

December 14, 2000

Mr. Michael A. Balduzzi
Vice President, Operations
Vermont Yankee Nuclear Power Corporation
185 Old Ferry Road
P.O. Box 7002
Brattleboro, VT 05302-7002

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION-SAFETY EVALUATION OF
LICENSEE RESPONSE TO GENERIC LETTER 96-05 (TAC NO. M97114)

Dear Mr. Balduzzi:

On September 18, 1996, the U.S. 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 15, 1996, Vermont Yankee Nuclear Power Corporation (the licensee) notified the NRC that an MOV periodic verification program would be established at Vermont Yankee Nuclear Power Station (Vermont Yankee) in response to GL 96-05. On March 13, 1997, the licensee submitted a summary description of the MOV periodic verification program being established at Vermont Yankee. In NRC Inspection Report 50-271/98-14 (dated January 28, 1999,) the NRC staff provided the results of an inspection at Vermont Yankee to review the licensee's GL 96-05 program. In a submittal dated May 27, 1999, the licensee provided additional information regarding its GL 96-05 program requested by the NRC staff in a letter dated March 1, 1999. In a letter dated November 14, 2000, the licensee clarified one aspect of the implementation of its GL 96-05 program.

M. Balduzzi

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The staff has reviewed the licensee's submittals and applicable NRC inspection reports for the MOV program at Vermont Yankee. The NRC staff finds that the licensee has established an acceptable program to periodically verify the design-basis capability of the safety-related MOVs at Vermont Yankee through the actions described in its submittals, including its commitment to the Joint Owners Group (JOG) Program on MOV Periodic Verification. As discussed in the enclosed safety evaluation (SE), the staff concludes that the licensee is adequately addressing the actions requested in GL 96-05. The NRC staff may conduct inspections at Vermont Yankee to verify that the implementation of the MOV periodic verification program is in accordance with the licensee's commitments; this NRC SE; and the NRC SE dated October 30, 1997, on the JOG Program on MOV Periodic Verification. If there are any questions please call me at (301) 415-3016. This closes TAC No. M97114.

Sincerely,

/RA/

Robert M. Pulsifer, Project Manager, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-271

Enclosure: Safety Evaluation

cc w/ encl: See next page

The staff has reviewed the licensee's submittals and applicable NRC inspection reports for the MOV program at Vermont Yankee. The NRC staff finds that the licensee has established an acceptable program to periodically verify the design-basis capability of the safety-related MOVs at Vermont Yankee through the actions described in its submittals, including its commitment to the Joint Owners Group (JOG) Program on MOV Periodic Verification. As discussed in the enclosed safety evaluation (SE), the staff concludes that the licensee is adequately addressing the actions requested in GL 96-05. The NRC staff may conduct inspections at Vermont Yankee to verify that the implementation of the MOV periodic verification program is in accordance with the licensee's commitments; this NRC SE; and the NRC SE dated October 30, 1997, on the JOG Program on MOV Periodic Verification. If there are any questions please call me at (301) 415-3016. This closes TAC No. M97114.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
LICENSEE RESPONSE TO GENERIC LETTER 96-05, "PERIODIC VERIFICATION OF
DESIGN-BASIS CAPABILITY OF SAFETY-RELATED MOTOR-OPERATED VALVES,"
VERMONT YANKEE NUCLEAR POWER STATION
DOCKET NUMBER 50-271

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 Vermont Yankee Nuclear Power Corporation (licensee) to verify periodically the design-basis capability of safety-related MOVs at the Vermont Yankee Nuclear Power Station (Vermont Yankee).

2.0 REGULATORY REQUIREMENTS

The 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 the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code*, and more recently the ASME *Code for Operation and Maintenance of Nuclear Power Plants*.

Enclosure

In response to concerns regarding MOV performance, the 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 generic letter. 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 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 ASME Code Case OMN-1, "Alternative Rules for Preservice and Inservice Testing of Certain Electric Motor Operated Valve Assemblies in 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 generic letter 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 an SE on the response of each licensee 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 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," 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, 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 not applicable to 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, JOG will evaluate the test results to validate the assumptions in the interim program to establish a long-term MOV periodic verification program to 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, CEOG and WOG submitted Topical Report MPR-1807 (Revision 2) describing the JOG program on August 6 and 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. On October 19, 1999, the Babcock & Wilcox Owners Group (B&WOG) forwarded Topical Report MPR-1807 (Revision 2) to the NRC, and stated that B&WOG is now participating in the JOG Program on MOV Periodic Verification. In a letter dated May 15, 2000, the NRC staff informed B&WOG that Topical Report MPR-1807 is acceptable for referencing in B&WOG licensing applications to the extent specified and under the limitations delineated in the report and the associated NRC SE dated October 30, 1997.

4.0 VERMONT YANKEE GL 96-05 PROGRAM

On November 15, 1996, the licensee notified the NRC that an MOV periodic verification program would be established at Vermont Yankee in response to GL 96-05. On March 13, 1997, the licensee submitted a summary description of the MOV periodic verification program being established at Vermont Yankee. In NRC Inspection Report (IR) 50-271/98-14 (dated January 28, 1999,) the NRC staff provided the results of an inspection at Vermont Yankee to review the licensee's GL 96-05 program. In a submittal dated May 27, 1999, the licensee provided additional information regarding its GL 96-05 program requested by the NRC staff in a letter dated March 1, 1999. In a letter dated November 14, 2000, the licensee clarified one aspect of the implementation of its GL 96-05 program.

In its letter dated March 13, 1997, the licensee stated that the assurance of continued MOV capability will be maintained through a combination of static and dynamic diagnostic testing and periodic maintenance activities. The licensee will establish test activities and the verification interval for each MOV based on: (1) the MOV's safety significance and reliability, including margin and operating conditions such as environmental and fluid conditions; and (2) the results of the MOV tracking and trending program at Vermont Yankee. The licensee plans to apply the methodology described in ASME Code Case OMN-1 along with the provisions in GL 96-05 regarding the application of the Code case as part of its MOV periodic verification program. The licensee will monitor MOV performance parameters directly at the valve and from the Motor Control Center (MCC). The licensee is participating in the testing of selected MOVs under dynamic conditions as part of the JOG Program on MOV Periodic Verification. In its letter dated May 27, 1999, the licensee stated that the Vermont Yankee program procedure in response to GL 96-05 was in the final stages of development. On September 22, 2000, licensee personnel indicated that the actions described in the letter dated May 27, 1999, had been completed in accordance with the planned schedule.

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 Vermont Yankee in response to GL 96-05. NRC IRs 50-271/91-80, 93-16, 96-05, and 97-08 provide 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 at Vermont Yankee. The staff closed the review of the GL 89-10 program at Vermont Yankee based on the inspection results documented in IR 97-08. In IR 98-14, the staff discussed the results of an inspection of the GL 96-05 program at Vermont Yankee. The staff's evaluation of the licensee's response to GL 96-05 is discussed 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 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 non-safety position.

As reported in IR 98-14, the licensee included the same 85 MOVs in the GL 96-05 program at Vermont Yankee as addressed in its GL 89-10 program. In its response to GL 96-05, the licensee did not take exception to the recommendation in the generic letter regarding the consideration of the capability of MOVs placed in their non-safety position. The staff did not identify any concerns regarding the scope of the MOV program at Vermont Yankee in IR 98-14.

The 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 97-08, the NRC staff closed its review of the licensee's justification for the assumptions and methodologies used in the MOV program at Vermont Yankee. With the long-term items discussed in the following section, the staff determined that the licensee had adequately justified the assumptions and methodologies used in its MOV program. In IR 98-14, the staff reported that the licensee had procedures in place to revise its MOV calculations after test data have been obtained, but that there were no guidelines for the timeliness or tracking of such updating. In its letter dated May 27, 1999, the licensee stated that formal evaluations for all tests performed up to that time had been completed and documented in accordance with its Quality Assurance Program. The licensee stated that it would revise the MOV program procedure to specify the completion of operability evaluations prior to returning components to service following maintenance or testing activities. The licensee also stated that the program

would establish the criteria for initial evaluations as well as a time frame for completing formal calculations and the method for tracking. The licensee indicated that this revision would be completed by October 31, 1999. On September 22, 2000, licensee personnel indicated that these actions were complete.

The 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, the NRC staff discussed in IR 97-08 several items of the licensee's MOV program to be addressed over the long term. These items included: (1) update the MOV program plan to ensure that a process was in place to incorporate future test results into design calculations; (2) revise existing design calculations to reflect statistically derived data from dynamically tested valves; (3) apply bounding rate-of-loading data from previously tested globe valves to non-testable globe valves; and (4) complete the Electric Power Research Institute MOV Performance Prediction Methodology for all applicable non-tested valves and apply the resulting thrust predictions (as necessary) in determining torque switch setting requirements. In letters dated March 2 and 30, 1998, the licensee notified the NRC that those actions were complete. In IR 98-14, the NRC staff reported that, based on a review of selected procedures and calculations at Vermont Yankee, the licensee had satisfied these commitments with the exception that some calculations had not been updated to reflect recent test results. In its letter dated May 27, 1999, the licensee stated that it had completed formal evaluations of all tests conducted at that time. In GL 89-10, the NRC staff identified pressure locking and thermal binding as potential performance concerns for safety-related MOVs. On October 1, 1998, the NRC staff accepted the licensee's response to GL 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," for Vermont Yankee.

In IR 98-14, the NRC staff reported on the review of the tracking and trending of MOV performance at Vermont Yankee. For example, the licensee has established procedures to require the review and trending of MOV failures, and static and dynamic diagnostic test results every 2 years. The licensee includes consideration of valve deficiencies in its trending of MOV performance. The primary MOV parameters trended are unseating thrust, thrust at close control switch trip (CST), total close thrust, average running thrust and motor current, stem friction at close CST, and any backseating thrust. The licensee evaluates significant differences from previous tests and selects additional parameters for review as necessary. The licensee had not identified any performance anomalies or adverse trends over the previous 2-year trend interval. The NRC staff found the most recent trend report at the time of the inspection to be comprehensive in its consideration of test data. In its letter dated May 27, 1999, the licensee stated that the Vermont Yankee MOV periodic verification program will, as a minimum, address each valve in the GL 96-05 program based on its associated margin, potential to degrade, and safety significance. The licensee will factor the results of its MOV periodic verification tests into the GL 96-05 program. The licensee will assess those test results quantitatively and qualitatively together with actual valve operating performance to determine if any changes or trends affect operability. The licensee will place an emphasis on qualitative assessments that are looking for overall changes in MOV performance including the use of diagnostic trace overlays and analysis.

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

5.4 JOG Program on MOV Periodic Verification

In an SE dated October 30, 1997, the NRC staff accepted the JOG Program on MOV Periodic Verification 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. In its letter dated March 13, 1997, the licensee stated that it is participating in the JOG testing program at Vermont Yankee.

As indicated in IR 98-14, the licensee has established an initial MOV periodic test method that differs from the test matrix provided in Phase 1 of the JOG program. In its letter dated May 27, 1999, the licensee stated that the Vermont Yankee MOV periodic verification program includes static baseline "at the valve" and inservice "at the MCC" testing. The licensee will determine the frequency and type of test and verification activities, based on the risk importance of each MOV and the actual valve performance information. The licensee selected initial test methodologies and frequencies based on margin, safety significance, and local ambient environmental conditions. The licensee stated that the results of the JOG program will be used in conjunction with plant-specific data to validate its methodologies and assumed degradation rates. The licensee reported that initial baseline testing has been completed for all MOVs. The licensee has established an initial static MCC inservice test frequency for high-risk MOVs for each operating cycle and for low-risk MOVs of every other operating cycle. The licensee specifies that "at the valve" static tests will be performed on MOVs where MCC testing needs to be supplemented.

In IR 98-14, the NRC staff noted that the licensee will verify its MCC data by direct thrust and torque measurements at the valve over extended intervals. For example, the staff noted that the licensee indicated that the static "at the valve" diagnostic tests were tentatively scheduled up to once every eight outages (i.e., 12 years). The issues to be evaluated for the use of MCC test data include: (1) the correlation between new MCC test data and existing direct MOV data measurements; (2) the relationship between changes in MCC test data and MOV thrust and torque performance; (3) system accuracies and sensitivities to MOV degradation for both outputs and operating performance requirements; and (4) validation of MOV operability using MCC testing. The staff has addressed the use of MCC data in the implementation of GL 96-05 programs at other nuclear plants. For example, see the NRC SE dated August 4, 2000, on the GL 96-05 program established at the Enrico Fermi Atomic Power Plant, Unit No. 2. In its May 27, 1999, letter the licensee indicates that the frequency of the MOV periodic verification tests may be modified based on the results of the JOG program and the Vermont Yankee MOV trending program.

In its letter dated May 27, 1999, the licensee states that it plans to use the guidance provided in ASME Code Case OMN-1 in conjunction with its commitment to Phases 2 and 3 of the JOG program, in the development of the Vermont Yankee MOV periodic verification program. The licensee addresses the three limitations discussed in GL 96-05 regarding the application of the Code case. First, the licensee states that it will use the results of Phase 3 of the JOG program combined with plant-specific verification and performance data (if appropriate) to support

development of valve degradation information in accounting for potential adverse effects when determining appropriate valve tests. Second, the licensee will perform inservice tests of high-risk MOVs each operating cycle and of low-risk MOVs every two operating cycles, and may perform additional "at the valve" static diagnostic tests to enhance information to evaluate MOV performance. The licensee notes that the interval of those subsequent "at the valve" tests might exceed the 10-year evaluation interval discussed in GL 96-05, but considers the frequent tests from the MCC to assure MOV capability. Also, the licensee states that the frequency for MCC or "at the valve" tests may be modified based on valve trending information and the JOG program results. Third, the licensee states that risk insights are being applied to assist in the determination of MOV test frequencies. The licensee does not currently intend to use Code Case OMN-1 as an alternative to the quarterly MOV stroke-time testing of the ASME Code, but will submit a request for relief from that Code requirement if appropriate in the future.

As discussed in IR 98-14, the NRC staff reviewed the risk ranking of MOVs at Vermont Yankee and compared the licensee's approach to the methodology described by the BWROG in Topical Report NEDC-32264 and the NRC SE dated February 27, 1996. The staff reviewed the licensee's use of importance measures, consideration of common-cause failure, and expert panel oversight. The staff also compared the MOVs identified at Vermont Yankee as risk significant to the composite list developed by BWROG, and reviewed the bases for the limited differences in those lists. The staff considers the MOV risk-ranking approach at Vermont Yankee to be acceptable.

In its letter dated May 27, 1999, the licensee stated that Vermont Yankee is actively participating in the JOG test program and is supporting the JOG Phase 2 dynamic testing efforts. The licensee stated that the Vermont Yankee MOV periodic verification program will include the results of the JOG Phase 2 test program and Phase 3 test results. The licensee expects the JOG program to provide information regarding valve factor changes over time and also insights for determining degradation for MOVs only stroked under accident conditions. The licensee states that its participation in the JOG program constitutes a commitment to implement the results of Phases 2 and 3 of the JOG program as discussed in its letter dated May 27, 1999. The licensee also states that it will implement the results of Phase 3 of the JOG program to establish any degradation of valve factor over time. The licensee will integrate this information into its MOV program for switch settings, trending, and other activities. As part of its commitment to the JOG program, the licensee states in its letter dated May 27, 1999, that, in the event that exceptions need to be taken from the results of the JOG program, the exceptions will be documented in the Vermont Yankee MOV program and supported with applicable plant-specific data. In a letter dated November 14, 2000, the licensee clarified the implementation of its GL 96-05 program by committing to review any exceptions to the JOG program in accordance with the Vermont Yankee program for managing regulatory commitments.

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. The JOG indicates that each licensee is responsible for addressing any MOVs outside the scope of applicability of the JOG program. In the NRC SE dated October 30, 1997, the NRC staff specifies 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 NRC staff recognizes that 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, the 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 its 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.

Based on the description of the licensee's initial MOV diagnostic testing program and its commitment to Phases 2 and 3 of the JOG Program on MOV Periodic Verification, the NRC staff considers the MOV periodic verification program being established at Vermont Yankee to be acceptable and consistent with the intent of the JOG program.

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 specifies that licensees are responsible for addressing the thrust or torque delivered by the MOV motor actuator and its potential degradation. Although 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 IR 98-14, the NRC staff reports that the licensee has established specific procedures to monitor potential degradation of MOV motor actuator performance at Vermont Yankee. The parameters to be trended include stem friction coefficient, motor current, load sensitive behavior, and dynamic margin. The licensee reviews and trends static and dynamic MOV diagnostic test results every 2 years. The licensee evaluates significance differences from previous tests and selects additional parameters for review as necessary. The licensee had not identified any MOV performance anomalies or adverse trends over the previous 2-year trend interval. The licensee will assess the results of its MOV periodic verification tests quantitatively and qualitatively together with actual valve operating performance to determine any adverse effect on operability. The licensee stated that an acceptance procedure for MCC testing was under development to specify which parameters are to be monitored for trending and which are to be given specific acceptance criteria. The licensee plans to use Motor Current Signature Analysis and frequency-based analysis using Fast Fourier Transformation methods to provide an overall evaluation of MOV performance.

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 IR 98-14, the NRC staff reported that the licensee is addressing the new information on ac-powered MOV

output. For example, the licensee was using pullout efficiency (as recommended in the technical update) for Limatorque actuators in the MOV sizing calculations at Vermont Yankee. In its letter dated May 27, 1999, the licensee stated that it calculates reduced-voltage motor torque using nameplate information and pullout efficiency. The licensee noted that dynamometer testing had been performed on almost all of the GL 96-05 MOV motors at Vermont Yankee. The licensee also stated that it was revising the MOV calculations to incorporate an application factor of 0.9 per the Limatorque technical update. On September 22, 2000, licensee personnel indicated that this action was complete. The licensee had not identified any impact on valve operability resulting from the change in application factor.

In its letter dated July 17, 1998, forwarding Technical Update 98-01, Limatorque indicated that a future technical update will be issued to address the application of dc-powered MOVs. In its letter dated May 27, 1999, the licensee noted that, similar to ac-powered MOVs, nameplate information and pullout efficiency are being used in dc-powered MOV calculations at Vermont Yankee. The licensee is also addressing the 0.9 application factor in its MOV calculations.

Any MOV operability concerns that might be identified in the future will be processed in accordance with established regulatory requirements and plant-specific commitments.

The NRC staff considers the licensee to be establishing sufficient means to monitor MOV motor actuator output and its potential degradation at Vermont Yankee.

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 Vermont Yankee through the actions described in its submittals, including its commitment to the JOG Program on MOV Periodic Verification. Therefore, the staff concludes that the licensee is adequately addressing the actions requested in GL 96-05 at Vermont Yankee. The staff may conduct inspections at Vermont Yankee to verify the implementation of the MOV periodic verification program is in accordance with the licensee's commitments; this NRC SE; and the NRC SE dated October 30, 1997, on the JOG Program on MOV Periodic Verification.

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