UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report Nos.: 50-338/94-04 and 50-339/94-04

Licensee: Virginia Electric and Power Company
Glen Allen, VA 23060

Docket Nos.: 50-338 and 50-339 License Nos.: NPF-4 and NPF-7

Facility Name: North Anna 1 and 2

Inspection Conducted: April 11-15, 1994

Inspector: for M. D. Hunt _____ 5/27/94
Date Signed

Accompanying Personnel: E. Girard
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Approved by: for C. Casto, Chief _____ 5/27/94
Date Signed
Test Programs Section
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SUMMARY

Scope:

This special, announced inspection was performed at the North Anna Nuclear Plant to examine the implementation of the licensee's motor-operated valve (MOV) program to meet commitments in response to Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance." The inspectors utilized the guidance provided in Temporary Instruction (TI) 2515/109 (Part 2), "Inspection Requirements for Generic Letter 89-10, Safety-Related Motor-Operated Valve Testing and Surveillance." As delineated in Part 2 of TI 2515/109, this inspection was the initial review of the licensee's MOV program implementation in response to GL 89-10.

The inspectors reviewed ten MOVs in detail including selected portions of design calculations, test packages, and diagnostic signature traces. The inspectors also reviewed followup issues from the previous NRC inspection of the MOV program (TI 2515/109, Part 1) conducted in May 6-10, 1991, and documented in NRC Inspection Report Nos. 50-338,339/91-09.

Results:

Based on the evaluation completed during this inspection the following strengths were noted in the licensee's GL 89-10 program:

The System Engineering Department's support of both the design-basis parameters and testing of the MOVs through the use of the "Testing And Results Documents" made a significant contribution to the GL 89-10 program.

The licensee evaluates the test results for DP tested valves prior to any mode change during the MOV testing phases.

While not classified as a program weakness, the inspectors were concerned that the licensee was not verifying (recalculating) the valve factor or stem coefficient of friction after dynamic testing to support the assumed values that were used for valves that can not be tested.

Except as noted above, the inspectors concluded that the licensee was in the process of implementing an effective program in response to GL 89-10 thereby ensuring the design-basis capability of MOVs at the facility.

In the areas inspected, violations or deviations were not identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*R. Beger, Nuclear Operations Support
*P. DeTine, Project Engineer, Nuclear Engineering
*J. Graf, Supervisor Project Engineering
*D. Heacock, Superintendent Engineering
*J. Hegner, Supervisor Licensing
*E. Hendrixson, Supervisor System Engineering
*D. Hughes, MOV Engineer
*G. Kane, Station Manager
*P. Kemp, Supervisor Corporate Licensing
*J. Leberstien, Staff Engineer, Licensing
*W. Mathews, Assistant Station Manager
*A. Parker, Supervisor Maintenance Engineering
*J. Smith, Manager Quality Assurance
*J. Stall, Assistant Station Manager
R. Sturgill, Supervisor System Engineering
*W. Thomas, MOV Coordinator

Other licensee employees contacted during this inspection included engineers, technicians, and administrative personnel.

NRC Resident Inspectors

R. McWhorter, SRI
*D. Taylor, RI

*Attended exit interview

Acronyms and initial sms used in this report are listed on the last page.

2.0 GENERIC LETTER (GL) 89-10 "SAFETY-RELATED MOTOR-OPERATED VALVE [MOV] TESTING AND SURVEILLANCE" (2515/109)

On June 28, 1989, the NRC issued GL 89-10, which requested licensees and construction permit holders to establish a program to ensure that switch settings for safety-related MOVs were selected, set, and maintained properly. Subsequently, six supplements to the GL have been issued. NRC inspections of licensee actions implementing commitments to GL 89-10 and its supplements have been conducted based on guidance provided in Temporary Instruction (TI) 2515/109, "Inspection Requirements for Generic Letter 89-10, Safety-Related Motor-Operated Valve Testing and Surveillance." TI 2515/109 is divided into Part 1, "Program Review," and Part 2, "Verification of Program Implementation."

The focus of this inspection was to evaluate in depth the test results of a sample of ten MOVs that had been dynamically tested and review the licensee's corrective actions for the concerns identified during the GL 89-10, Part 1 MOV Inspection. The test results and engineering documentation were examined for the MOVs listed below:

Valve No.	MOV Function, Size, and Type
1-FW-100A	Auxiliary Feedwater Pump Discharge Valve to Header A Steam Generator. 3 inch globe
1-SI-1863A	Low Head Safety Injection to High Head Safety Injection Cross-Connect Isolation Valve. 8 inch flex wedge gate
1-SI-1864A	Low Head Safety Injection Pump Discharge Valve to RCS Cold Leg Injection. 10 inch split wedge gate
1-SW-MOV-117	Auxiliary Service Water Pump Discharge Isolation Valve. 24 inch butterfly
2-SI-MOV-2890C	Low Head Safety Injection Pump Discharge Valve to RCS Cold Leg Injection. 10 inch double disc gate
2-CH-MOV-2267A	2A High Head Safety Injection Charging Pump Normal Suction Isolation Valve. 6 inch double disc gate
2-CH-MOV-2270A	2C High Head Safety Injection Charging Pump Normal Suction Isolation Valve. 6 inch double disc gate
2-CH-MOV-2275B	High Head Safety Injection Charging Pump Mini-Flow Recirculation Valve. 2 inch globe
2-CH-MOV-2286C	2C High Head Safety Injection Normal Discharge Isolation Valve. 3 inch flex wedge gate
2-CH-MOV-2289B	Normal Charging Header Isolation Valve (For RCS Makeup). 3 inch flex wedge gate

The inspectors verified that the system design-basis differential pressures (DP) and flows used for diagnostic testing of the GL 89-10 Program MOVs listed were reasonable and correct. This examination included review of piping and instrumentation drawings; design-basis

calculation results of the expected differential pressures; the sizing and switch setting calculations; and diagnostic test data. The inspectors also conducted a walkdown of the MOVs.

Except as noted in the following paragraphs, the inspectors concluded that the licensee was in the process of implementing an effective program in response to GL 89-10 thereby ensuring the design-basis capability of MOVs at the facility.

2.1 Design-Basis Reviews

The inspectors reviewed the licensee's design-basis documentation (DBD) to determine and verify its adequacy for all the MOVs in the licensee's GL 89-10 program including the 10 MOVs examined during this inspection. In addition, recommended action "a" of GL 89-10 requested licensees determine the maximum differential pressure and flow expected for both normal and abnormal (accident) conditions. The inspectors verified these values were used in thrust calculations.

These follow-up reviews were performed to determine and verify that changes were implemented to address items identified during the GL 89-10 Part 1 inspection conducted in May 1991. That inspection identified several concerns related to the review of the design-basis calculations. At that time the design-basis differential pressure calculations did not include flow rates (as discussed in GL 89-10). In addition, the degrading effects of high ambient temperature on the output torque of MOV motors had not been considered. Limitorque had not yet issued their Potential Part 21 Notice dated May 13, 1993, and the Technical Update 93-03 dated September, 1993, that discussed the effects of elevated temperature on motor torque.

The inspectors reviewed the licensee's Nuclear Electrical Engineering - Power Technical Report No. EE-0083, Addendum 3, GL 89-10 Electrical Issues that addressed Limitorque's Potential Part 21 Notice. The inspectors verified that the electrical calculations were revised to include the effects of elevated temperature on motor torque. The inspectors verified that the licensee revised the MOV Thrust Band Calculation ME-385 to include the effects of the elevated temperature on motor torque.

During this inspection, the inspectors reviewed the documentation referenced in the "Differential Pressure Calculations" and "Testing Basis and Results Documents" (TBRD) to verify that the maximum flow and differential pressure were used in the thrust calculations. The documentation reviewed included the operational procedures, system flow drawings (P&ID), pump curves, the system description documents in the Operator Development Program for the Safety Injection, Service Water, Feedwater, Auxiliary Feedwater, and Chemical and Volume Control Systems.

The System Engineering Department developed a series of DBDs identified as GL 89-10 TBRD. The TBRDs supplemented the Nuclear Engineering Design-Basis Calculations by providing design-basis flow and

differential pressure test parameters. Additionally, an evaluation and conclusion for the DP test results was included. The TBRDs provided a description of the limiting condition assumed in the thrust calculations at design-basis flow and DP. The DP test results were analyzed and compared against the thrust calculations to verify their adequacy. The inspectors concluded the TBRDs addressed the flow parameter and provided a method of interfacing between design engineering and the site for both testing and analysis. The TBRDs made a significant contribution to the GL 89-10 program.

The inspectors verified the licensee's MOV calculations for DP, electrical degraded grid voltage, flow, temperature, design thrust, and torque addressed the recommendations in GL 89-10. The inspectors verified that degraded grid calculations were included to ensure that the lowest motor terminal voltage commensurate with design-bases conditions was factored into the determination of thrust ratings. The inspectors also verified that the licensee satisfactorily addressed the design, replacement and testing of thermal overloads in the electrical circuits for the MOVs.

In the areas inspected the inspectors concluded the licensee had adequately implemented the design-basis review as recommended in GL 89-10.

2.2 MOV Sizing and Switch Setting

The inspectors reviewed program document, "Generic Letter 89-10, 'Motor-Operated Valve Testing and Surveillance,' Program Description," dated January 1994, calculation number X4C1000U02, and North Anna's General Nuclear Standard STD-GN-0002, "Motor-Operated Valve Sizing and Calculations," Revision 2, dated March 1994, which specified the use of the standard industry equations for calculating thrust for gate and globe valves. The licensee used a valve factor (VF) of 0.30 for flex wedge gate valves and 0.20 for parallel disc gate valves. A valve factor of 1.10 was used for globe valves. For Westinghouse valves, the licensee used data provided by the valve vendor, where available, or assumed a valve factor of 0.45 or 0.55. The valve mean seat diameter was used to calculate the valve disc seat area if available from the manufacturer, otherwise the valve orifice diameter was used. A stem friction coefficient (SFC) of 0.15 was used to calculate the minimum required torque. The minimum required thrust, calculated using the above factors, was then adjusted by adding a 15% margin to account for variations in valve factor, potential load sensitive behavior (also known as "rate-of-loading"), and other phenomena.

The inspectors were concerned that the use of a valve factor of 0.20 for parallel disc gate valves and 0.30 for flex wedge gate valves plus a 15% margin would not provide sufficient margin to encompass all cases. This has even more significance for those valves which could not be tested dynamically since this or the same methodology was also applied to those valves. The licensee stated that there was adequate margin demonstrated

for the valves tested and believed that no further verification was needed. Additionally, if an MOV exhibited signs of deterioration actions would be taken to determine the cause at that time. The inspectors concluded that this methodology did not provide complete assurance that the non-tested valves would have sufficient conservatism in thrust margins.

The inspectors noted that the licensee was not re-calculating the VF or SFC using the DP test results once dynamic testing of a MOV was completed. The inspectors suggested that these calculations be performed to establish a base line value for the VF and SFC for that MOV. This would also verify that the assumed values used in the original calculations for MOVs not tested but contained in the group with the tested MOV were truly representative of the actual VF and SFC. Further discussion of this subject is contained in Section 2.3 of this report.

The licensee had performed dynamic differential pressure testing at, or near, design-basis pressure and flow for approximately 32% of their valves (i.e., 80 valves). Two differential pressure test failures occurred during testing. One failure was due to a limit switch problem, the other was due to valve guide deformation. Both failures were immediately corrected including a valve replacement for the second failure. The licensee did not have any test failures due to the MOV thrust output being set to low because of the use of the standard industry valve factors plus a 15% margin. The inspectors concluded that valve factors appeared to be bounding for the valves tested to date.

The licensee adjusted the upper and lower thrust window settings for diagnostic inaccuracies and torque switch repeatability in accordance the Limitorque Maintenance Update 92-2 regarding torque switch repeatability. The licensee incorporated the information into their NASES-3.10, "North Anna Site Engineering Services Implementing Procedure," Rev. 2, dated April 8, 1994. This procedure required the Maintenance Engineering MOV Coordinator or the System Engineering MOV Engineer to be contacted if a torque switch setting of "1" was being considered. These engineers would then revise the thrust band due to the revised torque switch repeatability. The inspectors considered this procedure appropriate.

During implementation of the Limitorque Technical Update 93-03, The licensee identified seven MOVs that were affected by the reduced thrust output. The setup for these seven MOVs was justified by ensuring the present torque switch settings were adequate. One of the seven MOVs required a decrease in the torque switch setting to prevent the actuator motor from stalling. The inspectors considered this evaluation appropriate.

The licensee had removed all their torque switch limiter plates on GL 89-10 valves. Further, the licensee assumed a stem friction coefficient of 0.15 and did not routinely measure torque. The inspectors questioned whether this situation might result in exceeding

an actuator's torque rating, when a setting was increased to achieve a higher desired thrust output. The licensee had a list of the spring packs installed in their MOVs. A torque switch setting of 2.25 was the lowest setting for any limiter plate that had been installed. Procedure 0-ECM-1505-01, "Votes MOV Testing," Rev. 4-P1, dated May 24, 1993, Step 4.5, required stopping the procedure when adjusti g the torque switch setting above a dial setting of 2.25. At that point the MOV Coordinator, or designee, is contacted. The inspectors considered this procedure appropriate.

2.3 Design-Basis Capability

The inspectors reviewed Appendix J, "Guidelines for Reviewing VEGP Generic Letter 89-10 Motor-Operated Valve (MOV) Differential Pressure Test Data," Rev. 1, dated August 29, 1993, procedure 26866-C, "Dynamic Testing of Motor-Operated Valves Using VOTES Analysis and Test System," Rev. 1, dated February 19, 1993, differential pressure test summary reports, and dynamic test packages for the 10 valves reviewed.

The inspectors determined the licensee that had completed static testing for all their GL 89-10 valves (249). As of June 1993, the licensee had also completed 32% of the dynamic differential pressure testing on rising stem, and testable valves. The licensee intends to use the concept of grouping and plant specific data to complete their program. The licensee had reviewed Generic Letter 89-10, Supplement 1 and other staff guidance prior to formulating a methodology for grouping valves at the station. The licensee had 41 separate groups and intended to nominally test 30% of the valves in a group and at least two valves in groups containing three or more valves. The valve grouping was established by selecting valves in similar applications. This was further defined by valve manufacturer, type, model, size, and manufacturer's drawing number. In situations where a valve was used in both high and low differential pressure systems, the test results from the high differential pressure test was used to bound the lower pressure application. This methodology will result in the testing of 52% of tne testable valves. The inspectors considered the grouping methodology to be consistent with the intent of GL 89-10. However, because fixed criteria for close out of GL 89-10 has not been established and grouping methodology is still under discussion by NRR, the inspectors could not accept or reject the grouping actions of the licensee.

The licensee was performing an operability reviews per NASES-3.10, "Controlling Procedure Providing Guidelines For Addressing MOV Design Issues," Revision 2, dated April 8, 1994, this procedure was used to evaluated test failure on MOVs prior to returning them to service after design-basis DP testing. The licensee performs their testing when the plant is in the shutdown mode. Some valves may be released for flow blockage, etc, prior to completion of the test data review, but the review was required to be completed prior to the plant changing modes of operation. This methodology was reviewed as a program strength.

Evaluation acceptance criteria was developed to evaluate thrust at flow cutoff with the calculated minimum required thrust. This evaluation had three cases:

Case 1. Test differential pressure was equivalent to design-basis differential pressure.

Case 2. Test differential pressure was at least 80% or greater than design-basis differential pressure, with two methodologies.

Case 3. Test differential pressure was less than 80% design-basis differential pressure.

In all cases, the licensee checked for margin between the thrust at flow cutoff and the minimum required thrust. This was also compared to the thrust available at control switch trip (CST) thrust. Load sensitive behavior was checked by comparing CST thrust during dynamic testing with CST thrust measured during static testing.

Case 2, where test differential pressure was at least 80% or greater than design-basis differential pressure, the licensee had two methodologies to extrapolate conditions to design-basis. One method was to calculate an apparent valve factor from the given test conditions and then extrapolate to design-basis conditions, the other was to ratio the design-basis differential pressure with the test differential pressure and multiply this by the thrust measured at flow cutoff. All test packages requiring extrapolation to design-basis conditions used the ratio of the differential pressures method. The inspectors found this adequate for returning the MOV to service after testing. However, in discussions with the licensee, they did not intend to use test results to determine a valve factor (VF) or stem friction coefficient (SFC). This methodology reduces the value of DP testing. The inspectors were concerned that the licensee may not be able to justify this for closeout of their GL 89-10 program.

According to GL 89-10, Supplement 6, Enclosure 1, after returning the MOV to service, a more detailed evaluation of the test data for such items as valve factors and stem friction coefficients is expected. This information is to be used in their MOV sizing and switch setting methodology to ensure thrust windows are correct. Instead, this licensee compared their calculated thrust windows with the extrapolated thrust required at flow cutoff. This comparison was performed to verify that their calculated thrust window was greater than the thrust required at flow cutoff. The licensee believed that their methodology of using a 0.30 valve factor with 15% margin added to the calculation was bounding in all cases. The inspectors reviewed the licensee's test data and concluded that their methodology was bounding for valves tested to date. However, GL 89-10, Supplement 6 also states, if the licensee is only measuring one parameter (i.e., thrust) and assumes a SFC to estimate torque to operate the valve, the licensee needs to validate its assumption for SFC.

Industry testing programs have shown that VF and SFC are plant and valve specific. Licensees will be expected to use VFs and SFCs that are determined to be appropriate for specific application at each plant. The inspectors indicated that the GL 89-10 recommendation for validation of the VF and SFC assumptions needs to be accomplished and indicated that this would be evaluated during the GL 89-10 closeout process.

Except as noted, and based on the data examined, the inspectors concluded that the licensee's testing program for the GL 89-10 program MOVs should provide the assurance that the tested MOVs will perform their intended safety function.

2.4 Periodic Verification of MOV Capability

Recommended action "d" of the generic letter requests the preparation or revision of procedures to ensure that adequate MOV switch settings are determined and maintained throughout the life of the plant. Section "j" of the generic letter recommends surveillance to confirm the adequacy of the settings. The interval of the surveillance was to be based on the safety importance of the MOV as well as its maintenance and performance history, but was recommended not to exceed five years or three refueling outages. Further, GL 89-10 recommended that the capability of the MOV be verified if the MOV was replaced, modified, or overhauled to an extent that the existing test results are not representative of the MOV.

Detailed criteria for the periodic verification had not been established by the licensee. The inspectors found that GL 89-10 valves (e.g., 1-FW-MOV-100A) were in the process of being included in the licensee's database and that the database contained model preventive maintenance work orders (Work Orders 00286841 and 00287053) that specified VOTES diagnostic testing at a three refueling outage or five year frequency. The diagnostic testing was not specified to be performed at DP; that is, only static diagnostic testing would be performed. The licensee's criteria for test performance and acceptance of periodic verifications and its justification that the criteria are adequate will be evaluated by the NRC in a subsequent inspection.

The inspectors verified that post maintenance testing for different maintenance operations was specified in the licensee's electrical and mechanical Post Maintenance Test/Verification matrices. Comprehensive (static) diagnostic testing was required following valve replacement or repair. For packing adjustment, thrust verification was specified. Licensee personnel were questioned as to why only static testing was required for valve replacement. They were informed that a DP test should be performed for any valve replacement and that it was provided for as a "verification" on the related matrix. Only static testing was considered necessary for a repair unless the repair might affect the functioning of the valve. If functioning was affected, it should be considered a modification rather than maintenance and the need for DP testing should be evaluated. The inclusion of "verification" DP testing

on the matrix that covered valve replacement was confirmed by the inspectors. The inspectors found that the specified testing was appropriate.

The inspectors found that Work Orders were typically used to implement the post maintenance test requirements for frequent activities such as valve packing adjustment (verified for Work Order 335577, valve 1-SI-MOV-1862A). Two completed work orders for packing adjustment were selected and reviewed by the inspectors and found to contain appropriate thrust verifications (Work Orders 245429 and 262418). The licensee's application of post maintenance testing for packing adjustment was satisfactory.

In summary, the inspectors found that the licensee's periodic verifications were not fully implemented. Complete implementation, including adequately justified test methodology and acceptance criteria, will be evaluated in establishing the acceptability of the licensee's completion of its GL 89-10 commitments. The licensee was found to have implemented a satisfactory post maintenance testing program.

2.5 MOV Failures, Corrective Actions, and Trending

Recommended action "h" of the generic letter requests that licensees analyze and justify each MOV failure and corrective action. The documentation should include the results and history of each as-found deteriorated condition, malfunction, test, inspection, analysis, repair, or alteration. All documentation should be retained and reported in accordance with plant requirements. It is also suggested that the material be periodically examined (every two years or after each refueling outage after program implementation) as part of the monitoring and feedback effort to establish trends of MOV operability.

The licensee issues a quarterly report prepared by the MOV Coordinator which has wide distribution within the organization that lists the status of the program testing efforts and MOV failures occurring during the period covered. The reports also indicate the root cause for the failures and track the failures by item type since 1991. The reports were found to contain information that will contribute to the success of the GL 89-10 program at North Anna.

2.6 Schedule

In GL 89-10, the NRC staff requested that licensees complete all design-basis reviews, analyses, verifications, tests, and inspections that were initiated in order to satisfy the generic letter recommendations by June 28, 1994, or three refueling outages after December 28, 1989, whichever is later.

By letter dated June 29, 1993, the licensee informed NRC that the completion of their GL 89-10 commitments was being extended to 30 days after the refueling outage for NA-2 now scheduled for April 1995. The NRC letter dated August 19, 1993, implied that the extension was granted

if seven factors outlined in the letter were evaluated by an on-site review. These factors are summarized below along with the actions taken by the licensee.

ACTION 1. Establish the actual completion status of the GL 89-10 program for MOVs not yet set up.

STATUS Calculations determining the setpoints and static tests for all rising stem valves were complete as of April 11, 1994.

ACTION 2. The basis for confirming the operability for each MOV not set up under the program by June 28, 1994.

STATUS Valve 2-HV-213C has not been completely set up in that the torque switch bypass has not yet been installed and the thermal overloads were currently set high and not protecting the motor. Static tests indicate no unusual disc pullout or running loads that would challenge the torque switch setting. This was the only valve identified by the licensee that fell into this category.

ACTION 3. The schedule for completing MOV testing and any modifications.

STATUS North Anna is grouping MOVs between Unit 1 and Unit 2 for the purposes of differential pressure testing. The testing of the remaining five rising stem valves and 11 butterfly valves will be completed during the upcoming Unit 1 outage currently scheduled for November 1994.

ACTION 4. The extent of completed MOV testing under dynamic testing.

STATUS As of April 11, 1994 this site has performed differential testing as indicated below:

VALVE TYPE	UNIT 1	UNIT 2
Rising Stem	17	46
Butterfly	6	17

ACTION 5. The extent that plant and industry data have been used to establish the sizing and setting methodology.

STATUS The licensee requires reconciliation calculations when the test results for a given valve indicated that the sizing methodology was not conservative. The licensee indicated that no tests to date have required this evaluation. ERPI test results have been determined to bound the methodology used.

ACTION 6. The maintenance and modification activities to improve the performance of the MOVs. (For both Units)

STATUS The licensee provided a list of modifications to the Program MOVs which included static tests, spring pack replacements, motor replacements, TOL replacements, torque switch bypass installed on butterfly valves, and the rebuilding of several butterfly valves.

ACTION 7. Justification for any grouping methods used.

STATUS The licensee's December 3, 1993, letter No. 93-664 described the grouping methodology used at North Anna. The 249 safety related MOVs from ten manufacturers will be placed into 41 groups. The number of valves tested in each group will be a nominal 30%, with at least two valves tested in groups containing three or more valves.

Based on the inspectors review of the licensee's actions taken regarding the seven factors listed in the NRC letter dated August 19, 1993, the inspectors concluded that their program had met the conditions required for the requested extension.

2.7 Pressure Locking and Thermal Binding

The Office for Analysis and Evaluation of Operational Data (AEOD) has completed a study of pressure locking and thermal binding of gate valves. AEOD concluded in their report that licensees have not taken sufficient action to provide assurance that pressure locking and thermal binding will not prevent a gate valve from performing its safety function. The NRC regulations require that licensees design safety-related systems to provide assurance that those systems can perform their safety functions. In GL 89-10, the staff requested licensees to review the design basis of their safety-related MOVs.

The licensee provided documentation of its evaluation of the potential for pressure locking and thermal binding of gate valves as follows:

(1) Thermal Binding/Bonnet Pressurization of Gate Valves, North Anna Power Station - Units 1 and 2, NP 2196, dated October 2, 1991.

(2) Memo, E. May to P. Boulden, Response to Nuclear Licensing Review Comments on the Pressure Locking/Thermal Binding of Gate Valves, Type 1 Reports, North Anna and Surry Power Stations, NP 2196/NP 5479, September 11, 1992.

(3) Memo, E. May to P. Boulden, Response to Operating Experience Review Group Comments on the Pressure Locking/Thermal Binding of Gate Valves, Type 1 Reports, North Anna and Surry Power Stations, NP 2196/NP 5479, dated November 9, 1992.

The inspectors found that the Reference (1) report indicated that a review of all safety related gate valves had been performed and concluded that none of the valves had a significant probability of thermal binding or pressure locking. References (2) and (3) described concerns and related responses identified from internal reviews of NRC Information Notice 92-26 and Reference (1). The responses provided additional support for the conclusion of Reference (1). The inspectors reviewed a Reference (3) calculation used to support the capability of double disk parallel seat gate valves SI 1890/2890 A and B to close in the presence of a pressure lock condition. The calculation assumed that the thrust to overcome pressure locking would be primarily due frictional force caused by each disk being forced against its adjacent seat by pressure trapped in the bonnet (and between the disks) prior to opening. Packing and piston forces were included in the calculation but had a limited effect. The inspectors' review found that stall torque and motor-operator force values given in the calculation were incorrect. Licensee personnel responded that the values were typographical errors. Revised values provided to the inspectors appeared consistent with other calculation numbers and the conclusion of the calculation was not affected. The inspectors noted that the errors had not been identified by the licensee's internal reviews. Also, the inspectors questioned whether the valve factor (0.32) and methodology of the calculation were appropriate.

Licensees have been informed that the NRC plans to issue a Generic Letter to address continued concerns regarding pressure locking/thermal binding. Further NRC inspection of the licensee's actions are expected following issuance of the Generic Letter.

2.8 Quality Assurance (QA) Involvement

The inspectors evaluated the licensee's implementation of QA for GL 89-10 activities. Licensee QA personnel were requested to provide evidence of QA and Quality Control involvement. Reports of audits and Quality Control monitoring (e.g., Audits 92-14 and 92-17 and Inspector of the Day Reports for October 10, 11, and 24, 1993) were provided for review. The inspectors observed little evidence of QA or QC involvement in these documents. However, they found that the licensee documented monitoring of GL 89-10 activities through assessments performed by Nuclear Support Operations. The inspectors reviewed the assessment dated September 29, 1993, and determined that it reflected appropriate assessments.

2.9 Walkdown

A walkdown inspection of selected MOVs was conducted by the inspectors to observe the installed yoke sensors and the condition of the valve stems. In general, the valves were found in good condition. The valve stems were satisfactorily lubricated. It was noted that valves other than MOVs (air-operated and manual) were well-maintained, as indicated

by proper stem lubrication and cleanliness. The yoke sensors that had been installed for diagnostic testing were examined to determine their general condition including the installed location and wiring connections.

2.10 GL 89-10 Program Closure

For program closure the licensee will be expected to furnish appropriate information to insure:

- that thrust requirements are established for MOVs that are not dynamically tested to support operability;
- that the VF and SFC used are specific to the valves and the plant;
- that the assumed VF and SFC used in thrust calculations should be demonstrated appropriate for the MOVs not dynamically tested;
- that the torque switch settings relate to the torque to ensure that the torque rating is not exceeded in support of the 2.25 torque switch settings.

3. EXIT INTERVIEW

The inspection scope and results were summarized on April 15, 1994, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results listed below. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

4 ACRONYMS AND INITIALISMS

AC	Alternating Current
AEOD	Office for Analysis & Evaluation of Operational Data
AFW	Auxiliary Feedwater
CH	Charging
CS	Charging System
CST	Control Switch Trip
DBD	Design Basis Document
DC	Direct Current
DP	Differential Pressure
EE	Electrical Engineering
EPRI	Electric Power Research Institute
EWR	Engineering Work Request
FSAR	Final Safety Analysis Report
FW	Feedwater
GL	Generic Letter
IFI	Inspector Followup Item
LB	Pound
ME	Mechanical Engineering

MOV	Motor Operated Valve
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
P&ID	Process/Piping and Instrumentation Diagram
PSID	Pounds Per Square Inch Differential
RCS	Reactor Coolant System
ROL	Rate of Loading
SFC	Stem Friction Coefficient
SI	Safety Injection
SW	Service Water
TI	Temporary Instruction
TOL	Thermal Overload
TOLH	Thermal Overload Heater
V	Volts
VF	Valve Factor
VOTES	Valve Operation Test and Evaluation System