266-0149

Dr. Judith Johnsrud
National Energy Committee
Sierra Club
433 Orlando Avenue
State College, PA 16803

First Energy Nuclear Operating Company
Beaver Valley Power Station
J. J. Maracek
P. O. Box 4, BV-A
Shippingport, PA 15077

First Energy Nuclear Operating Company
Beaver Valley Power Station
PO Box 4
Shippingport, PA 15077
ATTN: Kevin L. Ostrowski,
Plant General Manager (BV-SOSB-7)

Bureau of Radiation Protection
Pennsylvania Department of
Environmental Protection
ATTN: Michael P. Murphy
Post Office Box 2063
Harrisburg, PA 17120

Mayor of the Borough of
Shippingport
Post Office Box 3
Shippingport, PA 15077

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Resident Inspector
U.S. Nuclear Regulatory Commission
Post Office Box 298
Shippingport, PA 15077

First Energy Nuclear Operating Company
Beaver Valley Power Station
PO Box 4
Shippingport, PA 15077
ATTN: M. P. Pearson, Director Plant
Services (BV-NCD-3)

Mr. J. A. Hultz, Manager
Projects & Support Services
First Energy
76 South Main Street
Akron, OH 44308

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

LICENSEE'S RESPONSE TO GENERIC LETTER 96-05, "PERIODIC VERIFICATION OF DESIGN-BASIS CAPABILITY OF SAFETY-RELATED MOTOR-OPERATED VALVES,"

BEAVER VALLEY POWER STATION, UNITS 1 AND 2

DOCKET N0S. 50-334 AND 50-412

1.0 INTRODUCTION

Many fluid systems at nuclear power plants depend on the successful operation of motor-operated valves (MOVs) in performing their safety functions. Several years ago, MOV operating experience and testing, and research programs sponsored by the nuclear industry and the U.S. Nuclear Regulatory Commission (NRC), revealed weaknesses in a wide range of activities (including design, qualification, testing, and maintenance) associated with the performance of MOVs in nuclear power plants. For example, some engineering analyses used in sizing and setting MOVs did not adequately predict the thrust and torque required to operate valves under their design-basis conditions. In addition, inservice tests of valve stroke time under zero differential-pressure and flow conditions did not ensure that MOVs could perform their safety functions under design-basis conditions.

Upon identification of the weaknesses in MOV performance, significant industry and regulatory activities were initiated to verify the design-basis capability of safety-related MOVs in nuclear power plants. After completion of these activities, nuclear power plant licensees began establishing long-term programs to maintain the design-basis capability of their safety-related MOVs. This safety evaluation (SE) addresses the program developed by Duquesne Light Company (DLC), described in letters dated November 18, 1996, March 17, 1997, and March 19, 1999, and being maintained by FirstEnergy Nuclear Operating Company (FENOC) to verify periodically the design-basis capability of safety-related MOVs at the Beaver Valley Power Station, Units 1 and 2 (BVPS-1 and 2).

On the dates of the November 18, 1996, March 17, 1997, and March 19, 1999, letters, DLC was the licensed operator for BVPS-1 and BVPS-2. On December 3, 1999, DLC's ownership interests in both BVPS-1 and BVPS-2 were transferred to the Pennsylvania Power Company, and DLC's operating authority for BVPS-1 and BVPS-2 was transferred to FENOC. By letter dated December 13, 1999, FENOC requested that the NRC continue to review and act upon all items before the commission which had been submitted by DLC. FENOC has made no changes to the commitments made by DLC regarding the program to verify periodically the design-basis capability of the safety-related MOVs at BVPS-1 and BVPS-2.

2.0 REGULATORY REQUIREMENTS

NRC regulations require that MOVs important to safety be treated in a manner that provides assurance of their intended performance. Criterion 1 to Appendix A, “General Design Criteria for Nuclear Power Plants,” to Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 50) states, in part, that structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. The quality assurance program to be applied to safety-related components is described in Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” to 10 CFR Part 50. In Section 50.55a of 10 CFR Part 50, the NRC requires licensees to establish inservice testing (IST) programs in accordance with Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code.

In response to concerns regarding MOV performance, NRC staff issued Generic Letter (GL) 89-10 (June 28, 1989), "Safety-Related Motor-Operated Valve Testing and Surveillance," which requested that nuclear power plant licensees and construction permit holders ensure the capability of MOVs in safety-related systems to perform their intended functions by reviewing MOV design bases, verifying MOV switch settings initially and periodically, testing MOVs under design-basis conditions where practicable, improving evaluations of MOV failures and necessary corrective action, and trending MOV problems. The staff requested that licensees complete the GL 89-10 program within approximately three refueling outages or 5 years from the issuance of the GL. Permit holders were requested to complete the GL 89-10 program before plant startup or in accordance with the above schedule, whichever was later.

The NRC staff issued seven supplements to GL 89-10 that provided additional guidance and information on MOV program scope, design-basis reviews, switch settings, testing, periodic verification, trending, and schedule extensions. GL 89-10 and its supplements provided only limited guidance regarding MOV periodic verification and the measures appropriate to assure preservation of design-basis capability. Consequently, the NRC staff determined that additional guidance on the periodic verification of MOV design-basis capability should be prepared. On September 18, 1996, the NRC staff issued GL 96-05, “Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves,” requesting each licensee establish a program, or ensure the effectiveness of its current program, to verify on a periodic basis that safety-related MOVs continue to be capable of performing their safety functions within the current licensing bases of the facility. In GL 96-05, the NRC staff summarized several industry and regulatory activities and programs related to maintaining long-term capability of safety-related MOVs. For example, GL 96-05 discussed non-mandatory American Society of Mechanical Engineers (ASME) Code Case OMN-1, "Alternative Rules for Preservice and Inservice Testing of Certain Electric Motor Operated Valve Assemblies in [Light-Water Reactor] LWR Power Plants, OM Code 1995 Edition; Subsection ISTC," which allows the replacement of ASME Code requirements for MOV quarterly stroke-time testing with exercising of safety-related MOVs at least once per operating cycle and periodic MOV diagnostic testing on a frequency to be determined on the basis of margin and degradation rate. In GL 96-05, the NRC staff stated that the method in OMN-1 meets the intent of the GL with certain limitations. The NRC staff also noted in GL 96-05 that licensees remain bound by the requirements in their code of record regarding MOV stroke-time testing, as supplemented by relief requests approved by the NRC staff.

In GL 96-05, licensees were requested to submit the following information to the NRC:

a. within 60 days from the date of GL 96-05, a written response indicating whether or not the licensee would implement the requested actions; and

b. within 180 days from the date of GL 96-05, or upon notification to the NRC of completion of GL 89-10 (whichever is later), a written summary description of the licensee's MOV periodic verification program.

The NRC staff is preparing separate SEs for each licensee's response to GL 96-05. The NRC staff intends to rely to a significant extent on an industry initiative to identify valve age-related degradation which could adversely affect the design-basis capability of safety-related MOVs (described in Section 3.0) where a licensee commits to implement that industry program. The NRC staff will conduct inspections to verify the implementation of GL 96-05 programs at nuclear power plants as necessary.

3.0 JOINT OWNERS GROUP PROGRAM ON MOV PERIODIC VERIFICATION

In response to GL 96-05, the Boiling Water Reactor Owners Group (BWROG), Westinghouse Owners Group (WOG), and Combustion Engineering Owners Group (CEOG) jointly developed an MOV periodic verification program to obtain benefits from the sharing of information between licensees. The Joint Owners Group (JOG) Program on MOV Periodic Verification is described by BWROG in its Licensing Topical Report NEDC-32719, "BWR Owners' Group Program on Motor-Operated Valve (MOV) Periodic Verification," and described by WOG and CEOG in their separately submitted Topical Report MPR-1807, "Joint BWR, Westinghouse and Combustion Engineering Owners' Group Program on Motor-Operated Valve (MOV) Periodic Verification." The stated objectives of the JOG program on MOV Periodic Verification are (1) to provide an approach for licensees to use immediately in their GL 96-05 programs; (2) to develop a basis for addressing the potential age-related increase in required thrust or torque under dynamic conditions; and (3) to use the developed basis to confirm, or if necessary to modify, the applied approach. The specific elements of the JOG program are (1) providing an "interim" MOV periodic verification program for applicable licensees to use in response to GL 96-05; (2) conducting a dynamic testing program over the next 5 years to identify potential age-related increases in required thrust or torque to operate gate, globe, and butterfly valves under dynamic conditions; and (3) evaluating the information from the dynamic testing program to confirm or modify the interim program assumptions.

The JOG interim MOV periodic verification program includes (1) continuation of MOV stroke-time testing required by the ASME Code Inservice Testing (IST) Program; and (2) performance of MOV static diagnostic testing on a frequency based on functional capability (age-related degradation margin over and above margin for GL 89-10 evaluated parameters) and safety significance. In implementing the interim MOV static diagnostic test program, licensees will rank MOVs within the scope of the JOG program according to their safety significance. The JOG program specifies that licensees need to justify their approach for risk ranking MOVs. In Topical Report NEDC 32264, "Application of Probabilistic Safety Assessment to Generic Letter 89-10 Implementation," the BWROG described a methodology to rank MOVs in GL 89-10 programs with respect to their relative importance to core-damage frequency and other considerations to be added by an expert panel. In an SE

dated February 27, 1996, the NRC staff accepted the BWROG methodology for risk ranking MOVs in boiling water reactor nuclear plants with certain conditions and limitations. In the NRC SE dated October 30, 1997, on the JOG program on MOV periodic verification, the NRC staff indicated its view that the BWROG methodology for MOV risk ranking is appropriate for use in response to GL 96-05. With respect to Westinghouse-designed pressurized water reactor nuclear plants, the WOG prepared Engineering Report V-EC-1658, "Risk Ranking Approach for Motor-Operated Valves in Response to Generic Letter 96-05." On April 14, 1998, the NRC staff issued an SE accepting with certain conditions and limitations the WOG approach for ranking MOVs based on their risk significance. Licensees who use methodologies other than the BWROG or WOG methodologies need to justify their MOV risk-ranking approach individually.

The objectives of the JOG dynamic test program are to determine degradation trends in dynamic thrust and torque, and to use dynamic test results to adjust the test frequency and method specified in the interim program if warranted. The JOG dynamic testing program includes (1) identification of conditions and features which could potentially lead to MOV degradation; (2) definition and assignment of valves for dynamic testing; (3) testing valves three times over a 5-year interval with at least a 1-year interval between valve-specific tests according to a standard test specification; (4) evaluation of results of each test; and (5) evaluation of collective test results.

In the last phase of its program, the JOG will evaluate the test results and validate the assumptions in the interim program in order to establish a long-term MOV periodic verification program which will be implemented by licensees. A feedback mechanism will be established to ensure timely sharing of MOV test results among licensees and to prompt individual licensees to adjust their own MOV periodic verification program, as appropriate.

Following consideration of NRC staff comments, BWROG submitted Licensing Topical Report NEDC-32719 (Revision 2) describing the JOG program on July 30, 1997. Similarly, the CEOG and WOG submitted Topical Report MPR-1807 (Revision 2) describing the JOG program on August 6 and August 12, 1997, respectively. On October 30, 1997, the NRC staff issued an SE accepting the JOG program with certain conditions and limitations as an acceptable industry-wide response to GL 96-05 for valve age-related degradation.

4.0 BEAVER VALLEY GL 96-05 PROGRAM

On November 18, 1996, Duquesne Light Company (DLC) submitted a 60-day response to GL 96-05 notifying the NRC that it would implement the requested MOV periodic verification program at BVPS-1 and 2. On March 17, 1997, DLC submitted a 180-day response to GL 96-05 providing a summary description of the MOV periodic verification program planned to be implemented at Beaver Valley. In a letter dated April 13, 1998, DLC updated its commitment to GL 96-05. On March 19, 1999, DLC provided a response to a request for additional information regarding GL 96-05 forwarded by the NRC staff on January 14, 1999.

In its letter dated March 17, 1997, DLC described its MOV periodic verification program, including scope, existing and planned testing, capability margin, and implementation of the JOG program at BVPS-1 and 2. For example, DLC indicated that the interim MOV static diagnostic test program at Beaver Valley would apply MOV risk and margin threshold values that are consistent with the JOG periodic verification program. The frequency of MOV static

testing is based on valve safety significance and actuator functional capability. DLC also noted that dynamic testing of selected MOVs would be performed to support the JOG dynamic test program. Adjustments to the GL 96-05 program at BVPS-1 and 2 would consider the test results and recommendations from the JOG dynamic test program. DLC stated that it would begin implementation of the JOG program at BVPS-1 and 2 in late 1997. In its letter dated April 13, 1998, DLC committed to implement Topical Report MPR-1807 (Revision 2) describing the JOG program. DLC indicated that MOV risk ranking at BVPS-1 and 2 will be assigned based on the approach and results presented in the WOG Engineering Report V-EC-1658 (Revision 1) with certain exceptions. In its letter dated March 19, 1999, DLC described the exceptions which are discussed in Section 5.4 of this SE.

On the dates of the November 18, 1996, March 17, 1997, and March 19, 1999, letters, DLC was the licensed operator for BVPS-1 and BVPS-2. On December 3, 1999, DLC's ownership interests in both BVPS-1 and BVPS-2 were transferred to the Pennsylvania Power Company, and DLC's operating authority for BVPS-1 and BVPS-2 was transferred to FENOC. By letter dated December 13, 1999, FENOC requested that the NRC continue to review and act upon all items before the Commission which had been submitted by DLC. FENOC has made no changes to the commitments made by DLC regarding the program to verify periodically the design-basis capability of the safety-related MOVs at BVPS-1 and BVPS-2.

5.0 NRC STAFF EVALUATION

The NRC staff has reviewed the information provided in the licensee's submittals describing the program to verify periodically the design-basis capability of safety-related MOVs at BVPS-1 and 2 in response to GL 96-05. NRC Inspection Report 50-334 & 412/95-12 (IR 95-12) provided the results of inspections to evaluate the licensee's program to verify the design-basis capability of safety-related MOVs in response to GL 89-10. The staff closed the review of the GL 89-10 program at Beaver Valley in IR 95-12 based on verification of the design-basis capability of safety-related MOVs at BVPS-1 and 2. The NRC staff's evaluation of the licensee's response to GL 96-05 is described below.

5.1 MOV Program Scope

In GL 96-05, the NRC staff indicated that all safety-related MOVs covered by the GL 89-10 program should be considered in the development of the MOV periodic verification program. The NRC staff noted that the program should consider safety-related MOVs that are assumed to be capable of returning to their safety position when placed in a position that prevents their safety system (or train) from performing its safety function; and the system (or train) is not declared inoperable when the MOVs are in their nonsafety position.

In a letter dated November 18, 1996, the licensee committed to implement the requested MOV periodic verification program at BVPS-1 and 2 in response to GL 96-05 and did not take exception to the scope of the generic letter. In its letter dated March 17, 1997, the licensee indicated that the MOV periodic verification program included all MOVs within the scope of its GL 89-10 program. The licensee also stated that, if MOVs placed out of their normal system arrangement are not capable of automatically positioning to their engineered safety feature required position, then the valve or train is considered out-of-service. In IR

95-12, the NRC staff reviewed the licensee's MOV program in response to GL 89-10 and found that (1) the scope was consistent with GL 89-10 and its supplements; and (2) the licensee provided a technically sound basis for the removal of certain valves for the scope of GL 89-10. Therefore, the NRC staff considers the licensee to have made adequate commitments regarding the scope of its MOV program.

5.2 MOV Assumptions and Methodologies

Licensees maintain their assumptions and methodologies used in the development of MOV programs consistent with the plant configuration throughout the life of the plant (a concept commonly described as a "living program"). For example, the design basis of safety-related MOVs is maintained up to date, including consideration of any plant modifications or power uprate conditions.

In IR 95-12, the NRC staff reviewed the licensee's justification for the assumptions and methodologies used in the MOV program in response to GL 89-10 at BVPS-1 and 2. The NRC staff determined that the licensee had adequately justified the assumptions and methodologies used in its MOV program. The licensee's letter dated March 19, 1999, indicated ongoing activities, such as review of motor actuator output, to update its MOV program assumptions and methodologies. Updating of design assumptions is required per Criterion III, Design Control, of 10 CFR Part 50, Appendix B. Based on our review, the NRC staff considers the licensee to have adequate processes in place to maintain the assumptions and methodologies used in its MOV program, including the design basis of its safety-related MOVs.

5.3 GL 89-10 Long-Term Items

When evaluating the GL 89-10 program at BVPS-1 and 2, the NRC staff discussed in IR 95-12 several items of the licensee's MOV program to be addressed over the long term. In its letter dated March 19, 1999, the licensee reported on the status of those long-term GL 89-10 items. The licensee stated that it had reviewed 12 additional dynamic tests since the closure of GL 89-10 in 1995 and that the results of a total of 70 tests show that the overall load sensitive behavior continues to be consistent with the assumed design values for the tested valves. The licensee indicated that it would evaluate additional test data as they become available in order to ensure that load sensitive behavior assumptions remain valid. The licensee completed modifications to increase capability margin for MOV-1QS-101A/B. The licensee stated that it is continuing to evaluate measured valve factor, load sensitive behavior and stem coefficient of friction whenever dynamic testing is conducted to ensure that the assumptions for non-testable valves remain valid. The licensee stated that the review of as-found/as-left MOV test data indicates that stem lubrication degradation assumptions remain valid. Also in GL 89-10, the NRC staff identified pressure locking and thermal binding as potential performance concerns for safety-related MOVs. The NRC staff completed its review of the licensee's actions in response to GL 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," in an SE dated November 3, 1999.

In IR 95-12, the NRC staff discussed the quantitative and qualitative aspects of the licensee's program for trending MOV performance at BVPS-1 and 2. For example, the licensee reviews MOV preventive maintenance, corrective maintenance, and diagnostic test

data. MOV failure histories are tracked at the sub-component level. In IR 95-12, the staff determined that the licensee's tracking and trending program met the intent of GL 89-10. In its letter dated March 17, 1997, the licensee stated that preventive maintenance inspection results are reviewed for any trends that may develop and that static and dynamic test results are reviewed and trended. Valve factors, stem coefficients, stem lubrication effects, packing loads, rate of loading/load sensitive behavior, and bearing coefficients are monitored for any changes that may affect design assumptions.

With the licensee's ongoing MOV activities and trending program, no outstanding issues regarding the licensee's GL 89-10 program remain at BVPS-1 and 2.

5.4 JOG Program on MOV Periodic Verification

In its letter dated April 13, 1998, the licensee updated its commitment to implement the JOG Program on MOV Periodic Verification as described in Topical Report MPR-1807 (Revision 2). In an SE dated October 30, 1997, the NRC staff accepted the JOG program as an industry-wide response to GL 96-05 with certain conditions and limitations. The JOG program consists of the following three phases: (1) the JOG interim static diagnostic test program; (2) the JOG 5-year dynamic test program; and (3) the JOG long-term periodic test program. The staff considers the licensee's commitment in response to GL 96-05 to include implementation of all three phases of the JOG program at BVPS-1 and 2. The conditions and limitations discussed in the NRC SE dated October 30, 1997, apply to the JOG program at Beaver Valley. The staff considers the commitments by the licensee to implement all three phases of the JOG program at BVPS-1 and 2 to be an acceptable response to GL 96-05 for valve age-related degradation.

In its letter dated March 17, 1997, the licensee noted that the interim MOV static diagnostic testing under the JOG program would be performed on a test frequency based on the safety significance and functional capability of each GL 96-05 MOV. In its letters dated April 13, 1998, and March 19, 1999, the licensee indicated that MOV ranking at BVPS-1 and 2 was assigned based on the MOV risk-ranking approach and results presented in the WOG Engineering Report V-EC-1658 (Revision 1) with certain exceptions.

The first exception involves the sole use of core damage frequency (CDF) importance measures to rank MOVs. Large early release frequency (LERF) importance measures were not initially used to risk rank MOVs because, at that time, basic event importance measures based on LERF could not be readily calculated. The licensee therefore followed the guidance in WOG Engineering Report V-EC-1658 to conduct a qualitative assessment of the importance of the MOVs to containment isolation to prevent a large release. The licensee stated that containment spray and containment isolation systems had been modeled in the Level I plant response event trees. Since the initial MOV risk ranking, the licensee has developed the ability to calculate LERF basic event importance measures for the MOVs at BVPS-1. The results of this alternate MOV ranking did not result in any changes when compared to the results of the risk-ranking method using CDF importance measures.

The second exception involves the expert panel review of MOVs modeled in the Beaver Valley probabilistic risk analysis (PRA). The licensee stated that only MOVs not modeled in the PRA were reviewed using the expert panel approach presented in the WOG report. The licensee's justification for this exception was that the MOVs that were modeled in the PRA

had their top event risk significance contribution already considered for initiating events, system response and/or basic events considered in the PRA previously reviewed by the Maintenance Rule expert panel. In addition, the licensee used the example list of risk-significant MOVs provided in the WOG report as guidance in determining the final risk categories for MOVs at Beaver Valley. The GL 96-05 expert panel used the WOG example list of risk-significant MOVs as guidance in determining the final risk categories for MOVs not modeled in the Beaver Valley PRA.

The third exception involves the assessment of MOVs located in systems where one train is operating and the other train is in a standby alignment. The PRA at Beaver Valley includes a bias with respect to the importance of one train over the other because the MOV in the operating train is not required to change position to accomplish its safety function. The licensee stated that a qualitative approach using the PRA CDF importance measures is used to rank these MOVs by assigning the highest ranking to both MOVs in the operating and standby trains. The licensee considered this approach consistent with Section 3.4 of the WOG Engineering Report V-EC-1658 (Revision 1) for the assessment of interchanging functions of MOVs that can perform the same function.

The licensee's fourth exception involves modeling MOV passive failures. The licensee stated that MOVs that were only modeled as passive failures in the PRA were ranked based on the PRA CDF importance measures for that passive failure, then qualitatively reassessed by the PRA analyst to determine a final ranking. The licensee notes that WOG Engineering Report V-EC-1658 (Revision 1) only addresses MOV active failures. The NRC staff agrees that GL 96-05 and WOG Engineering Report V-EC-1658 (Revision 1) primarily focus on MOVs that are required to change position in order to accomplish their safety function.

The NRC staff considers the above exceptions as detailed clarifications of the licensee's MOV risk ranking approach. The conditions and limitations discussed in the NRC SE dated April 14, 1998, on the WOG methodology for ranking MOVs by their safety significance apply to the JOG program at BVPS-1 and 2. Based on the licensee's commitment, the staff considers the licensee's approach to risk-ranking MOVs at BVPS-1 and 2 to be acceptable.

The JOG program is intended to address most gate, globe and butterfly valves used in safety-related applications in the nuclear power plants of participating licensees. JOG indicates that each licensee is responsible for addressing any MOVs outside the scope of applicability of the JOG program. The NRC staff recognizes that the JOG has selected a broad range of MOVs and conditions for the dynamic testing program, and that significant information will be obtained on the performance and potential degradation of safety-related MOVs during the interim static diagnostic test program and the JOG dynamic test program. As the test results are evaluated, JOG might include or exclude additional MOVs with respect to the scope of its program. Although the test information from the MOVs in the JOG dynamic test program might not be adequate to establish a long-term periodic verification program for each MOV outside the scope of the JOG program, sufficient information should be obtained from the JOG dynamic test program to identify any immediate safety concern for potential valve age-related degradation during the interim period of the JOG program. Therefore, the NRC staff considers it acceptable for the licensee to apply the JOG interim static diagnostic test program to GL 96-05 MOVs that currently might be outside the scope of the JOG program with the feedback of information from the JOG dynamic test program to those MOVs. In the NRC SE dated

October 30, 1997, the NRC staff specified that licensees implementing the JOG Program must determine any MOVs outside the scope of the JOG program (including service conditions) and justify a separate program for periodic verification of the design-basis capability (including static and dynamic operating requirements) of those MOVs. The licensee has committed to the program established in the JOG topical report. The NRC staff considers this to be accetable.

5.5 Motor Actuator Output

The JOG program focuses on the potential age-related increase in the thrust or torque required to operate valves under their design-basis conditions. In the NRC SE dated October 30, 1997, on the JOG program, the NRC staff specified that licensees are responsible for addressing the thrust or torque delivered by the MOV motor actuator and its potential degradation. Although the JOG does not plan to evaluate degradation of motor actuator output, significant information on the output of motor actuators will be obtained through the interim MOV static diagnostic test program and the JOG dynamic test program. Several parameters obtained during MOV static and dynamic diagnostic testing help identify motor actuator output degradation when opening and closing the valve including, as applicable, capability margin, thrust and torque at control switch trip, stem friction coefficient, load sensitive behavior, and motor current.

In its letter dated March 17, 1997, the licensee indicated that, in order to ensure adequate actuator output capability for safety-related MOVs at BVPS-1 and 2 to perform their design-basis functions, it uses a combination of periodic static testing, data trending, and preventive maintenance. For example, valve factors, stem coefficients, stem lubrication effects, packing loads, rate of loading/load sensitive behavior, and bearing coefficients are routinely monitored for any changes that may affect design assumptions. In its letter dated March 19, 1999, the licensee stated that MOV testing procedures included provisions to obtain as-found/as-left test data for scheduled tests for periodic verification in response to GL 89-10 and GL 96-05.

In Technical Update 98-01 and its Supplement 1, Limitorque Corporation provided updated guidance for predicting the torque output of its ac-powered motor actuators. In its letter dated March 19, 1999, the licensee reported that it had completed reviews of this information for incorporation into the MOV sizing calculations at Beaver Valley. The licensee concluded that MOVs have sufficient capability to ensure valve operability at the current settings. The licensee has modified certain MOVs and plans to modify two additional MOVs to recover additional performance margin. Other MOVs will be considered for margin improvements during future outages. The NRC staff considers the licensee's actions to upgrade these MOVs to be acceptable. The licensee stated that revisions to the BVPS-2 MOV torque output calculations were complete and that the revised BVPS-1 MOV output calculations would be complete prior to the next scheduled Unit 1 refueling outage. Any MOV operability concerns that might be identified in the future will be processed in accordance with established regulatory requirements and plant-specific commitments.

In its letter dated July 17, 1998, forwarding Technical Update 98-01, Limitorque indicates that a future technical update will be issued to address the application of dc-powered MOVs. On December 15, 1999, the licensee clarified to the Office of Nuclear Reactor Regulation, Beaver Valley Project Manager that there is only one dc-powered MOV in the Beaver Valley

GL 96-05 program and that the capability margin for this MOV is approximately 100 percent. WOG is participating in an industry effort to provide updated guidance on dc-powered MOV performance.

Based on the above discussion, the NRC staff considers the licensee to have established sufficient means to monitor MOV motor actuator output and its potential degradation.

6.0 CONCLUSION

The NRC staff finds that the licensee has established an acceptable program to verify periodically the design-basis capability of the safety-related MOVs at BVPS-1 and 2 through its commitment to all three phases of the JOG program on MOV periodic verification and the additional actions described in its submittals. As part of this review, the NRC staff considers the licensee's approach for ranking MOVs by their safety significance, including identified exceptions, to be acceptable. Therefore, the NRC staff concludes that the licensee is adequately addressing the actions requested in GL 96-05. The staff may conduct inspections at BVPS-1 and 2 to verify the implementation of the MOV periodic verification program is in accordance with the licensee's commitments; this NRC SE; the NRC SE dated October 30, 1997, on the JOG program on MOV periodic verification; and the NRC SE dated April 14, 1998, on the WOG methodology for ranking MOVs by their safety significance.

Principal Contributors: T. Scarbrough
S. Tingen

Date: February 22, 2000