August 4, 2000

Mr. William T. O'Connor, Jr.
Vice President - Nuclear Generation
Detroit Edison Company
6400 North Dixie Highway
Newport, MI 48166

SUBJECT: FERMI 2 - COMPLETION OF LICENSING ACTION FOR GENERIC LETTER (GL) 96-05, "PERIODIC VERIFICATION OF DESIGN-BASIS CAPABILITY OF SAFETY-RELATED MOTOR-OPERATED VALVES," DATED SEPTEMBER 18, 1996 (TAC NO. M97047)

Dear Mr. O'Connor:

The NRC staff issued GL 96-05 on September 18, 1996, requesting each addressee to establish a program, or to ensure the effectiveness of its current program, to verify on a periodic basis that safety-related motor-operated valves (MOVs) continue to be capable of performing their safety functions within the current licensing bases of the facility.

On November 18, 1996, you submitted your 60-day response to GL 96-05, notifying the NRC that you would implement the requested MOV periodic verification program at Fermi 2. On March 18, 1997, you submitted your 180-day response to GL 96-05, providing a summary description of the planned MOV periodic verification program at Fermi 2. In a letter dated June 17, 1998, you updated your commitment to GL 96-05. On April 23, 1999, you provided your response to the NRC staff's February 22, 1999, request for additional information regarding GL 96-05. In a letter dated December 22, 1999, you revised your commitment to GL 96-05 and in your submittal dated June 21, 2000, you provided additional information regarding the use and application of a methodology that determines MOV thrust based on data obtained from the motor control center at Fermi 2.

The NRC staff has completed its review of your submittals and applicable NRC inspection reports concerning the MOV program at Fermi 2. The staff finds that you have established an acceptable program to periodically verify the design-basis capability of the safety-related MOVs at Fermi 2 through your commitments to all three phases of the Joint Owners Group (JOG) Program on MOV Periodic Verification and the additional actions described in your submittals. As discussed in the enclosed safety evaluation (SE), the staff concludes that you are addressing the actions requested in GL 96-05 adequately.

The NRC staff may conduct inspections at Fermi 2 to verify that the implementation of the MOV periodic verification program is in accordance with your commitments, the enclosed SE, and the NRC SE dated October 30, 1997, concerning the JOG Program on MOV Periodic Verification.

Finally, the staff concludes that you have provided all of the information requested by GL 96-05. Therefore, we consider GL 96-05 (TAC No. M97047) to be closed for your facility.

Sincerely,

/RA/

Andrew J. Kugler, Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-341

Enclosure: Safety Evaluation

cc w/encl: See next page

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Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-341

Enclosure: Safety Evaluation

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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"

FERMI 2

DOCKET NO. 50-341

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, 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 (ISTs) 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.

After these weaknesses in MOV performance were identified, NRC and the industry initiated activities to verify the design-basis capability of safety-related MOVs in nuclear power plants. After these activities were completed, 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 the Detroit Edison Company (DECo or the licensee) to periodically verify the design-basis capability of safety-related MOVs at Fermi 2.

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 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." In Section 50.55a of 10 CFR Part 50, the NRC requires licensees to establish

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* (OM Code).

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. Actions licensees were expected to take in response to GL 89-10 included 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 actions, and trending MOV problems. The staff requested that licensees complete the GL 89-10 program within approximately three refueling outages or 5 years after 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 the 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 it should prepare additional guidance on the periodic verification of MOV design-basis capability. On September 18, 1996, the NRC staff issued GL 96-05, “Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves,” requesting that each licensee establish a program, or ensure the effectiveness of its current program, to periodically verify 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 the 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." This code case allows licensees to replace ASME OM 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 that could adversely affect the design-basis capability of safety-related MOVs (described in Section 3.0 below) 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,” both of which were published in March 1997. 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 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 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 with plants 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 and 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.

After considering 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 FERMI 2 GL 96-05 PROGRAM

On November 18, 1996, DECo submitted its 60-day response to GL 96-05 notifying the NRC that it would implement the requested MOV periodic verification program at Fermi 2. On March 18, 1997, DECo submitted its 180-day response to GL 96-05 providing a summary description of the planned MOV periodic verification program at Fermi 2. In a letter dated June 17, 1998, the licensee updated its commitment to GL 96-05. On April 23, 1999, the licensee provided its response to the NRC staff's February 22, 1999, request for additional information regarding GL 96-05. In a letter dated December 22, 1999, the licensee revised its commitment to GL 96-05. In its submittal dated June 21, 2000, the licensee provided additional information regarding the use and application of a methodology that determines MOV thrust based on data obtained from the associated motor control centers (MCCs) at Fermi 2.

In its letter dated March 18, 1997, the licensee provided an initial description of the MOV periodic verification program planned for Fermi 2. In some instances, the licensee planned to implement an MOV periodic verification program that differed from the JOG program, such as the static MOV diagnostic testing program. However, in its letter dated December 22, 1999, the licensee revised its MOV program plans to state that it would implement all three phases of the JOG program, including the JOG interim static MOV diagnostic test program, 5-year dynamic MOV testing program, and long-term MOV periodic verification program. The licensee stated

that it would begin implementation of the JOG interim static MOV diagnostic test program within 60 days of the completion of the refueling outage scheduled to begin on March 31, 2000. As part of its MOV periodic verification, the licensee indicated that it plans to make extensive use of test data obtained from the MCCs that power the MOVs to evaluate any degradation in MOV thrust. In its letter dated June 21, 2000, the licensee described the validation of the MCC thrust determination methodology. The methodology determines thrust at torque switch trip using data obtained from the MCC for MOVs that use alternating current (ac) power.

5.0 NRC STAFF EVALUATION

The NRC staff has reviewed the information provided in the licensee's submittals describing the program to periodically verify the design-basis capability of safety-related MOVs at Fermi 2 in response to GL 96-05. NRC Inspection Reports (IRs) 50-341/91016, 93003, and 95010 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. The staff closed its review of the GL 89-10 program at Fermi 2 based on the results documented in IR 95010. The staff's evaluation of the licensee's response to GL 96-05 is described below.

5.1 MOV Program Scope

In GL 96-05, the NRC staff indicated that all safety-related MOVs covered by the GL 89-10 program should be considered in the development of the MOV periodic verification program. The 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 if the system (or train) is not declared inoperable when the MOVs are in their nonsafety position.

In IR 91016, the NRC staff reviewed the licensee's MOV program in response to GL 89-10 and concluded that the scope of the licensee's program was consistent with the guidance of GL 89-10. In a letter dated November 18, 1996, the licensee committed to implement the requested MOV periodic verification program at Fermi 2 in response to GL 96-05 and did not take exception to the scope of the generic letter. In its letter dated March 18, 1997, the licensee indicated that the scope of its MOV periodic verification program is identical with the scope of its GL 89-10 program.

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 95010, the NRC staff closed its review of the licensee's justification for the assumptions and methodologies used in the MOV program at Fermi 2. 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. The licensee's letter dated April 23, 1999, indicated ongoing margin improvement activities, such as switch adjustments, motor replacements, and gearing changes. The staff concludes that the licensee has 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

In its evaluation of the Fermi 2 GL 89-10 program in IR 95010, the NRC staff discussed several items in the licensee's MOV program that would need to be addressed over the long term. In its letter dated April 23, 1999, the licensee reported on the status of the remaining long-term GL 89-10 items. For example, the licensee (1) used the Electric Power Research Institute's (EPRI's) MOV Performance Prediction Methodology (PPM) to develop thrust requirements for non-testable valves, (2) used bounding valve factor assumptions with significant margin for sizing and setting selected Velan gate valves, (3) used a specialized EPRI MOV PPM analysis developed by the licensee of the Susquehanna Nuclear Power Plant with a 0.7 valve factor for two gate valves manufactured by Lunkenheimer and modified these MOVs to provide the increased thrust requirements, (4) implemented EPRI's guidance for evaluation of increased thrust requirements resulting from bent valve guides (referred to as "parasitic" loads), and (5) completed actions to resolve torque switch setting concerns for several direct current (dc)-powered MOVs.

In GL 89-10, the NRC staff also identified pressure locking and thermal binding as potential performance concerns for safety-related MOVs. The NRC staff completed its review of the licensee's actions in response to GL 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," in an SE dated May 10, 1999.

In IR 95010, the NRC staff reported that the MOV trending program at Fermi 2 was considered to be an industry leader and a strength of the overall MOV program. The staff noted that the MOV trending program at Fermi 2 was clearly established and capable of providing meaningful data for the purpose of maintaining MOV design-basis capability. In its letter dated March 18, 1997, the licensee provided details regarding the quantitative and qualitative aspects of its MOV trending program. For example, the licensee reported that it had been trending MOV problems and failures for several years and was beginning to incorporate that information into a coded database. As one result of its trending efforts, the licensee pointed to improvements in plant procedures for valve packing adjustments to reduce the number of packing leaks. The licensee also stated that the overall reduction in actuator- and valve-related problems had resulted in an increased awareness of MOV failures caused by MCC problems. At Fermi 2, the Maintenance MOV Coordinator assembles the corrective action trend data once every year and compares the latest annual data to historic benchmarks. The licensee also evaluates multiple problems and failures associated with individual MOVs. The licensee conducts MOV performance trending using specialized computer software for monitoring and analyzing MOV test data. The licensee stated that 14 MOV properties are trended, including average running force, maximum running force, disk pullout force, maximum thrust, torque switch setting, peak motor current, and running motor current. The licensee is exploring means to establish alarm values for these monitored parameters to indicate a degraded MOV. The licensee is also beginning to trend MOV performance by overlaying present and previous data

traces. In its letter dated June 21, 2000, the licensee stated that the MCC test data are also used to help monitor and trend MOV performance. The licensee indicated that average running and the peak seating current and power, power at torque switch trip, parasitic load power ratio, actuator no-load power level, total wedging time, contact operation time, and equivalent thrust, are examples of the evaluated MCC test parameters.

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

5.4 JOG Program on MOV Periodic Verification

In its letter dated December 22, 1999, the licensee updated its commitment to implement the JOG Program on MOV Periodic Verification as described in NEDC-32719 (Revision 2). In an SE dated October 30, 1997, the NRC staff accepted the JOG program as an industry-wide response to GL 96-05 with certain conditions and limitations. The JOG program consists of the following three phases: (1) the JOG interim static diagnostic test program; (2) the JOG 5-year dynamic test program; and (3) the JOG long-term periodic test program. The staff considers the licensee's commitment in response to GL 96-05 to include implementation of all three phases of the JOG program at Fermi 2. In its letter dated December 22, 1999, the licensee addressed the limitations and conditions discussed in the NRC SE dated October 30, 1997, on application of the JOG topical report. The staff considers the commitments by the licensee that it will implement all three phases of the JOG program at Fermi 2 to be an acceptable response to GL 96-05 for valve age-related degradation.

In its letter dated December 22, 1999, the licensee stated that MOV static diagnostic test intervals will be established in accordance with the method described by the JOG interim periodic test program. The JOG interim periodic test program uses MOV safety significance and margin to establish MOV static test intervals. The licensee described its MOV risk-ranking process in letters dated March 18, 1997, and December 22, 1999. The licensee completed the MOV risk prioritization at Fermi 2 prior to development of the MOV risk-ranking methodology in BWROG Topical Report NEDC-32264. At Fermi 2, the licensee used its probabilistic safety assessment (PSA) and an expert panel to categorize MOVs as high, medium or low risk. In performing this risk ranking, the licensee determined the Risk Achievement Worth (RAW) for each MOV modeled in the PSA at Fermi 2. An expert panel categorized the risk importance of MOVs not modeled in the PSA using judgmental consideration of their accident mitigation worth. The expert panel also assessed the risk importance of each GL 96-05 MOV in detail. The expert panel evaluated functional failure modes modeled in the PSA along with aspects of the valve location and history of reliability. The expert panel considered issues and accident precursors not explicitly modeled in the PSA including flooding, fires, safe shutdown capability, loss of coolant accident, spent fuel pool cooling, and shutdown operations. The licensee reported that the expert panel assigned some PSA-modeled MOVs to a higher risk ranking, but did not assign any MOVs to a lower risk ranking. The licensee stated that the PSA model at Fermi 2 was enhanced and revised in 1997 with the MOV risk prioritization updated based on the new model. The licensee considers the MOV risk prioritization methodologies applied at Fermi 2 and described in NEDC-32264 to be similar. The licensee asserts that a high level of confidence exists that the GL 96-05 MOVs at Fermi 2 have been assigned a risk ranking based on an accurate, conservative, and up-to-date process equivalent to the methodology contained

in NEDC-32264. The NRC staff concludes the licensee's approach to risk-ranking MOVs at Fermi 2 is acceptable.

In its letter dated April 23, 1999, the licensee stated that it uses a diagnostic system that acquires data from the MCCs for periodic testing of a portion of the MOVs in the GL 96-05 program at Fermi 2. The licensee reported that it performed over 500 MCC diagnostic tests with about 50 of those tests applied to MOV periodic verification. The licensee also stated that it is participating in an industry effort to prepare a standard guideline for use of MCC diagnostic data as part of MOV periodic verification programs, and will adjust its program as appropriate based on that effort. In its letter dated March 18, 1997, the licensee noted that ac-powered MOVs to be designated as testable using the MCC diagnostic system will be tested more frequently (by one refueling cycle) than the base test frequencies established by the interim static test program. In its letter dated June 21, 2000, the licensee stated that an MOV must have a thrust margin of at least 25 percent in order to apply the MCC test results as an alternative to at-valve diagnostic testing to determine thrust output at torque switch trip. The licensee noted that, at this time, 80 out of 129 non-quarter-turn GL 96-05 MOVs at Fermi 2 meet this criterion. The licensee also uses motor power data to derive motor torque values to indicate MOV torque output performance. The licensee stated that a plant-specific validation of its MCC thrust determination methodology was completed in June 1999. The evaluation compared the results obtained from concurrent diagnostic tests performed at the valve and from the MCC for 16 MOVs. The licensee found its MCC test method to have a 12.3-percent accuracy within two standard deviations in comparison to the vendor-stated 15-percent accuracy. The licensee is continuing to update its validation of the MCC thrust determination methodology as additional data are obtained. The licensee stated that MCC testing is presently performed on GL 96-05 MOVs every 18 to 24 months in addition to the required periodic verification testing per its IST program. Based on the licensee's summary, the staff concludes that the methodology for using MCC testing to monitor valve degradation at Fermi 2 is acceptable.

The JOG program is intended to address most gate, globe, and butterfly valves used in safety-related applications in the nuclear power plants of participating licensees. JOG indicates that each licensee is responsible for addressing any MOVs outside the scope of applicability of the JOG program. 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. In its letter dated December 22, 1999, the licensee of Fermi 2 stated that it will identify any valves in its MOV program that are not adequately covered under the JOG dynamic testing program, and will pursue a separate program to assess potential aging or service-related degradation of those valves. 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, 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 concludes that it is 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.

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 its letter dated March 18, 1997, the licensee indicated that, to assure adequate actuator output capability for safety-related MOVs at Fermi 2 to perform their design-basis functions, it uses a combination of conservative margins, periodic static testing, MCC testing, comprehensive maintenance practices, and annual reviews of MOV corrective maintenance. The licensee notes that static and dynamic test results are input into the MOV trending program to ensure that reliable MOV performance is maintained. Each MOV in the GL 96-05 program at Fermi 2 is periodically monitored using the MCC diagnostic system in conjunction with the preventive maintenance program. As noted in its letter dated April 23, 1999, the licensee considers that stem lubricant degradation is the only significant potential time dependent mechanism for reduced actuator output. In more than 10 years of focused MOV program testing and evaluation, the licensee has not identified any other time dependent degradation mechanisms. The licensee implements a program of preventive maintenance to help control potential stem lubricant degradation. In its letter dated December 22, 1999, the licensee emphasized that it addresses potential age-related effects on MOV actuator output in a programmatic manner and has embedded appropriate factors into margin calculations. The licensee evaluates the results of those tests for any indication of degradation using both quantitative and qualitative trending techniques. The licensee also stated that it maintains close contact with MOV industry groups and will address any new information on potential age-related output degradation issues as it is developed. The licensee points to its programs of comprehensive preventive and predictive MOV maintenance, trending of MOV performance and reliability, and monitoring of MOV performance with MCC diagnostic equipment. The licensee quantifies instrument accuracy, torque switch repeatability, rate of loading, spring pack relaxation, stem lubricant degradation, and parasitic loads on a valve-specific basis, and applies this information as conservative adjustments in actuator output thrust calculations.

In a letter dated July 17, 1998, Limitorque Corporation provided its Technical Update 98-01 and Supplement 1, which give updated guidance for predicting the torque output of Limitorque ac-powered motor actuators. In a letter dated April 23, 1999, the licensee reported that it had performed a technical evaluation of the MOVs within the scope of its MOV program in response to this new information. The licensee stated that its evaluation justifies the operability of the

affected MOVs and establishes follow-up corrective actions. The licensee noted that the corrective actions involve torque switch adjustments, motor replacements, and gearing changes.

In its July 17, 1998, letter, Limitorque indicates that a future technical update will be issued to address the application of dc-powered MOVs. In IR 95010, the NRC staff reported that the licensee evaluated dc-powered MOVs using standard industry methods and identified several MOVs as having insufficient capability to trip the torque switch under degraded conditions. In IR 98019, the NRC staff reported that the licensee relied on an operability justification for these MOVs until corrective action was implemented. In its letter dated April 23, 1999, the licensee noted that, as a result of further evaluation and testing, motors were replaced for several MOVs to upgrade actuator capability. The licensee stated that it had conducted a preliminary review of the NRC-sponsored testing of dc-powered MOVs conducted by the Idaho National Engineering and Environmental Laboratory. The licensee also noted that it is participating in the BWROG effort to develop improved guidance to predict dc-powered MOV performance and that appropriate actions will be taken in response to that guidance. Any MOV operability concerns that the licensee identifies in the future would be evaluated in accordance with the licensee's corrective action program.

The NRC staff concludes that the licensee is establishing sufficient means to monitor MOV motor actuator output and its potential degradation.

6.0 CONCLUSION

The NRC staff finds that the licensee has established an acceptable program to periodically verify the design-basis capability of the safety-related MOVs at Fermi 2 through its commitment to all three phases of the JOG Program on MOV Periodic Verification, and the additional actions described in its submittals. Therefore, the staff concludes that the licensee is adequately addressing the actions requested in GL 96-05. The staff may conduct inspections at Fermi 2 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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