CHARLES H. CRUSE
Vice President
Nuclear Energy

Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410 495-4455

BGE

September 3, 1996

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
Final Response to NRC Generic Letter 89-10; Safety-Related Motor-Operated Valve Testing and Surveillance (TAC Nos. M75643; M75644)

REFERENCES:
(a) Letter from Mr. J. G. Partlow (NRC) to Mr. G. C. Creel (BGE), dated June 28, 1989, Safety-Related Motor-Operated Valve Testing and Surveillance (Generic Letter No. 89-10) - 10 CFR 50.54(f)

(b) Letter from Mr. G. C. Creel (BGE) to NRC Document Control Desk, dated December 28, 1989, NRC Generic Letter No. 89-10; Safety-Related Motor-Operated Valve Testing and Surveillance

The purpose of this letter is to forward our final response to Nuclear Regulatory Commission Generic Letter 89-10, Safety-Related Motor-Operated Valve Testing and Surveillance (Reference a). The generic letter identified concerns with motor-operated valve (MOV) performance, including weaknesses in MOV sizing, maintenance and testing methods. Reference (b), our initial response to the generic letter, notified the NRC of our schedule to meet its recommendations.

In response to these concerns and the recommended actions in the generic letter, Baltimore Gas and Electric Company began an extensive effort to review the performance requirements of our MOVs. Significant improvements have been implemented at Calvert Cliffs in the way MOVs are sized, maintained and tested. Our increased understanding of MOV capability and performance issues has been reflected in revisions to, and creation of, engineering and maintenance procedures and standards. The combination of enhancing MOV personnel training, improving the MOV personnel qualification program and employing comprehensive monitoring and testing techniques for MOVs provides further assurance that our MOVs are capable of operating under normal and design basis conditions.

The valves in the scope of our Generic Letter 89-10 Program are listed on page 23 of the Attachment. Throughout this letter they are referred to as the "Program MOVs". We have overhauled and performed significant modifications to each of the Program MOVs. Their design basis requirements have been reviewed and affirmed. We confirmed that they are capable of meeting their design basis requirements.

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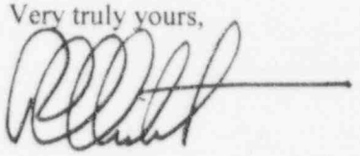
Our seven-year effort to address the recommended actions of the generic letter has cost $14 million and involved virtually every department, process and program at Calvert Cliffs. As a result, the reliability of critical plant components has been improved. Since we have applied the improvements in analysis of MOV performance and maintenance to key balance of plant MOVs, we have increased assurance that the plant will perform as designed.

Calvert Cliffs has established a program for ensuring MOVs are set and maintained so that the MOVs will operate as required during normal and abnormal conditions. We will continue to monitor advances in methods and techniques of maintaining and evaluating MOVs. We will implement, as appropriate, those which we determine improve our Program.

Attachment (1) contains our detailed response to the actions requested in Reference (a).

Should you have questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,



for
C. H. Cruse
Vice President - Nuclear Energy

CHC/JMO/dlm

Attachment: Baltimore Gas & Electric Company's Final Response to Generic Letter 89-10: Safety-Related Motor-Operated Valve Testing and Surveillance

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File 06.04 (GL 89-10)
Electronic Docket File

CHC/JMO/jmo/dlm

NRC 96-049

ATTACHMENT

BALTIMORE GAS & ELECTRIC COMPANY'S

FINAL RESPONSE

TO

GENERIC LETTER 89-10:

SAFETY-RELATED MOTOR-OPERATED VALVE

TESTING AND SURVEILLANCE

Calvert Cliffs Nuclear Power Plant
Units 1 & 2
September 3, 1996

ATTACHMENT

BALTIMORE GAS & ELECTRIC COMPANY
RESPONSE TO GENERIC LETTER 89-10
SAFETY-RELATED MOTOR-OPERATED VALVE TESTING AND SURVEILLANCE

BACKGROUND

On June 28, 1989, the Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance." The purpose of this GL was to extend the scope of the program outlined in NRC Bulletin 85-03. In Bulletin 85-03, the NRC recommended that licensees develop and implement a program to ensure that valve motor-operator switch settings (torque, torque bypass, position limit, overload) for Motor-Operated Valves (MOVs) in several specified systems are selected, set and maintained so that the MOVs will operate under design basis conditions. Generic Letter 89-10 expanded the scope of Bulletin 85-03 to all safety-related MOVs, as well as all position changeable MOVs. Specifically, the NRC recommended that licensees develop a program that would, "provide for testing, inspection and maintenance of MOVs so as to provide the necessary assurance that they will function when subjected to design basis conditions that are to be considered during both normal operation and abnormal events within the design basis of the plant."

Since the issuance of GL 89-10, seven additional GL Supplements have been issued. These Supplements reflect the complexity and dynamics of responding to the issues presented in GL 89-10.

OVERVIEW OF BGE's ACTIONS TO RESPOND TO GL 89-10

In a letter dated December 28, 1989, Baltimore Gas and Electric Company (BGE) notified the NRC of its intent to implement the recommendations of GL 89-10 and complete such action within the schedules specified in the GL. The Calvert Cliffs scheduled completion dates coincided with the 1996 Refueling Outage and 1997 Refueling Outage, Units 1 and 2, respectively.

Our initial investigation indicated considerable actions were required to address the rather large and complicated scope of the GL. We recognized that comprehensive process controls would be necessary to ensure an appropriate response to GL 89-10 issues. The decision was made by plant management to apply a "project methodology," and subsequently, the MOV Project was created. The project methodology utilizes acquired expertise and support structure to define the problem, analyze corrective measures and options, secure necessary resources and execute appropriate response actions. To allow this to occur in an effective and expeditious manner, the Projects Section has a direct-line path to management.

The most important aspect of the Project effort was the early recruitment of the necessary team members. The MOV Project Team consisted of representatives from Design Engineering, Plant Engineering, Operations, Maintenance, Projects, and Planning and Scheduling.

One of the considerable strengths of the MOV Project was full management commitment. Site management, including the Vice President-Nuclear Energy Division, was committed to assuring Calvert Cliffs responded to MOV issues in appropriate and effective fashion. Baltimore Gas and Electric Company recognizes the role site management has in ensuring a continuously effective MOV Program. A primary example of management commitment to the MOV project was the early formation and continued support of a dedicated MOV Component Engineer and MOV Maintenance Group.

ATTACHMENT

BALTIMORE GAS & ELECTRIC COMPANY
RESPONSE TO GENERIC LETTER 89-10
SAFETY-RELATED MOTOR-OPERATED VALVE TESTING AND SURVEILLANCE

Following is a brief description of actions taken by BGE. These actions are categorized to specific areas of interest.

Design Basis Review

A design basis review has been performed on all safety-related Calvert Cliffs MOVs as requested by Item "a" of the GL. In addition to these, design basis review of all Balance of Plant MOVs has also been performed. This review has determined the maximum differential pressures each MOV will be required to operate against during both normal and abnormal conditions. The reviews are documented as formal pressure calculations controlled by Calvert Cliffs Design Engineering Standards. The BGE Mechanical Engineering Unit has reviewed and approved all pressure calculations and maintains responsibility of these calculations. These pressure calculations have incorporated appropriately conservative inputs and are used as input for determining the operational requirements for Calvert Cliffs MOVs.

Establishment of Switch Settings

Correct torque switch settings were determined and documented under formal BGE calculations. These "Thrust Calculations" were prepared, controlled and maintained under Design Engineering Standards. Thrust calculations evaluate both capability as well as limitations of the MOV, as detailed by the vendor "weak link analysis." The Babcock & Wilcox Motor-Operated Valve Evaluation computer program was used in determining the required stem thrust. The program utilizes the industry standard equation for gate valves of:

$$\text{Required Thrust} = [(Ase) \times (DP) \times (\mu)] + [(Ast) \times (LP)] + PL$$

where:
- Ase = valve seat/orifice area
- DP = design basis differential pressure
- Ast = valve stem area @ packing
- LP = design basis line pressure
- μ = valve/seat factor
- PL = packing load

If adequate margin exists, the same equation will apply to both gate and globe valves. Otherwise, the piston effect factor for globe valves will be incorporated as:

$$\text{Required Thrust} = [(Ase) \times (DP) \times (\mu)] + [(Ast) \times (LP-DP)] + PL$$

This program has been independently reviewed and approved by BGE. Conservative inputs are used to develop an appropriate "Thrust Window" (see page 5). For example, the industry practice of using a valve factor value of 0.3 for gate valves was initially replaced with a more appropriate value of 0.5. This value has been further increased based on the results of site testing to a value of 0.7, and is used as a standard for those MOVs unable to be tested at design basis conditions. A stem friction coefficient of 0.2 is used to increase margin in establishing the necessary thrust requirements. The thrust window is further adjusted by a 10% (15% where unable to test at design basis conditions) factor for Rate of Loading (load sensitive behavior), and a 5% (10% if margin allows) factor to compensate for stem lube degradation and spring pack relaxation.

Further conservatism is factored into the thrust calculations, in that for many cases, several valves are bounded by one calculation. Input to these calculations are based on the most conservative values of the valves. If each MOV has been independently evaluated, many MOVs would show substantially more margin.

Additional factors, such as using the Limitorque established pullout efficiency as opposed to running efficiency and the adjustments for reduced voltage and increase temperature effects on motor capability, are also incorporated.

MOV Modifications

A significant amount of component modification has been performed as a result of the design review effort and the required thrust windows established by the thrust calculations. Over 220 modifications have been performed on GL 89-10 Program MOVs. These included:

- valve work - replacement of valve wedges/disc and stems; and
- operator work - replacement of motors, gearing and spring packs.

Included in the improvements of MOV performance and reliability is the installation of four-train limit switches in all Program MOVs. This change supports the increased assurance MOVs will function as required by allowing torque switch bypass duration to be adjusted to provide full operator capability to position the valve.

Verification of Switch Settings

Verification of correct switch settings has been accomplished through a combination of dynamic and static testing and evaluation of MOV performance characteristics. All Program MOVs have been statically tested. Where practicable to do so, we tested all Program MOVs under design basis conditions. As a result, 60% of Program MOVs have been tested dynamically. Test results have been fed back into associated thrust calculations and have been used to develop bounding values for Calvert Cliffs MOVs.

MOV Overhauls

All GL 89-10 Program MOVs have been inspected, overhauled and assembled under enhanced maintenance procedures by qualified personnel. These procedures have incorporated "lessons learned" concerning deficiencies and degraded conditions which have been identified by the NRC, Industry Notices and Calvert Cliffs operating experience data.

Process Controls

Actions in response to GL 89-10 have been directed and controlled by a formal Project Plan. This document defined the scope of the GL 89-10 Program, identified the organizations involved in this effort, and established responsibilities for implementing the necessary actions. This Plan controlled all work associated with MOVs at Calvert Cliffs until the Project transitioned to a Plant Program. Transition to a Plant Program occurred in phases allowing for complete incorporation of Project objectives and results into normal plant processes. Plant Engineering

Section Guideline 15 "Motor Operated Valve Program" now defines the process and delineates responsibilities for Calvert Cliffs MOVs.

The "Program Owner" is the MOV Component Engineer. He serves as the Calvert Cliffs technical expert and is responsible for overseeing the administrative, maintenance and testing aspects of the MOV Program.

Motor-operated valve maintenance is performed by the MOV Unit within the Electrical & Controls Section. The Unit is staffed by a dedicated supervisor and qualified MOV technicians. Technicians receive specialized training in MOV maintenance and the use of diagnostic test equipment, including advanced diagnostic training. Calvert Cliffs utilizes the Liberty Technologies' computer-based Valve Operation Test and Evaluation System (VOTES) and the Babcock & Wilcox Nuclear Service Company's "THRUST 2" spring pack testing system to monitor and assess critical MOV performance characteristics.

Engineering and Maintenance procedures have been prepared or revised as necessary to ensure appropriate instruction exists to determine, set and maintain the MOV capable of operating as required. Critical performance characteristics are monitored for indication of degrading capability. Conditions which can potentially degrade MOV performance are identified and tracked under the Calvert Cliffs MOV Trending Program.

Periodic Verification

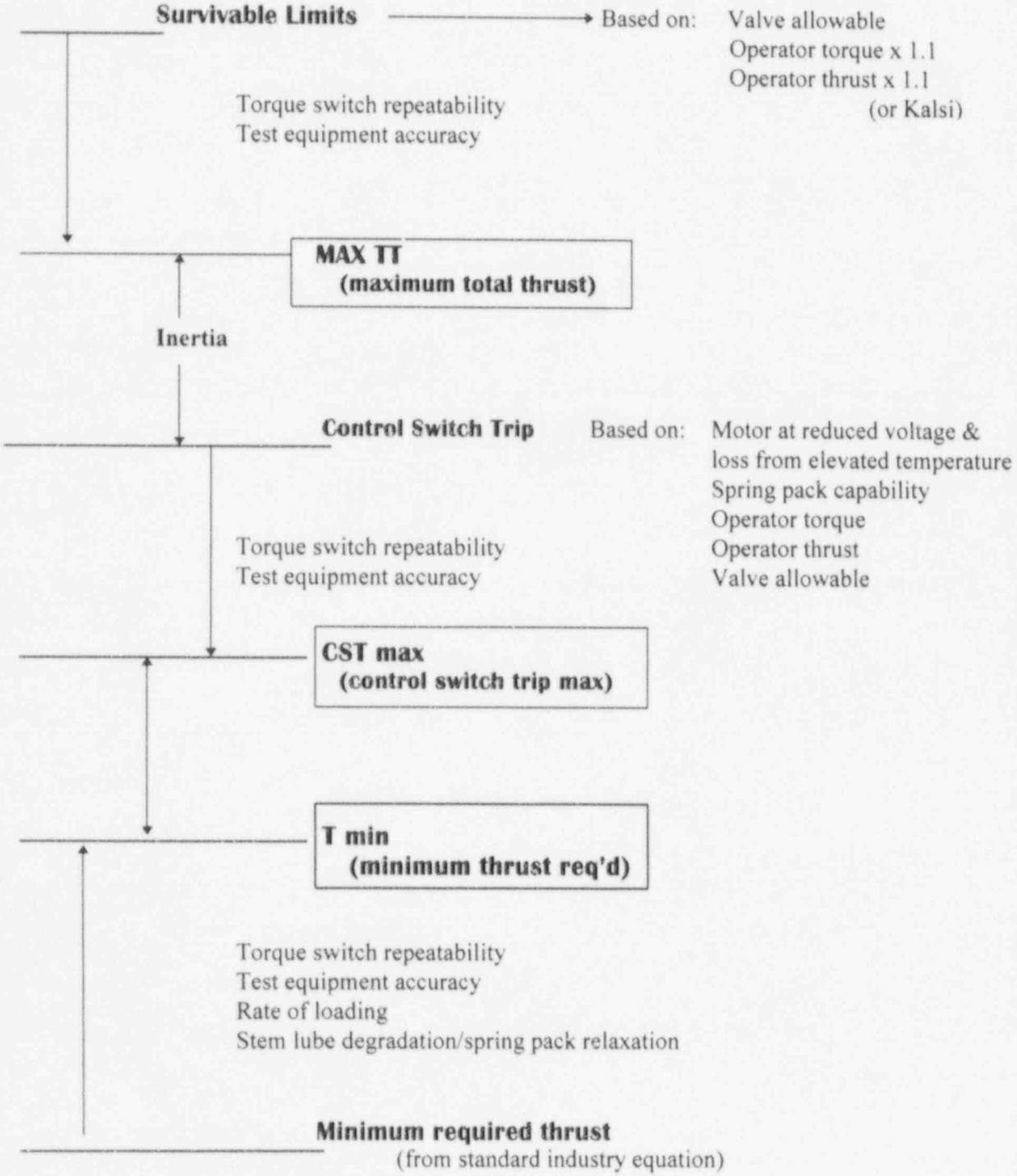
Calvert Cliffs has developed a plan for periodically verifying the capability of Program MOVs based on a combination of dynamic diagnostic testing and static diagnostic testing, along with an additional qualification factor. A margin-based method incorporating the results of dynamic testing conducted at Calvert Cliffs is used to establish an initial bin/category of testing. Each MOV is further evaluated based on its relative safety significance to the plant (see page 24). Through this two part analysis, the appropriate method and frequency of testing to ensure capability is determined.

Continuing Efforts

Calvert Cliffs has established a program for ensuring MOVs are set and maintained so that the MOVs will operate as required during normal and abnormal conditions. This includes evaluation of MOVs with low margin to assess ways to increase margin. Modification activities are in progress which will result in increased capability for several MOVs.

The MOV Program ensures continuous monitoring of MOV performance both at Calvert Cliffs and throughout the nuclear industry. We will continue to monitor advances in methods and techniques of maintaining and evaluating MOVs. We will implement, as appropriate, those we determine improve our Program.

MOV THRUST WINDOW



GENERIC LETTER ITEMS:

a. *Review and document the design basis for the operation of each MOV to include the maximum differential pressure expected - opening or closing during normal and abnormal events.*

BGE Response

Complete design basis reviews have been performed on all Calvert Cliffs Nuclear Power Plant (CCNPP) motor-operated valves to establish maximum line pressure & differential pressures expected. From this review, the maximum system pressure and differential pressures were determined. To ensure a complete review of design basis conditions, this determination included the review and evaluation of system and operating parameters identified and defined by:

- CCNPP Updated Final Safety Analysis Report
- CCNPP Emergency Operating Procedures
- CCNPP Abnormal Operating Procedures
- CCNPP Operating Instructions
- CCNPP System O&M / P&ID Drawings
- CCNPP Technical Specifications
- Equipment performance data

These reviews were performed and are documented under BGE Mechanical Calculations controlled by BGE Design Engineering Standards. Conservative inputs were used to ensure added performance margin. For example:

- Head loss through piping was not used to reduce pressures;
- Interfacing systems (pumps and piping cross-connects) were included in determining maximum pressure;
- Valve position was considered as full closed, resulting in the greatest differential pressure;
- In systems with recirculation valves, the calculations were based on the recirculation valves being closed, thereby applying maximum pressure to the subject valve;
- For valves in a series configuration, each valve was evaluated as though it is the first of the pair to close thereby incurring the highest inlet pressure; and
- Where analysis predicts maximum upstream pressure to exist but not simultaneously with minimum downstream pressure, each pressure condition is used to determine maximum differential pressure affecting the valve (the use of this non-simultaneous conditions produces a conservative value for differential pressure).

b. *Based on the results from Item a, establish the correct switch settings (torque, torque bypass, position limit & overload).*

BGE Response

Appropriate switch settings have been determined through a series of comprehensive and coordinated actions. Thrust calculations performed and documented under BGE Mechanical Calculations, established the operating "thrust window." This window was determined through evaluation of the required operational parameters established by the associate pressure calculation. The Babcock & Wilcox Nuclear Technologies computer based program "Motor Operated Valve Evaluation" was used to evaluate MOV configuration and calculate design parameters. This program was verified by independent calculation under BGE Design Engineering Standards. Further evaluation was performed incorporating margin to compensate for anticipated loss of operator motor performance from reduced voltage conditions and temperature effects. For added conservatism, pullout efficiency was used instead of running efficiency to calculate motor capability. Thrust calculations apply other conservative standards to compensate for additional factors. Diagnostic inaccuracy is combined with torque switch repeatability values as a square root sum of squares error. The resultant value is further adjusted directly by factors for rate of loading, stem lubrication degradation and spring pack relaxation.

In response to industry testing, valve factor assumptions of 0.5 for gate valve and 1.1 for globe valves were used as calculation standards. In cases where dynamic testing indicated a higher value, the associated calculation was revised to reflect the tested value and the thrust window adjusted accordingly. Statistical analysis of the results of dynamic testing at Calvert Cliffs has been used to further increase conservatism in switch settings. From this testing, a confidence level of 95% has been used to establish a standard value for valve factor of 0.7 for gate valves. As an additional measure of conservatism, a stem thread coefficient of friction of 0.2 is used in determining MOV capability.

Open and closed torque switches are bypassed for approximately 75% and 95% of the stroke, respectively. This standard set-up gives added assurance the operator will position the valve as required by applying full motor capability during the bypass condition duration.

Settings for overload heaters for Program MOVs have been evaluated under BGE's response to the Electrical Distribution System Functional Inspection. Overloads have been sized to preclude premature trip. In concert with any MOV modification affecting motor performance, the overload setting is reviewed and adjusted accordingly.

c. *Switch settings should be changed to those established in response to Item b. The MOV should be demonstrated to be operable by testing at design basis differential pressure and/or flow. Where testing at design conditions is not practicable, describe alternatives used to verify correct settings.*

BGE Response

Switch settings for all GL 89-10 Program MOVs have been based on the review and evaluation of design basis requirements, as determined in response to GL 89-10 Item b, and have been confirmed by in-situ testing. Where necessary, component modifications have been performed on those MOVs which showed limited capability, as determined through evaluations of required thrust. In addition, all operators on Program MOVs have been inspected, overhauled and assembled by qualified personnel under enhanced maintenance procedures.

Each torque switch and spring pack are individually tested to determine their performance characteristics for suitable matching to the MOV and to establish a baseline for on-going condition assessment. The Babcock & Wilcox Nuclear Service Company's "THRUST 2" spring pack testing system was used for this testing, and developed a detailed profile of each spring pack / torque switch set, allowing for distinct control over torque switch trip.

All Program MOVs have been tested under static conditions. The Liberty Technologies' VOTES is used to monitor, measure and confirm critical MOV performance characteristics. Calvert Cliffs established the position to test dynamically all MOVs at design basis conditions that were practicable to do so. As a result, 60% of CCNPP Program MOVs have been tested dynamically. Of these tests, approximately half were greater than or equal to 78% of design basis differential pressures.

Where testing at design basis conditions is not practicable, alternative methods are used to verify the correct switch settings are used. These methods consist of:

- Comparison of test results on similar MOVs;
- Application of statistical analysis of the results of dynamic tests at Calvert Cliffs; and
- Application of the EPRI Performance Prediction Model (PPM) (the PPM was run by MPR Associates, the primary developer of the PPM).

d. *Prepare or revise procedures to ensure that the correct settings are determined and maintained throughout the life of the plant. These procedures should include provisions for monitoring MOV performance to ensure switch settings are correct.*

BGE Response

As previously noted, determination of appropriate switch settings is controlled by BGE Design Engineering Section Standards and verified by comprehensive Maintenance Procedures. Thrust windows are established by formal Thrust Calculations which are prepared and maintained under

Design Engineering Section Mechanical Engineering Standards. The calculations are maintained current via a formal controlled document and revision process.

Critical component performance parameters are measured, evaluated and matched to the individual MOV's design requirements. Spring pack and torque switch function is tested using computer-based test equipment. Comprehensive procedures control the performance of this testing and include evaluation and acceptance criteria. This process ensures important MOV components are appropriately suited to the MOV's design requirements.

Periodic monitoring and maintenance of critical MOV performance characteristics, including limit switch, torque switch and torque switch by-pass switches is through an established preventive maintenance system tailored to MOVs. In addition, VOTES testing is performed to verify proper MOV operation and confirm correct switch settings following any maintenance or modification activity which may have affected MOV performance.

Valve Operation Test and Evaluation System tests are conducted under detailed procedures which contain required acceptance criteria. The design thrust window is included in the acceptance evaluation to ensure MOV capability to operate, as required under design basis conditions, is maintained.

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e. *Design basis review should include an examination of pertinent design and installation criteria that were used in choosing the particular MOV. The review should include the effects on MOV performance of design basis degraded voltage.*

BGE Response

As noted in response to Item a, a complete review of the design basis of each MOV within the GL 89-10 Program, as well as balance of plant MOVs, have been performed. Included in this review was an examination of all pertinent construction and installation specifications. All design basis requirements and operation requirements were re-validated through review of all design-related, as well as operationally-based, procedures, specifications and standards.

This review included an analysis of the affects of degraded voltage on MOV performance. Expected motor capability reduction has been accounted for by using degraded voltage at the MOV motor terminals. In addition, motor capability has also been determined by incorporating the effects of torque loss due to temperature.

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f. *Documentation of explanations and the description of actual test methods used for accomplishing Item c should be retained as part of the required records for the MOV. Testing degraded voltage conditions may be impracticable to perform in-situ. Switch settings should account for the situation where a valve may be called upon to operate at design basis differential pressure.*

Testing of MOVs at design basis conditions need not be repeated unless the MOV is replaced, modified or overhauled to the extent that the existing test results are not representative of the MOV in its modified configuration.

BGE Response

The capability of Program MOVs to operate as required under design basis conditions is evaluated, established and documented under a "Capability Package" (see page 23). This document describes the method used to verify correct switch settings and is maintained as a permanent record.

Dynamic tests performed on Program MOVs were directed and documented by formal test procedures. Engineering Test Procedures controlled all dynamic testing and contain the test results and acceptance criteria. These procedures are maintained as permanent life-time records under the Calvert Cliffs Quality Assurance Program.

As previously noted, as a result of certain MOVs being not practicable to test at design basis condition, alternative methods have been used. All Program MOVs have been set according to the best available information. This includes:

- Actual dynamic test results;
- Comparison to similar valves; and
- The use of conservative statistical application of Calvert Cliffs dynamic test results to MOVs which were not practicable to test under design basis conditions.

These methods have established the necessary assurance that the MOV will function as required under all design basis conditions.

Calvert Cliffs concurs with the position that testing under design basis conditions need not be repeated unless the MOV is altered in such a way to render the existing test results invalid. Conditions which may impact the existing test results have been identified and are used to assess the need for subsequent design basis testing.

g. *A number of deficiencies, misadjustments, and degraded conditions were discovered by licensees, either as a result of their efforts to comply with Bulletin 85-03 or from other experiences. A list of these conditions is included in Attachment A to the GL.*

BGE Response

Calvert Cliffs has reviewed the list of deficiencies, misadjustments and degraded conditions as presented by in the GL. Criteria to preclude conditions such as those identified by the list have been incorporated into site procedures and standards. The MOV Trending Program has incorporated these items into our continuous monitoring of conditions which affect MOV performance.

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h. *Each MOV failure or corrective action taken, including repair, alteration, analysis, test and surveillance, should be analyzed or justified and documented. It is suggested that these MOV data should be periodically examined as part of a monitoring and feedback effort to establish trends of MOV operability. These trends could provide the basis for a licensee revision of the testing frequency established to periodically verify the adequacy of MOV switch settings. For this monitoring and feedback effort, a well -structured and component-oriented system(e.g. the Nuclear Plant Reliability Data System is needed to capture, track and share the equipment history data.*

BGE Response

Motor-operated valve failure, corrective action and test results are analyzed and documented by qualified MOV personnel. The MOV Trending Program establishes the process for comprehensive monitoring and assessment of MOV performance. Results of MOV testing are reviewed and evaluated by a qualified MOV engineer. Data from these evaluations is entered into the MOV trending database. Trending data is reviewed after each refueling outage.

Calvert Cliffs has created an enhanced version of the Nuclear Plant Reliability Data System based on the criteria established by the technical subcommittee of the MOV Users Group. A report is generated on a monthly basis identifying any MOV problems and failures. This report is updated by the Reliability Engineering Unit and evaluated by the MOV Component Engineer.

The MOV Component Engineer is responsible for the review, evaluation and determination of any adverse trends in the performance of MOVs at Calvert Cliffs. This determination is documented in a semi-annual report on MOV performance.

The results of this trending process are used to assess the quality of maintenance practices and, if necessary, initiate changes to procedures and practices and frequency of MOV testing.

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i. *Each licensee with an operating license should complete all design basis reviews, analysis, verifications, tests, and inspections that have been instituted in order to comply with Items a through h within five years or three refueling outages of the date of this letter.*

BGE Response

Calvert Cliffs' actions in response to the Items a through h of GL 89-10 have been completed within the prescribed time frame. As indicated in the December 28, 1989 letter from Mr. G. C. Creel to the NRC Document Control Desk, associated actions on Unit 1 were scheduled for completion at the end of the 1996 Refueling Outage. Associated actions for Unit 2 were scheduled for completion at the end of the 1997 Refueling Outage.

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j. *The program for the verification of the procedures outlined in Item d, as well as other tests or surveillance that the owner may chose to use to identify potential MOV degradation or misadjustment, such as those described in Attachment A, should be implemented after maintenance or adjustment, (including packing adjustment) of each MOV, and periodically thereafter. The surveillance interval should be based on the licensee's evaluation of the safety importance of each MOV as well as its maintenance and performance history. The surveillance interval should not exceed five years or three refueling outages, whichever is longer, unless a longer interval can be justified for any particular MOV.*

BGE Response

Calvert Cliffs has an established program which allows for the verification and assurance that actions needed to maintain MOVs capable of operating when required are appropriate and maintained. Maintenance or modification activities which can affect the performance of the MOV are assessed to determine the appropriate action needed to verify the MOV remains capable of performing as required. Formal direction has been established for the determination for the necessary post-maintenance test following any activity which can affect MOV performance.

Surveillance intervals for periodically verifying that switch settings remain correct are based on an analysis of the safety importance (see page 24), performance capability and history of the particular MOV. The Calvert Cliffs Periodic Verification Program describes the process and establishes the appropriate surveillance interval. In general, static testing using the VOTES diagnostic test equipment in conjunction with select dynamic testing is performed at a interval of six years. Where analysis has determined conditions warrant, a surveillance interval not to exceed ten years has been established.

Surveillance testing is controlled by the Preventive Maintenance Program. Its sequence logic has VOTES testing performed to approximately one-sixth of the Program valves each year. This logic allows for continuous monitoring of MOV performance to enable identification of degrading conditions.

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k. *In recognition of the necessity for preplanning, refueling outages that start within six months of the date of this letter need not be counted in establishing the schedule to meet the time limits recommended in Items i and j.*

BGE Response

As noted in the BGE response to Item i., the schedule for completing actions associated with GL 89-10 was established as the end of refueling outages in 1996 and 1997 for Units 1 and 2, respectively. This schedule is consistent with the guidance contained in the GL.

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l. *Each licensee shall advise the NRC in writing within six months of the date of this letter that the above schedule and recommendations will be met.*

BGE Response

Baltimore Gas and Electric Company responded in writing within the time frame described by the Letter. By letter dated December 28, 1989, Mr. G. C. Creel to the NRC Document Control Desk, the planned schedule and commitment to implement the recommendations of GL 89-10 was submitted.

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m. *Each licensee shall notify the NRC in writing within 30 days after the actions described in the first paragraph of Item i. have been completed.*

BGE Response

Actions in response to the first paragraph of Item i have been completed for Calvert Cliffs Units 1 and 2 with the completion of refueling activities of Unit 1. Although Unit 2 actions were originally slated for completion during the 1997 refueling outage, all actions needed in response to the first paragraph Item i have been completed.

GL 89-10 **June 13, 1990**
SUPPLEMENT 1: **"RESULTS OF THE PUBLIC WORKSHOPS"**

This supplement to GL 89-10 includes the opening remarks by NRC representatives and the responses provided by the NRC staff to all significant questions that were discussed during three NRC held public workshops concerning GL 89-10.

This supplement was prepared to assist licensees and permit holders in development programs that will provide assurance of MOV operability under design basis conditions.

BGE Response

As stated above, this supplement presented the results of three public workshops held to discuss GL 89-10. The supplement presents sixty questions asked by attendees of the NRC staff at those workshops, provides clarification to the recommendations of the GL, and describes methods for licensee response to the those recommendations.

Baltimore Gas and Electric Company MOV Project personnel attended one of the workshops. The issues and responses from the NRC staff have been reviewed by the Project personnel and incorporated as appropriate into the Calvert Cliffs response to the GL.

GL 89-10 **August 3, 1990**
SUPPLEMENT 2: **"AVAILABILITY OF PROGRAM DESCRIPTIONS"**

This supplement extended the date licensees and permit holders were required to have made available their GL program description from June 28, 1990, to January 1, 1991. The schedule for completing of recommended actions a through h of the GL remained unchanged.

BGE Response

The Calvert Cliffs' MOV Project Manual outlining the actions to be taken in response to the recommendations of GL 89-10 was initiated and available on July 13, 1990.

Calvert Cliffs has completed all actions in response to recommended actions a through h of the GL within the schedule requested.

GL 89-10 SUPPLEMENT 3: **October 25, 1990**
"CONSIDERATION OF THE RESULTS OF NRC-SPONSORED TEST OF MOTOR-OPERATED VALVES"

This supplement describes actions requested of Boiling Water Reactors (BWR) licensees in response to the results of NRC-sponsored MOV tests of steam supply lines of High Pressure Coolant Injection and in the supply lines for Reactor Water Cleanup systems at BWRs. The results of this testing were to be considered in prioritizing actions on GL 89-10 Program MOVs. Additionally, all licensees and construction permit holders were requested to consider the applicability of this information to other MOVs within scope of GL 89-10.

BGE Response

Calvert Cliffs is a Pressurized Water Reactor and consequently a written response to this supplement was not required. The findings and conclusions obtained from the results of the NRC-sponsored testing of MOVs were reviewed and considered applicable to the Calvert Cliffs GL 89-10 Program. All Calvert Cliffs Program MOVs were prioritized based on their safety function and their potential of exhibiting minimal capability margin resulting from the revised thrust calculations. The findings and conclusions were incorporated into the design basis verification and dynamic testing plan for GL 89-10 MOVs.

GL 89-10 SUPPLEMENT 4: **February 12, 1992**
"CONSIDERATION OF VALVE MISPOSITIONING IN BOILING WATER REACTORS"

This supplement provided notification to licensees that the NRC staff, following a review of the issues concerning mispositioning of valves from the Control Room for BWRs, no longer considers the recommendations for inadvertent operation of MOVs from the Control Room to be within the scope of GL 89-10 for BWRs. Additionally, it indicated that the NRC will perform a similar review for PWRs.

BGE Response

Calvert Cliffs is a Pressurized Water Reactor. As such, this supplement did not directly affect our GL 89-10 Program.

GL 89-10 SUPPLEMENT 5: **June 28, 1993 "INACCURACY OF MOTOR-OPERATED VALVE DIAGNOSTIC EQUIPMENT"**

This supplement requested licensees to reexamine their MOV programs and to identify measures taken or planned to account for uncertainties in MOV diagnostic equipment inaccuracy. Licensees were required within 90 days of receipt of the letter to:

- Notify the NRC staff of the diagnostic equipment used to confirm the proper size or to establish settings for MOVs within the scope of GL 89-10.

- Report whether they have taken actions or plan to take actions (including schedule and summary of actions taken or planned) to address the information on the accuracy of MOV diagnostic equipment.

BGE Response

Baltimore Gas and Electric Company has used the Liberty Technologies' VOTES System for MOV testing and diagnostics. Liberty Technologies issued a 10 CFR Part 21 report on October 2, 1992, concerning increased diagnostic inaccuracies associated with stem torque effects and stem material constants.

All MOVs within the scope of GL 89-10 which had been tested using VOTES were evaluated based on the information contained in the Liberty Technologies' October 2, 1992 10 CFR Part 21 report and the VOTES version 2.3 software. All MOVs were confirmed operable.

In a letter dated September 29, 1993, BGE notified the NRC of our response to this supplement and the status of our MOVs.

GL 89-10 SUPPLEMENT 6: **MARCH 8, 1994 "INFORMATION ON SCHEDULE AND GROUPING, AND STAFF RESPONSES TO ADDITIONAL PUBLIC QUESTIONS"**

In this supplement, the NRC staff further clarifies the positions on the schedule for completing the MOV testing to verify design basis capability recommended in GL 89-10 and the grouping of MOVs to establish valve setup conditions. The staff responses to other general public questions and a list of the recently issued NRC GLs are also provided in the enclosures to this supplement.

BGE Response

The completion of Calvert Cliffs' actions in response to GL 89-10 were planned to meet the schedule and have been completed within the original schedule as submitted by BGE to the NRC.

Calvert Cliffs has incorporated the "MOV Grouping" method for several Program MOVs that were not practicable to test at design basis conditions. We have reviewed the items identified as important considerations by the NRC staff and have incorporated them as appropriate.

The MOV Project has reviewed the questions and NRC staff responses to questions on the GL and Supplements, and have taken them into consideration in the development of our GL 89-10 Program.

GL 89-10 SUPPLEMENT 7: **JANUARY 24, 1996 "CONSIDERATION OF VALVE MISPOSITIONING IN PRESSURIZED-WATER REACTORS"**

In this supplement, the NRC removed the recommendation that MOV mispositioning be considered by PWR licensees in responding to GL 89-10, as was done for BWR licensees in Supplement 4.

BGE Response

Originally, the MOV Project incorporated the effect of a mispositioning event into the determination of required thrust when adequate margin was available to incorporate the higher pressures without performing modifications. However, after Supplement 7 was issued, we deleted consideration of mispositioning pressures in our thrust determinations.

ATTACHMENT

BALTIMORE GAS & ELECTRIC COMPANY
RESPONSE TO GENERIC LETTER 89-10
SAFETY-RELATED MOTOR-OPERATED VALVE TESTING AND SURVEILLANCE

MOV Number	System/Function	Valve Information			Actuator Information			Design Delta P	Line Pressure	Thrust Required		Field Margin	Evaluation Method
		Manufacturer	Type	Size	Manufacturer	Type / Size	Motor			Bare*	T min*		
1-MOV-0269	Chemical and Volume Control System to High Pressure Safety Injection Header	Velan	Globe	2 in	Limitorque	SMB / 000	5 ft lb	0	2488	3974	4952	23.3	Comparison
1-MOV-0399	Shutdown Cooling Heat Exchanger Recirculation	Velan	Globe	2 in	Limitorque	SMB / 000	5 ft lb	210	210	2367	3162	43.8	Comparison
1-MOV-0403	Power-Operated Relief Valve Block	Velan	Gate	2.5 in	Limitorque	SMB / 000	5 ft lb	2282	2285	6622	8963	7.8	Comparison
1-MOV-0405	Power-Operated Relief Valve Block	Velan	Gate	2.5 in	Limitorque	SMB / 000	5 ft lb	2282	2285	6622	8134	3.8	Comparison
1-MOV-0501	Chemical and Volume Control System; Volume Control Tank Outlet Isolation	Velan	Gate	4 in	Limitorque	SMB / 00	7.5 ft lb	139	145	1740	2012	30.0	Statistical
1-MOV-0504	Chemical and Volume Control System; Reactor Coolant Make-up to Volume Control Tank	Velan	Gate	3 in	Limitorque	SMB / 00	5 ft lb	105	139	1376	2187	16.5	Statistical / DP
1-MOV-0508	Chemical and Volume Control System; Boric Acid Tank to Charging Pump, Bypass	Velan	Gate	3 in	Limitorque	SMB / 00	7.5 ft lb	154	148	1342	1874	8.3	Statistical / DP
1-MOV-0509	Chemical and Volume Control System; Boric Acid Tank to Charging Pump, Bypass	Velan	Gate	3 in	Limitorque	SMB / 00	7.5 ft lb	138	138	1711	2397	3.0	Statistical / DP
1-MOV-0514	Chemical and Volume Control System; Boric Acid Pump to Charging Pump	Velan	Gate	3 in	Limitorque	SMB / 00	7.5 ft lb	154	148	1393	2113	32.9	Statistical / DP
1-MOV-0615	Low Pressure Safety Injection; Loop Isolation, 11A	Velan	Globe	6 in	Limitorque	SMB / 2	60 ft lb	35	245	6080	8313	304.8	Dynamic Test
1-MOV-0616	High Pressure Safety Injection; Loop Isolation, 11A, Normal Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	1269	1282	4074	8621	37.8	Dynamic Test
1-MOV-0617	High Pressure Safety Injection; Loop Isolation, 11A, Alternate Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	2723	2723	5842	13818	1.3	Dynamic Test
1-MOV-0625	Low Pressure Safety Injection; Loop Isolation, 11B	Velan	Globe	6 in	Limitorque	SMB / 2	60 ft lb	35	245	6080	8313	304.8	Dynamic Test
1-MOV-0626	High Pressure Safety Injection; Loop Isolation, 11B, Normal Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	1269	1282	4574	10699	1.6	Dynamic Test
1-MOV-0627	High Pressure Safety Injection; Loop Isolation, 11B, Alternate Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	2723	2723	5842	13818	1.3	Dynamic Test
1-MOV-0635	Low Pressure Safety Injection; Loop Isolation, 12A	Velan	Globe	6 in	Limitorque	SMB / 2	60 ft lb	35	245	6080	8313	304.8	Dynamic Test
1-MOV-0636	High Pressure Safety Injection; Loop Isolation, 12A, Normal Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	1269	1282	4574	10699	1.6	Dynamic Test

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SAFETY-RELATED MOTOR-OPERATED VALVE TESTING AND SURVEILLANCE

MOV Number	System/Function	Valve Information			Actuator Information			Design Delta P	Line Pressure	Thrust Required		Field Margin	Evaluation Method
		Manufacturer	Type	Size	Manufacturer	Type / Size	Motor			Bare*	T min*		
1-MOV-0637	High Pressure Safety Injection; Loop Isolation, 12A, Alternate Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	2723	2723	5842	13818	1.3	Dynamic Test
1-MOV-0645	Low Pressure Safety Injection; Loop Isolation, 12B	Velan	Globe	6 in	Limitorque	SMB / 2	60 ft lb	35	245	6080	8313	304.8	Dynamic Test
1-MOV-0646	High Pressure Safety Injection; Loop Isolation, 12B Normal Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	1269	1282	4574	10699	1.6	Dynamic Test
1-MOV-0647	High Pressure Safety Injection; Loop Isolation, 12B, Alternate Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	2723	2723	5842	13818	1.3	Dynamic Test
1-MOV-0651	Shutdown Cooling Return Isolation	Velan	Gate	12 in	Limitorque	SMB/3	100 ft lb	256	256	**51347	**51347	25.1	EPRI PPM
1-MOV-0652	Shutdown Cooling Return Isolation	Velan	Gate	12 in	Limitorque	SMB/3	100 ft lb	253	253	**51347	**51347	24.1	EPRI PPM
1-MOV-0653	High Pressure Safety Injection; Header Cross Connection Valve	Velan	Gate	4 in	Limitorque	SMB/00	25 ft lb	0	1300	3930	7406	35.0	Dynamic Test
1-MOV-0654	High Pressure Safety Injection; Header Isolation Valve	Velan	Gate	6 in	Limitorque	SMB/0	40 ft lb	43	43	5709	7807	97.7	Dynamic Test
1-MOV-0655	High Pressure Safety Injection; Header Cross Connection Valve	Velan	Gate	4 in	Limitorque	SMB/00	25 ft lb	0	1300	3930	6351	57.4	Dynamic Test
1-MOV-0656	High Pressure Safety Injection; Header Isolation Valve	Velan	Gate	6 in	Limitorque	SMB/1	60 ft lb	259	301	6331	8752	16.3	Dynamic Test
1-MOV-0658	Low Pressure Safety Injection Supply to Shutdown Cooling Heat Exchanger	Velan	Gate	12 in	Limitorque	SMB/0	40 ft lb	0	43	4304	8025	84.1	Dynamic Test
1-MOV-0659	Safety Injection to Refueling Water Tank Mini Flow Return Isolation	Velan	Gate	4 in	Limitorque	SMB/00	10 ft lb	1252	1283	6751	8410	9.0	Dynamic Test
1-MOV-0660	Safety Injection to Refueling Water Tank Mini Flow Return Isolation	Velan	Gate	4 in	Limitorque	SMB/00	7.5 ft lb	1252	1283	6751	8938	5.0	Dynamic Test
1-MOV-0662	Shutdown Cooling Recirculation Valve	Velan	Gate	4 in	Limitorque	SMB/00	10 ft lb	469	510	1514	1514	411.3	Statistical / DP
1-MOV-0663	Shutdown Cooling Recirculation Valve	Velan	Gate	4 in	Limitorque	SMB/00	10 ft lb	469	510	1594	1594	385.4	Statistical / DP
1-MOV-2080	Instrument Air Supply To Containment	Anchor D	Gate	2 in	Limitorque	SMB/000	5 ft lb	156	155	1170	1790	21.0	Statistical / DP
1-MOV-4045	Main Steam Isolation Bypass Valve	Rockwell	Globe	2 in	Limitorque	SMB/000	5 ft lb	1115	1100	4880	6080	5.5	Comparison
1-MOV-4052	Main Steam Isolation Bypass Valve	Rockwell	Globe	2 in	Limitorque	SMB/000	5 ft lb	1115	1100	4880	6080	7.9	Comparison
1-MOV-4142	Refueling Water Tank Outlet Valves	Velan	Gate	18 in	Limitorque	SMB/0	40 ft lb	17	17	4520	6792	81.5	Statistical
1-MOV-4143	Refueling Water Tank Outlet Valves	Velan	Gate	18 in	Limitorque	SMB/0	40 ft lb	17	17	5020	8133	8.5	Statistical
1-MOV-4144	Containment Sump Outlet Isolation	Velan	Gate	24 in	Limitorque	SMB/2	60 ft lb	22	22	**22483	**22483	105.8	EPRI PPM
1-MOV-4145	Containment Sump Outlet Isolation	Velan	Gate	24 in	Limitorque	SMB/2	60 ft lb	22	22	**22483	**22483	105.8	EPRI PPM
1-MOV-4516	Steam Generator Feedwater Isolation	Velan	Gate	16 in	Limitorque	SMB/2	80 ft lb	275	275	**27275	35699	0.6	EPRI PPM
1-MOV-4517	Steam Generator Feedwater Isolation	Velan	Gate	16 in	Limitorque	SMB/2	80 ft lb	275	275	**26151	36986	17.8	EPRI PPM

ATTACHMENT

BALTIMORE GAS & ELECTRIC COMPANY
RESPONSE TO GENERIC LETTER 89-10
SAFETY-RELATED MOTOR-OPERATED VALVE TESTING AND SURVEILLANCE

MOV Number	System/Function	Valve Information			Actuator Information			Design	Line	Thrust Required		Field	Evaluation
		Manufacturer	Type	Size	Manufacturer	Type / Size	Motor	Delta P	Pressure	Bare*	T min*	Margin	Method
1-MOV-5462	Containment Normal Drain Isolation	Velan	Gate	4 in	Limitorque	SMB/00	10 ft lb	50	50	1376	2276	101.0	Statistical
1-MOV-5463	Containment Normal Drain Isolation	Velan	Gate	4 in	Limitorque	SMB/00	10 ft lb	50	50	1376	2013	69.8	Statistical
1-MOV-6900	Hydrogen Purge Containment Isolation	Velan	Gate	4 in	Limitorque	SMB/00	5 ft lb	21	6	814	1192	86.4	Statistical / DP
1-MOV-6901	Hydrogen Purge Containment Isolation	Velan	Gate	4 in	Limitorque	SMB/00	5 ft lb	21	6	378	554	332.5	Statistical / DP
1-MOV-6903	Hydrogen Purge Containment Replacement Air Isolation.	Velan	Gate	4 in	Limitorque	SMB/00	5 ft lb	21	6	823	1424	108.4	Statistical / DP
2-MOV-0269	Chemical and Volume Control System to High Pressure Safety Injection Header	Velan	Globe	2 in	Limitorque	SMB / 000	5 ft lb	0	2488	3974	5439	11.7	Comparison
2-MOV-0399	Shutdown Cooling Heat Exchanger Recirculation	Velan	Globe	2 in	Limitorque	SMB / 000	5 ft lb	210	210	2367	3591	26.2	Comparison
2-MOV-0403	Power-Operated Relief Valve Block	Velan	Gate	2.5 in	Limitorque	SMB / 000	5 ft lb	2282	2285	6622	9042	2.2	Comparison
2-MOV-0405	Power-Operated Relief Valve Block	Velan	Gate	2.5 in	Limitorque	SMB / 000	5 ft lb	2282	2285	6622	7580	2.6	Comparison
2-MOV-0501	Chemical and Volume Control System; Volume Control Tank Outlet Isolation	Velan	Gate	4 in	Limitorque	SMB / 00	7.5 ft lb	139	145	1740	2012	37.0	Statistical
2-MOV-0504	Chemical and Volume Control System; Reactor Coolant Make-up to Volume Control Tank	Velan	Gate	3 in	Limitorque	SMB / 00	5 ft lb	105	139	1376	2381	42.2	Statistical / DP
2-MOV-0508	Chemical and Volume Control System; Boric Acid Tank to Charging Pump, Bypass	Velan	Gate	3 in	Limitorque	SMB / 00	7.5 ft lb	154	148	1342	2037	36.6	Statistical / DP
2-MOV-0509	Chemical and Volume Control System; Boric Acid Tank to Charging Pump, Bypass	Velan	Gate	3 in	Limitorque	SMB / 00	7.5 ft lb	137	137	1338	2031	37.9	Statistical / DP
2-MOV-0514	Chemical and Volume Control System; Boric Acid Pump to Charging Pump	Velan	Gate	3 in	Limitorque	SMB / 00	7.5 ft lb	154	148	1393	2113	46.9	Statistical / DP
2-MOV-0615	Low Pressure Safety Injection; Loop Isolation, 11A	Velan	Globe	6 in	Limitorque	SMB / 2	60 ft lb	35	245	4580	6262	437.4	Dynamic Test
2-MOV-0616	High Pressure Safety Injection; Loop Isolation, 11A, Normal Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	1269	1282	4574	10699	1.6	Dynamic Test
2-MOV-0617	High Pressure Safety Injection; Loop Isolation, 11A, Alternate Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	2723	2723	5842	13818	1.3	Dynamic Test
2-MOV-0625	Low Pressure Safety Injection; Loop Isolation, 11B	Velan	Globe	6 in	Limitorque	SMB / 2	60 ft lb	35	245	6080	8313	304.8	Dynamic Test
2-MOV-0626	High Pressure Safety Injection; Loop Isolation, 11B, Normal Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	1269	1282	4574	10699	1.6	Dynamic Test
2-MOV-0627	High Pressure Safety Injection; Loop Isolation, 11B, Alternate Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	2723	2723	5842	13818	1.3	Dynamic Test

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MOV Number	System/Function	Valve Information			Actuator Information			Design	Line	Thrust Required		Field	Evaluation
		Manufacturer	Type	Size	Manufacturer	Type / Size	Motor	Delta P	Pressure	Bare*	T min*	Margin	Method
2-MOV-0635	Low Pressure Safety Injection; Loop Isolation, 12A	Velan	Globe	6 in	Limitorque	SMB / 2	60 ft lb	35	245	6080	8313	304.8	Dynamic Test
2-MOV-0636	High Pressure Safety Injection; Loop Isolation, 12A, Normal Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	1269	1282	4574	10699	1.6	Dynamic Test
2-MOV-0637	High Pressure Safety Injection; Loop Isolation, 12A, Alternate Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	2723	2723	5842	13818	1.3	Dynamic Test
2-MOV-0645	Low Pressure Safety Injection; Loop Isolation, 12B	Velan	Globe	6 in	Limitorque	SMB / 2	60 ft lb	35	245	6080	8313	304.8	Dynamic Test
2-MOV-0646	High Pressure Safety Injection; Loop Isolation, 12B Normal Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	1269	1282	4574	10699	1.6	Dynamic Test
2-MOV-0647	High Pressure Safety Injection; Loop Isolation, 12B, Alternate Header	Velan	Globe	2 in	Limitorque	SMB / 00	25 ft lb	2723	2723	5842	13818	1.3	Dynamic Test
2-MOV-0651	Shutdown Cooling Return Isolation	Velan	Gate	12 in	Limitorque	SMB/3	100 ft lb	256	256	**47758	**47758	33.5	EPRI PPM
2-MOV-0652	Shutdown Cooling Return Isolation	Velan	Gate	12 in	Limitorque	SMB/3	100 ft lb	253	253	**51347	**51347	24.1	EPRI PPM
2-MOV-0653	High Pressure Safety Injection; Header Cross Connection Valve	Velan	Gate	4 in	Limitorque	SMB/00	25 ft lb	0	1300	3930	5863	29.5	Dynamic Test
2-MOV-0654	High Pressure Safety Injection; Header Isolation Valve	Velan	Gate	6 in	Limitorque	SMB/0	40 ft lb	43	43	5709	7807	32.2	Dynamic Test
2-MOV-0655	High Pressure Safety Injection; Header Cross Connection Valve	Velan	Gate	4 in	Limitorque	SMB/00	25 ft lb	0	1300	3930	6928	18.9	Dynamic Test
2-MOV-0656	High Pressure Safety Injection; Header Isolation Valve	Velan	Gate	6 in	Limitorque	SMB/1	60 ft lb	259	301	5831	9457	90.3	Dynamic Test
2-MOV-0658	Low Pressure Safety Injection Supply to Shutdown Cooling Heat Exchanger	Velan	Gate	12 in	Limitorque	SMB/0	40 ft lb	0	43	4304	6383	262.2	Dynamic Test
2-MOV-0659	Safety Injection to Refueling Water Tank Mini Flow Return Isolation	Velan	Gate	4 in	Limitorque	SMB/00	10 ft lb	1252	1283	7126	8722	8.3	Dynamic Test
2-MOV-0660	Safety Injection to Refueling Water Tank Mini Flow Return Isolation	Velan	Gate	4 in	Limitorque	SMB/00	10 ft lb	1252	1283	6876	9094	3.3	Dynamic Test
2-MOV-0662	Shutdown Cooling Recirculation Valve	Velan	Gate	4 in	Limitorque	SMB/00	10 ft lb	469	500	1855	1855	337.3	Statistical / DP
2-MOV-0663	Shutdown Cooling Recirculation Valve	Velan	Gate	4 in	Limitorque	SMB/00	10 ft lb	469	500	2197	2197	277.9	Statistical / DP
2-MOV-2080	Instrument Air Supply To Containment	Anchor D	Gate	2 in	Limitorque	SMB/000	5 ft lb	156	155	1170	1790	16.0	Statistical / DP
2-MOV-4045	Main Steam Isolation Bypass Valve	Rockwell	Globe	2 in	Limitorque	SMB/000	5 ft lb	1115	1100	4880	6080	12.6	Comparison
2-MOV-4052	Main Steam Isolation Bypass Valve	Rockwell	Globe	2 in	Limitorque	SMB/000	5 ft lb	1115	1100	4880	6080	5.4	Comparison
2-MOV-4142	Refueling Water Tank Outlet Valves	Velan	Gate	18 in	Limitorque	SMB/0	40 ft lb	17	17	4520	7175	31.7	Statistical
2-MOV-4143	Refueling Water Tank Outlet Valves	Velan	Gate	18 in	Limitorque	SMB/0	40 ft lb	17	17	4520	7175	76.6	Statistical

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BALTIMORE GAS & ELECTRIC COMPANY
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SAFETY-RELATED MOTOR-OPERATED VALVE TESTING AND SURVEILLANCE

MOV Number	System/Function	Valve Information			Actuator Information			Design Delta P	Line Pressure	Thrust Required		Field Margin	Evaluation Method
		Manufacturer	Type	Size	Manufacturer	Type / Size	Motor			Bare*	T min*		
2-MOV-4144	Containment Sump Outlet Isolation	Velan	Gate	24 in	Limitorque	SMB/2	60 ft lb	22	22	**22483	**22483	105.8	EPRI PPM
2-MOV-4145	Containment Sump Outlet Isolation	Velan	Gate	24 in	Limitorque	SMB/2	60 ft lb	22	22	**27385	**27385	70.0	EPRI PPM
2-MOV-4516	Steam Generator Feedwater Isolation	Velan	Gate	16 in	Limitorque	SMB/2	80 ft lb	275	275	**28258	34228	24.6	EPRI PPM
2-MOV-4517	Steam Generator Feedwater Isolation	Velan	Gate	16 in	Limitorque	SMB/2	80 ft lb	275	275	**30761	40262	2.9	EPRI PPM
2-MOV-5462	Containment Normal Drain Isolation	Velan	Gate	4 in	Limitorque	SMB/00	5 ft lb	50	50	1370	2013	44.8	Statistical
2-MOV-5463	Containment Normal Drain Isolation	Velan	Gate	4 in	Limitorque	SMB/00	5 ft lb	50	50	867	1268	29.6	Statistical
2-MOV-6900	Hydrogen Purge Containment Isolation	Velan	Gate	4 in	Limitorque	SMB/00	5 ft lb	21	6	738	1080	170.9	Statistical / DP
2-MOV-6901	Hydrogen Purge Containment Isolation	Velan	Gate	4 in	Limitorque	SMB/00	5 ft lb	21	6	691	1012	215.8	Statistical / DP
2-MOV-6903	Hydrogen Purge Containment Replacement Air Isolation	Velan	Gate	4 in	Limitorque	SMB/00	5 ft lb	21	6	1546	2262	63.4	Statistical / DP

* DEFINITIONS:

1. Thrust Required

   Bare: Force calculated from standard industry gate valve equation

   T min: Minimum thrust determined by raising bare thrust to incorporate effects of:
   - test equipment accuracy
   - torque switch repeatability
   - rate of loading
   - lubrication degradation and spring pack relaxation

2. Field Margin

   Close direction - margin expressed as a percentage between T min and thrust at torque switch trip

   Open direction - margin expressed as a percentage between T min and MOV output

3. Evaluation Method

   Comparison: evaluation based on test results of similar MOVs

   Statistical: evaluation based on statistical analysis of Calvert Cliffs dynamic testing

   Statistical / DP: evaluation based on statistical analysis of Calvert Cliffs dynamic testing and in-situ DP test less than design basis conditions

   EPRI PPM: evaluation based on the EPRI Performance Prediction Model

** Thrust values calculated by EPRI PPM

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BALTIMORE GAS & ELECTRIC COMPANY
RESPONSE TO GENERIC LETTER 89-10
SAFETY-RELATED MOTOR-OPERATED VALVE TESTING AND SURVEILLANCE

CAPABILITY PACKAGES

MOVs under the scope of GL 89-10 have been divided into 22 groups. Group definition was based on considerations identified in GL 89-10, Supplement 6. These capability packages document the evaluations performed and support verification that each GL 89-10 Program MOV is capable of operating when required under normal and abnormal design basis conditions.

It should be noted that this grouping of MOVs was to support documentation of operability and was not used to reduced dynamic testing.

GL 89-10 Program MOVs:

GROUP NUMBER	APPLICABLE MOVs
1	1 & 2-MOV-616,626,636,646
2	1 & 2-MOV-617,627,637,647
3	1 & 2-MOV-269
4	1 & 2-MOV-399
5	1 & 2-MOV-4045,4052
6	1 & 2-MOV-2080
7	1 & 2-MOV-403,405
8	1 & 2-MOV-504,508,509,514
9	1 & 2-MOV-501
10	1 & 2-MOV-662,663
11	1 & 2-MOV-659,660
12	1 & 2-MOV-5462,5463
13	1 & 2-MOV-6900,6901,6903
14	1 & 2-MOV-653,655
15	1 & 2-MOV-615,625,635,645
16	1 & 2-MOV-654
17	1 & 2-MOV-656
18	1 & 2-MOV-658
19	1 & 2-MOV-651,652
20	1 & 2-MOV-4516,4517
21	1 & 2-MOV-4142,4143
22	1 & 2-MOV-4144,4145

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BALTIMORE GAS & ELECTRIC COMPANY
RESPONSE TO GENERIC LETTER 89-10
SAFETY-RELATED MOTOR-OPERATED VALVE TESTING AND SURVEILLANCE

RISK CATEGORIES

HIGH RISK		MEDIUM RISK		LOW RISK		LOW-LOW RISK	
1/2-MOV 403	1/2-MOV 405	1/2-MOV 617	1/2-MOV 627	1/2-MOV 269	1/2-MOV 399	1/2-MOV 501	1/2-MOV 504
1/2-MOV 4144	1/2-MOV 4145	1/2-MOV 637	1/2-MOV 647	1/2-MOV 615	1/2-MOV 625	1/2-MOV 508	1/2-MOV 509
		1/2-MOV 616	1/2-MOV 626	1/2-MOV 635	1/2-MOV 645	1/2-MOV 514	1/2-MOV 662
		1/2-MOV 636	1/2-MOV 646	1/2-MOV 653	1/2-MOV 655	1/2-MOV 663	1/2-MOV 654
		1/2-MOV 651	1/2-MOV 652	1/2-MOV 4516	1/2-MOV 4517	1/2-MOV 656	1/2-MOV 658
		1/2-MOV 659	1/2-MOV 660	1/2-MOV 6900	1/2-MOV 6901	1/2-MOV 4045	1/2-MOV 4052
		1/2-MOV 5462	1/2-MOV 5463	1/2-MOV 6903		1/2-MOV 4142	1/2-MOV 4143
						1/2-MOV 2080	