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

Report Nos.: 50-413/92-15 and 50-414/92-15

Licensee: Duke Power Company
422 South Church Street
Charlotte, NC 28242

Docket Nos.: 50-413 and 50-414 License Nos.: NPF-35 and NPF-52

Facility Name: Catawba 1 and 2

Inspection Conducted: May 4-8, 1992

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SUMMARY

Scope:

This special, announced inspection was conducted to examine the program developed in response to NRC Generic Letter (GL) 89-10, "Safety-Related Motor Operated Valve (MOV) Testing and Surveillance." The inspection was conducted in accordance with NRC Temporary Instruction (TI) 2515/109, issued January 14, 1991. This inspection covered phase 1 to the Temporary Instruction requirements.

Results:

In the areas inspected, violations or deviations were not identified. The inspectors determined that the GL 89-10 MOV program prepared by Duke Power Company (DPC) to inspect/test the MOVs at this site was satisfactory. The inspectors did identify concerns within the program as well as strengths. The concerns are listed below.

## CONCERNS

1. DPC needs to revise their Electric Motor Operator Sizing Guidelines when the bounding values for both power factor and amperage for different motors becomes available.

2. The Rotork study of ambient temperature on motor performance has not been determined to be applicable to Limitorque operators. DPC is currently waiting for Limitorque to publish the results of their study.

3. FSAR 8.3.1.1.4 states that class IE motors for valves are designed to start at 85% rated voltage. CNS has some valves which do not meet this criteria. FSAR revision or corrective action is necessary. CNS indicated that their FSAR will be revised during the next scheduled revision.

4. DPC needs to insure that previous test results meet the new requirements specified in the VOTES Analysis Guidelines. DPC indicated that changes made to the Analysis Guidelines which affect key parameters in previously analyzed tests or new key parameters will be evaluated for applicability to previously analyzed tests.

5. Site Level Procedure No. IP/0/A/3820/09, "Removal, Replacement and Field Set-up of Rotork Actuator", is presently being revised to include added capabilities of the MOV testing equipment. Procedure No. IP/0/A/3820/04A, "MOV Votes Testing", is being revised and will be issued by June 1992. This item will be re-inspected during subsequent inspections.

6. Licensee's site level program document Station Directive 4.4.4, "Processing Nuclear Station Modifications", does not implement program requirements delineated in DPC NRC GL 89-10 Program, Section 6.1.3, concerning post-modification testing. Site level procedures need to be revised or developed to implement upper-tier program document requirements.

7. Licensee needs to verify and implement configuration controls related to Group 2 non-safety related MOV PM activities to insure configuration control of thermal overloads (TOLs) is maintained.

8. The calculations and D/P test data for those valves that had been previously D/P tested under the Mechanical Engineering Section (MES) Guidelines and are now included in the GL 89-10 program, should be reviewed and made part of the GL 89-10 valve data package in order to support any future testing.

9. DPC needs to ensure that the switch setting calculations done under the previous guidelines (DPS-1205.19-00-0002) are reviewed to insure inclusion of the application factor for electric motor sizing.

10. The technical basis for using static tests to verify continued capability of an MOV to operate under worst case differential pressure and flow needs to be developed.

11. Program description needs to be revised to establish requirements for specifying post-modification test requirements and test acceptance criteria for modified MOVs.

12. DPC needs to consider Reevaluation of the GL 89-10 MOV Program Scope concerning the inclusion of Group 2 passive position changeable MOVs (nonsafety-related).

## REPORT DETAILS

### 1. BACKGROUND

This was an NRC Inspection of the program developed in response to Generic Letter 89-10 for Catawba Nuclear Station, Units 1 and 2. A list of the acronyms and initialisms appearing in this report is included as Appendix B.

Generic letter (GL) 89-10, Safety-related Motor-Operated Valve Testing and Surveillance, was issued June 28, 1989, and requested licensees and construction permit holders to establish a program to ensure that switch settings for safety-related motor-operated valves (MOVs) and certain other MOVs in safety-related systems are selected, set and maintained properly. Three public workshops were held to answer questions regarding GL 89-10 and Supplement 1 of GL 89-10 was issued June 13, 1990, to provide the results of those workshops. Supplement 2 to GL 89-10 issued August 3, 1990, stated that inspections of programs developed in response to the GL would not begin until January 1, 1991. Supplement 3 of the GL was issued on October 25,1990, and requested that boiling water reactors licensees evaluate the capability of MOVs used in containment isolation in several systems. In addition, all licensees and construction permit holders should consider the applicability of the information contained in Supplement 3 and should consider this information in the development of priorities for implementing the generic letter program. On February 12, 1992, Supplement 4 was issued to remove the recommendations for inadvertent operation of MOVs from the control room to be within the scope of GL 89-10 for BWRs.

The NRC staff requested licensees to submit a response to the generic letter by December 28, 1989. Duke Power Company (DPC) submitted a response on that date. The letter stated Duke Power Company's desire for NRC involvement once the program was developed and validated to ensure that it is consistent with the general objectives of the Generic Letter. Also, the number of motor operated valves considered to be in the scope of GL 89-10 for DPC's three plants along with a general discussion of program development, execution, and exceptions were included.

### 2. INSPECTION PLAN

The NRC inspectors used the guidance contained Temporary Instruction (TI) 2515/109, (January 14, 1991), Inspection Requirements for Generic Letter 89-10, " Safety-Related Motor-Operated Valve Testing and Surveillance," in performing this inspection. The inspection focused on Part 1 of the TI which involves a review of the program being established by the licensee in response to GL 89-10. Part 2 of the TI, which involves a detailed review of

program implementation, was not performed. Implementation was examined only where this aided in evaluating the program.

3. PROGRAM AREAS INSPECTED AND FINDINGS

3.a SCOPE OF THE GENERIC LETTER

The scope of GL 89-10 includes all safety-related MOVs and other MOVs that are position-changeable in safety-related piping systems. GL 89-10 Supplement 1 defined "position-changeable" as any MOV in a safety-related piping system that can be inadvertently operated as a result of an action in the control room.

The inspectors reviewed and discussed the scope of the GL 89-10 program with licensee's personnel to ascertain agreement with GL recommendations. The licensee's upper-tier program document, Duke Power Company NRC Generic Letter 89-10 Program Plan, Section 4.0, specified the selection criteria used for identifying MOVs that were within the GL 89-10 program scope. Additionally, the program description stated that only elements and scenarios that are within the current licensing basis (CLB) of the units were considered. Mispositioning of valves is outside the current licensing basis (CLB) of Catawba Units 1 and 2, however, the licensee's program provides for recovery from mis-positioning. Valves in the GL 89-10 MOV program were classified into two groups. Group 1 MOVs consisted of those MOVs that are active and contribute to the core melt scenarios. They are significant from an accident analysis viewpoint. Group 2 MOVs are the balance of active MOVS that are not in Group 1. Group 2 also included passive position changeable MOVs that do not contribute to core melt scenarios.

The inspectors verified the accuracy of the GL 89-10 program scope by comparison of selected MOVs shown on Piping and Instrument Drawings (P&IDs) with those identified in the licensee's GL 89-10 MOV List. The P&IDs used as the basis for this review were the Component Cooling System (KC); Chemical and Volume Control System (NV); Containment Spray System (NS); and Residual Heat Removal System. Additional verification of the program scope was accomplished by reviewing selected EOPs. The following EOPs contained operator actions required for positioning MOVs during emergency events. These MOVs were compared to the licensee's GL 89-10 MOV list to verify inclusion in the program.

- EP/1/A/5000/1C2, Post LOCA Cooldown and Depressurization (Retype No. 7)

- EP/2/A/5000/1A1, Natural Circulation Cooldown (Retype No. 6)

- EP/1/A/5000/1B, Termination Following Spurious SI (Retype No. 16)

All MOVs selected for review were determined to have been included in the GL 89-10 program scope.

The inspectors identified a concern with the GL 89-10 Program scope based on review of the periodic test requirements discussed in paragraph 3.e. The licensee is committed to recovery of MOVs from inadvertent mispositioning. The inspectors determined, however, that Group 2 passive position changeable MOVs, i.e., BOP valves, have Thermal Overload (TOL) relay contacts in the motor control circuit on a continuous basis with the capability to trip the motor in the event of an overload condition. This motor control configuration is different from the safety related MOVs which have the TOLs continuously bypassed for tripping functions and are used only for alarms. The licensee does not envisage performing any GL 89-10 periodic test activities to ensure adequate configuration control of the BOP motor TOLs. Other than a visual inspection that may be performed during required corrective maintenance activities, positive controls for maintaining design basis of non-safety related MOVs TOLs do not exist. Licensee management upon discussing this issue with the inspectors have decided to re-evaluate the scope of the GL 89-10 program. This issue is generic to the Licensee's other operating units at Oconee and McGuire and will be identified as a concern for NRC followup (Concern #12).

3.b DESIGN BASIS REVIEW

In recommended action "a" of GL 89-10, the staff requested the review and documentation of the design basis for the operation of each MOV within the generic letter program to determine the maximum differential pressure and flow (and other factors) expected for both normal operations and abnormal conditions.

The inspectors discussed with licensee personnel the performance of the design basis reviews for MOVs identified in the licensee's GL 89-10 program. With the exception of two MOVs, the licensee had completed all 538 of their design basis reviews. The inspectors reviewed DPS-1205.19-00-0003, "Motor Operated Valve Design Basis Review Guidelines," Rev. 2, November 1, 1991. This document required that design basis parameters such as differential pressure, fluid flow, and ambient temperature be determined, and that the FSAR, normal operating procedures, emergency operating procedures, and other plant documents be reviewed to determine these design basis parameters. The inspectors reviewed differential

calculations for the pressurizer power-operated relief valves block valves which were documented in CNC 1223.03-00-0017 "Operating Parameters for Valves 1(2)NC31B, NC33A, and NC35B," Rev. 0, November 16, 1991. The maximum worst case differential pressure was 2485 psid. This value was based on the safety relief valve setpoint. The differential pressure calculation was consistent with the requirements specified in Specification DPS-1205.19-00-0003.

The licensee used the computerized Auxiliary System Design Optimization Program (ASDOP) to determine the worst case degraded voltages present at the terminals of each MOV. This program considered the motor starting characteristics, line impedances, thermal overloads, transformer impedance, and cable impedance calculations. The licensee assumed 167°F as the ambient temperature for its cable runs. The licensee performed an analysis to justify the ambient temperature used in the degraded voltage calculations by determining if the voltage drop would be significant at temperatures at 167°F and 330°F.

The inspectors learned that a power factor of 0.25 was used in the degraded voltage calculations. The use of a 0.25 power factor was based on the assumption that the actuator motors were continuous duty. Because the motors used on Rotork and Limitorque actuators are not continuous duty, a different power factor will be applied to determine the degraded voltage in the calculations. Duke Power Company (DPC) was waiting for the operator manufacturers (Limitorque and Rotork) to provide the bounding generic values for both power factor and amperage for the different size motors. The licensee plans to revise the degraded voltage calculations and MOV sizing calculations when this information becomes available. The inspectors will review these efforts during future inspections (Concern 1).

3.c MOV SWITCH SETTINGS

Recommended action b. of Generic Letter 89-10 request licensees to review, and to revise as necessary, the methods for selecting and setting all MOV switches.

The NRC inspectors discussed with licensee personnel the process of sizing MOVs and setting their switches. The inspectors reviewed the DPS-1205.19-00-0002, "Guideline for Performing Motor Operated Valve Reviews and Calculations," Rev. 2, April 20, 1992, and several calculation packages.

The licensee had completed sizing and switch setting calculations for approximately 208 MOVs. The licensee plans to have their sizing and

switch setting calculations completed by February 1, 1993. The results of the switch setting calculations were implemented into setpoint document CNM 1205.00-1997-001, "Catawba Nuclear Station Units 1 and 2 Torque Switch Settings Sheets Rotork and Limitorque EMO." This document is kept current as switch setting calculations are revised.

According to Section 5.1.4 of DPS-1205.19-00-0002, a valve factor of 0.50 was assumed in high temperature/pressure applications for solid and flexible wedge gate valves. A valve factor range between 0.35 to 0.50 was assumed for MOVs in low temperature/pressure applications. However, a valve factor of 0.50 was typically used in several of the switch setting calculations for MOVs in low pressure applications. A lower valve factor would be applied when an operability concern existed but the valve factor would not be lower then 0.35 without justification. Section 5.1.4.3 of DPS-1205.19-00-0002 stated that a valve factor of 0.35 would be assumed for parallel disc gate valves and a 1.10 valve factor would be assumed for globe valves. An exception was made for MOVs with a safety function only in the open direction. To reduce the seating forces, the closing thrust for these MOVs was determined by assuming a valve factor of 0.35.

The inspectors reviewed the "VOTES Sensor Test Report Analysis Guideline," Rev. 2, January 31, 1992. This guideline provided instructions how to calculate the available valve factor for the open and close direction by interpreting the VOTES sensor trace. The inspectors also reviewed a composite of differential test results and observed that MOVs 1NI118A, 2NI118B and 2NI150B had valve factors higher then the assumed valve factor of 0.50. The inspectors questioned the licensee whether their switch setting calculations were revised to reflect the higher apparent valve factor. The licensee had revised switch setting calculations CNC 1205.19-00-0018, Rev. 0, April 29, 1992, to reflect a valve factor of 0.61.

According to DPS-1205.19-00-002, a stem coefficient of friction (SCF) of 0.15 was assumed for Rotork and Limitorque operators. The licensee had based their assumed SCF on a study performed by Rotork and the evaluation of in-plant test data. Test analyzes was conducted in accordance with the "VOTES Sensor Test Report Analysis Guideline. This guideline indirectly verified the stem coefficient of friction SCF by multiplying the stem factor (using an assumed SCF) by the measured thrust at control switch trip (CST) which resulted in an equivalent torque. The calculated torque value was then compared to the torque available based on a spring pack curve. However, the licensee stated that relying on spring pack curves was not the most accurate method. Therefore, the licensee had recently revised their VOTES analysis guideline. The stem factor will be directly calculated by measuring torque at CST and dividing by the measured thrust at torque

switch trip (TST). The licensee's preferred method for measuring torque is through the use of a torque sensing strain gage. To verify the assumed SCF, the calculated stem factor is compared and required to be less than the assumed stem factor. Licensee personnel stated that as-found testing will be conducted at the end of the stem lubrication period to validate their assumption for SCF.

The inspectors questioned the licensee whether the revisions made to their VOTES Sensor Test Report Analysis Guideline had been applied to previously analyzed tests. The licensee indicated that changes that affect key parameters in previously analyzed tests would be evaluated. The inspectors will review this effort during future inspections (Concern 2).

The methodology for determining minimum required thrust/torque requirements was defined in DPS-1205.19-00-0002. Maximum thrust/torque limitations were based on the lesser of the valve structural limits, actuator limits, and motor capability at degraded voltage conditions. Both minimum and maximum thrust/torque ratings were adjusted by 10% to account for diagnostic instrument inaccuracies. Included with the 10% tolerance was torque switch repeatability. However, the inspectors were concerned that the licensee's approach may not adequately ensure that torque switch repeatability is not a concern for those valves that are not practicable to test under dynamic conditions. The licensee needs to develop justification that their approach will adequately account for torque switch repeatability for valves that are not practicable to test. This concern will be reviewed during future inspections. The inspectors observed that MOVs with oversized actuators had additional margin added to the minimum thrust/torque requirements. Also maximum thrust/torque requirements were lowered to prevent over shoot due to inertial effects.

DPC had sponsored a two part study to justify increases in thrust ratings for Limitorque and Rotork operators. The first part of the study performed overload testing on certain Limitorque models. The Limitorque test program raised the thrust ratings of SMB-000, SMB-00, SMB-0 and SMB-1 operators to 162% of their currently published ratings for a 2000 life cycle. The second part of the study performed overload testing on a selection of operators manufactured by Rotork. The goal of this study was to increase the thrust ratings to 200% of their currently published levels. The results of the study indicated that for certain operators the goal was achieved, but for other Rotork operators the goal was not achieved.

The licensee had not extended the thrust ratings for any MOVs at Catawba. However, if Catawba intends to extend the Limitorque ratings in the future, the related seismic study indicated that for a SMB-000, it is necessary that

the actuator mounting bolts be properly tightened to the prescribed levels, and that the manual declutch lever be secured with a cable to keep it from spuriously engaging during a seismic event. Limitorque is reviewing potential modifications to the declutch system, such as using a lighter mass declutch lever. The design and associated static seismic analysis is expected to be finalized by May of 1992.

The inspectors noted that no margins were included in the MOV sizing calculations to account for rate of loading effects that might decrease the available thrust delivered by the actuator during high pressure conditions compared to the thrust delivered during the static conditions when settings are made. However, test data had been evaluated to identify the rate of loading phenomenon. This data was compared to the design basis conditions to ensure that adequate margin exists. The inspectors also observed that the licensee had performed an extensive evaluation to determine whether a trend existed for various types of MOVs. The licensee needs to develop justification that their method will adequately account for rate of loading that may affect those valves that are not practicable to test under dynamic conditions. Accounting for ROL effects is crucial, especially to those MOVs that cannot be tested at design basis conditions.

The licensee does include margin in its MOV sizing calculations to account for high ambient temperature effects on motor performance. The licensee relies on a study performed by Rotork for that manufactures's actuators. According to this study, temperatures within the range of 162°F and 370°F could reduced motor torque from 10% to 17%. The licensee had applied this study to Limitorque actuators. The inspectors indicated that the Rotork study may not be applicable to Limitorque operators. The licensee had used the results of this study to develope a flow chart to address MOVs located in high temperature areas that may need to operate upon initiation of an accident during degraded voltage conditions and MOVs that may need to operate later in a scenario when voltage has not yet recovered to normal conditions. This flow chart methodology was documented in the licensee's Electric Motor Operator Sizing Guidelines and DPS-1205.19.00-0002. The licensee was waiting for Limitorque to provide the results of a study regarding the effect of high ambient temperature on AC motors furnished with Limitorque MOVs. When this information becomes available, the licensee indicated that its sizing calculations will be revised accordingly. The inspectors will review these efforts during future inspections (Concern 3).

The inspectors reviewed several differential switch setting calculations for MOVS 2NC31B, 2NC033A, and 2NC033B. These calculations were documented Rev 0, April 30, 1992 and CNC 1205.19-00-0028, "Generic

Letter 89-10 MOV Calculation for 2NC33A and 2NC33B," Rev 0, April 30, 1992. The inspectors did not identify any concerns with these calculations.

The inspectors observed in the licensee's FSAR that the minimum voltage for Class 1E motor operators for valves was 85%. In several of the electric motor sizing calculations, the degraded voltage for several operators was less than 85%. The licensee needs to ensure that their FSAR requirements are consistent with the minimum voltages documented in their electric motor operator sizing calculations. The licensee indicated that their FSAR would be revised accordingly. The inspectors will review this effort during future inspections (Concern 4).

In Section 6.5 of its GL 89-10 Program document, the licensee stated that missing Limitorque switch limiter plates were to be identified during preventive maintenance and diagnostic testing activities. Maintenance procedure MP/0/A/7300/01 "Limitorque Operator Preventive Maintenance," Rev. 0, April 8, 1992 identifies whether a torque switch does or does not have a limiter plate. Procedure IP/O/3820/04A "MOV Testing With VOTES," Rev 6, October 18, 1991 prevents the removal of limiter plates. The licensee stated that when a torque switch has to be set above the manufacturer's maximum recommendations a safety analysis in accordance with 10 CFR Part 50.59 will be performed.

According to Section 7.1 of its GL 89-10 Program document, motor overload protection at Catawba was intended to meet the intent of Regulatory Guide 1.106 (Rev. 1), "Thermal Overload Protection for Electric Motors on Motor-Operated Valves." Catawba has an overload heater in each phase for QA1 MOV circuits used for overload alarms only. The open torque switch bypass was set for 50% + 25% for all GL-89-10 gate valves (and globe valves with flow over the disk) to cover high unseating loads for a minimum of 25% of the valve stroke.

3.d DESIGN-BASIS DIFFERENTIAL PRESSURE AND FLOW TESTING

Recommended action c. of the generic letter, requests licensees to test MOVs within the generic letter program in situ under their design-basis differential pressure and flow conditions. If testing in situ under those conditions is not practicable, the NRC staff allows alternate methods to be used to demonstrate the capability of the MOV. A two-stage approach is suggested for situations where design-basis testing in situ is not practicable and, at this time, an alternate method of demonstrating MOV capability cannot be justified. With the two-stage approach, a licensee would evaluate the capability of the MOV using the best data available and then would work to obtain applicable test data within the schedule of the generic letter.

The licensee stated that all MOVs that could be baseline tested would be scheduled and the switch settings would be verified. Differential pressure testing will be accomplished in accordance with the program definition of the objectives of the D/P testing plan. The DPC response dated December 28, 1989, states that differential pressure testing would be performed only where practical and only to the extent that the test will provide useful information for the DPC program methodology.

At the present time a total of 20 valves have been D/P tested but only 15 of these were to tested by the GL 89-10 guidelines. Five of these valves were D/P tested after the valves and operators were replaced due to problems which were described in detail in INFORMATION NOTICE NO. 89-61, FAILURE OF BORG-WARNER GATE VALVES TO CLOSE AGAINST DIFFERENTIAL PRESSURE. The licensee submitted a courtesy LER regarding the failure of an Auxiliary Feedwater pump discharge motor operated valve to fully close against a differential pressure of 1800 psi at CNS. As a result of these valve problems, several valves were replaced and included the five valves that were D/P tested in the feedwater (CA) system. The calculations for the setting of torque switches for these were completed in Calculation No. CNC 1205.01-00-0020, REV 1 issued September 6, 1990. The testing was performed in accordance with MES D/P Guidelines. There was no baseline test performed to determine the accuracy of the switch settings as this was determined during the D/P testing. The inspectors reviewed the calculations performed under the mentioned guidelines and determined that the factors used in these calculations were suitable for inclusion in the GL 89-10 calculations but that MOV baseline data should be developed by testing. The licensee advised the inspectors that baseline testing would be performed at some future time; but, felt that other MOVs should be tested ahead of these because of the successful D/P tests. The calculations and D/P test data for those valves that have been previously tested under the MES Guidelines and are now included in the GL 89-10 program, should be reviewed and made part of the GL valve data package in order to support any future testing requirements (Concern 9).

The licensee is currently revising Catawba Nuclear Station procedures IP/OA/3820/03E, TESTING OF LIMITORQUE ACTUATORS ON KEROTEST VALVES USING FORCE TRANSDUCERS, and IP/0/A/3820/04A, MOV TESTING WITH VOTES. These revisions are being made to insure that the required GL 89-10 program data is used during the testing of the MOVs and that the correct program data is collected.

3.e 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. In Section j. of the generic letter, the staff recommends surveillance to confirm the adequacy of the settings. The interval of the surveillance is to be based on the safety importance of the MOV as well as its maintenance and performance history, but is not to exceed five years or three refueling outages. Further, the capability of the MOV is to be verified if the MOV is replaced, modified, or overhauled to an extent that the existing test results are not representative of the MOV.

The licensee's GL 89-10 MOV Program, Section 6.1.4, establishes requirements for performing surveillance tests to identify MOV degradation. The frequency for performing these surveillances was specified as three RFOs or five years; and six RFOs or eight years from the baseline or surveillance test for Group 1 and 2 MOVs respectively. These intervals may also be extended or reduced based on results obtained from the MOV trending program. The licensee is presently engaged in activities intended to identify a trendable parameter which would be indicative of MOV performance degradation. This effort is being performed to eliminate the need for performing periodic dynamic MOV tests. The inspectors were informed that until trendable parameters are identified, static tests will be performed to meet the periodic test program requirements. Licensee management was advised that the use of static test to verify continued capability of an MOV to operate under worst case differential pressure and flow conditions was not considered adequate. The reason given was the unknown relationship between the performance of an MOV under static conditions and under design conditions. Pending successful development of a trendable parameter by the licensee, this is identified as concern to be followed by the NRC (Concern 10).

Requirements for performing post-maintenance test have been established by the licensee's GL 89-10 MOV Program. These requirements are specified in a PMTR matrix and PM activities are implemented via site level procedures IP/O/A/3820/02B, Rotork Actuator Preventive Maintenance, and IP/O/A/3820/03B, Limitorque Operator Preventive Maintenance. Lubrication requirements for MOVs within the scope of the GL program has been established and are implemented on 18 month frequency. The inspectors reviewed the DPC Catawba Nuclear Station Post Maintenance Retest Manual and verified that program controls have been established to ensure that baseline tested MOVs are incorporated in the periodic test program. Post-modification test requirements for previously baseline tested MOVs were also reviewed. One concern was identified in that the requirements of the upper-tier program document DPC NRC Generic Letter Program Plan, Section 6.1.3, was not implemented by Catawba Nuclear Station Directive 4.4.4,

Processing Nuclear Station Modifications. This item is identified as a concern and will be re-examined in future NRC MOV inspections (Concern 11).

Discussions with licensee's engineering personnel revealed that specific site level procedures were being revised to enhance the GL program requirements. Among these were procedures IP/O/A/3820/04A, Motor Operated Valve Testing with VOTES, and IP/O/A/3820/04, Operating Checkout of Limitorque and Rotork Valve Actuators. The nature of the changes involve enhanced test capabilities of the VOTES in IP/O/A/3820/04A, and more clearly identifying retest interface requirements in IP/O/A/3820/04. Pending completion of these revisions this item will be followed up by the NRC in future MOV inspections.

The licensee's GL 89-10 MOV Program does not include TOLs. The licensee's commitment to Regulatory Guide 1.106 is contained in FSAR Section 8.1.5.2 which shows that the TOLs are continuously bypassed and are used for alarm only. The inspectors determined, however, that non-safety related Group 2 MOVs may be tripped upon a motor overload because they are not required to be bypassed for trip functions. The licensee is committed to recovery of Group 2 MOVs from inadvertent mispositioning. However, the licensee will not be performing periodic tests to verify the design basis of Group 2 TOLs and positive controls have not been established to prevent unauthorized changes in TOL sizes. The inspection team informed licensee management of their concern regarding this issue. Licensee management subsequently decided to re-evaluate the program scope as to whether-or-not the BOP Group 2 MOVs will be kept in the program. This item is classified as a concern to be followed up by the NRC as discussed in Section 3.a of the report.

3.f MOV Failures, Corrective Actions, and Trending

In recommended action h. of the generic letter, the staff requires that licensees analyze or justify each MOV failure and corrective actions. 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 2 years or after each refueling outage after program implementation) as part of the monitoring and feedback effort to establish trends of MOV operability. These trends could provide the basis for a licensee revision of the testing frequency established to verify periodically adequate MOV capability. The generic letter indicates that a well-structured and component-oriented system is necessary to track,

capture, and share equipment history data.

The licensee's general requirements for identifying and analyzing MOV degradations and failures is described in Section 6.0 of their GL 89-10 Plan and requires the cause of all MOV failures be assessed to determine the failure mode. Failure analysis is performed at several different levels and under different existing licensee programs. At the technician level, maintenance procedures for troubleshooting or performing corrective action on actuator problems require that the MOV technicians identify and document the failure mechanism(s). MOV maintenance is documented using the station's work request system which requires that the cause of the failure be documented. Abnormal valve performance or significant failures are reviewed under the licensee's Problem Investigation Report (PIR) programs.

The inspectors reviewed licensee corrective actions associated with four work requests. The inspectors reviewed the failure analysis and corrective actions associated with the work requests. The licensee appeared to adequately investigate the root cause of the failures and took appropriate corrective actions. Corrective actions for items at the other sites controlled by the same licensee, were assessed and promptly implemented, as required.

MOV failure trending is also described in Section 6.0 of the licensee's Plan. The licensee has been periodically examining MOV failures, degradations, and other associated problems with MOVs. The inspector reviewed sample reports generated from this review and concluded that they contained sufficient information to determine adverse MOV performance trends.

The inspector discussed with the licensee their plans to trend MOV diagnostic test results. At present, a program to trend the test results is still in the development state. An outside contractor has been contracted to develop appropriate trending software.

3.g SCHEDULE

In GL 89-10, the staff requested that licensees complete all design-basis reviews, analysis, 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.

The GL 89-10 specifies that Catawba Nuclear Station test all program valves by the End of Cycle 7 (1EOC7) for Unit 1 and cycle 6 (2EOC6) for Unit 2. Due to the large number of valves in the program, DPC has grouped the

valves into 2 groups based on their importance. The groups are defined as:

GROUP 1 MOVs that are active and contribute to core melt scenarios and are significant from an accident analyses viewpoint. The group also contains certain "low margin" Group 2 valves. This group contains 175 Unit 1 valves and 161 Unit 2 valves which will require retesting on a 3 RFO interval.

GROUP 2 This group contains the remainder of the valves in the program. This group contains 104 Unit 1 valves and 100 Unit 2 valves. These valves will require retesting on a 6 RFO interval.

The licensee has scheduled the Group 1 valves for completion by 1EOC7 and 2EOC6. The Group 2 valves are to be completed by 1EOC10 and 2EOC9. The inspectors questioned the completion dates for the Group 2 valves. The projected refueling outage schedule indicates that 1EOC10 completion date is November 1997 and 2EOC9 is July 1998.

At the time of this inspection the licensee had completed the set-up or baseline tests listed below:

| | Unit 1 | Unit 2 |
|---|---|---|
| Group 1 | 48 | 49 |
| Group 2 | 36 | 30 |

Differential pressure testing has been completed for 20 MOVs. The testing of these valves is discussed further in other sections of this report.

3.h OVERALL ADMINISTRATION OF MOV ACTIVITIES

The inspectors found that the overall administration of the Catawba GL-89-10 program was as described in the corporate submittal to the NRC which described the program for the three DPC sites.

The site engineering functions are performed by the component engineering group which is responsible for the valve and actuator technical support, program development, test procedure development, and corrective and preventative maintenance and retest requirements.

The mechanical/nuclear engineering group is responsible for the component

calculations, and switch settings. This group also develops the design basis D/P or flow determinations and the definition of the valves for test grouping assignment.

The systems engineering group is responsible for support of D/P testing by determining the testable valves and coordinating the valve alignments for testing purposes.

The D/P testing and diagnostic testing are performed by the Instrumentation and Electrical (I&E) group under the Nuclear Station Manager's organization. The I&E group is responsible for electrical and mechanical maintenance/ refurbishment of Rotork actuators; and the electrical maintenance of the Limitorque actuators. The mechanical maintenance group is responsible for the mechanical maintenance/refurbishment and PMs of Limitorque actuators.

3.i MOV SETPOINT CONTROL

The licensees GL 89-10 program description described the process for determining torque switch setpoints and is discussed in paragraph 3.c. The inspectors determined that site level procedure and/or documents have been developed to ensure positive control of MOV setpoints. The site level source document for torque switch and limit switch setpoints is document No. CNM 1205.00-1997, EMO Valve Operator Setup Instructions. This document provided necessary design basis information and guidance required to set-up electric motor operators on valves in the field. Changes to design basis information contained in this document can be made only through the Exempt Change Process. Based on review of CNS Station Directive 4.4.4 paragraph 5.3 the inspectors concluded that adequate design controls have been established to ensure positive control of MOV setpoints. No deficiencies were identified.

3.j Training

The inspectors reviewed the licensee's MOV training program, held discussions with training personnel, and reviewed training course outlines and training records of selected individuals. MOV maintenance and testing is conducted by personnel from the Instrumentation and Electrical (IAE) Department. Section 6.9 of the licensee's GL 89-10 Plan indicates that MOV training activities for IAE personnel are to be covered under the licensee's existing Employee Training and Qualification System (ETQS) program.

Under the ETQS program, IAE and station engineering personnel involved

with MOV maintenance and testing are provided general training through 32-hour basic courses in both Limitorque and Rotork valve actuators. MOV maintenance activities are conducted using approved procedures that IAE personnel must be qualified to, prior to their independent use. Qualification involves the successful demonstration in the proper use of the procedures under the observation of the individual's supervisor, or may be waived by completion of an system training course.

The inspectors noted that basic refresher training is provided on MOV actuators, but IAE personnel do not have to be requalified periodically on any of the MOV maintenance or test procedures. Periodically, the technician's performance is assessed by their line supervision. If the supervisor judges that the technician is in need of refresher training, the course is scheduled for the technician.

IAE personnel performing MOV diagnostic testing get a week of Valve Operation Test and Evaluation System (VOTES) training, conducted by instructors contracted from B&W Nuclear Service Company. The inspectors observed a portion of this training and reviewed the course outline. The training appears to be comprehensive and adequately conducted. In addition, B&W has performed advanced training in signature trace analysis for a few of the more experienced IAE personnel involved with MOV testing.

When the procedure used for a Training and Qualification (T&Q) guide is revised, the Training staff reviews the revised procedure for inclusion in the T&Q guide. Training records of the maintenance personnel are reviewed and a list of technicians who are thought to need retraining are submitted to the craft management for review and approval.

The Quality Control/Quality Assurance inspectors who review and observe maintenance activities on the MOVs have received the basic training courses on the actuators. No requirement exists for them to receive the training, but it was recognized that a basic knowledge of the equipment would be beneficial to the inspectors. This additional training for the inspectors is considered a strength and is encouraged to be continued in the future.

The inspectors reviewed maintenance work requests (WRs) for several MOVs. In all cases, there was at least one qualified technician for all tasks performed. In most cases, there was more than one qualified technician on each crew.

A training program for station operations personnel has also been implemented to provide them with an overview of MOV theory, operation, testing, and potentially damaging operational practices to avoid. Sequence

1 of requalification training for non-licensed operators for 1992 covered valves and valve positioning. The inspectors interviewed several operators and found them able to answer all questions presented them on MOV operation. The inspectors considered the training of operations personnel to be a positive and noteworthy initiative.

3.k Industry Experience and Vendor Information

The licensee's program for reviewing industry experience and vendor information is controlled by the corporate Nuclear Safety Assurance Department under Nuclear Production Department (NPD) Directive 4.8.1, Operating Experience Program Description. In accordance with the procedure, the Operational Nuclear Safety (ONS) group is responsible for industry experience and vendor information, and the Regulatory Compliance group is responsible for NRC generated documents.

ONS personnel review and screen incoming documents to determine to which Technical/Engineering Supervisor (T/ES) individual the documents needs to be assigned. T/ES evaluates the information to determine the specific corrective actions and training recommendations that should be implemented. ONS personnel review these corrective actions and recommendations, and for a significant problem, the package is sent to the site Safety Review Group. This group determines if the item needs NRC notification. If so, the item is documented as a PIR and are distributed to the appropriate group for review and corrective actions. The training recommendations are reviewed by the Production Training Services group to ensure that appropriate training is specified and site training personnel are responsible for implementing the training.

The inspectors reviewed a sample of selected industry events, vendor bulletins, and NRC generic communications to determine the appropriateness of the licensee corrective actions. In all cases, the licensee had taken prompt and thorough corrective actions.

During the review of an industry study on Limitorque actuators applications, the licensee identified a generic concern with the operation of the declutch lever on SMB-000 actuators during seismic events. Limitorque is presently pursuing corrective actions for the situation. The licensee also reopened a closed NRC Information Notice (IN), when review of the industry study revealed that the situation may be more wide-spread than the IN had indicated. The leadership the licensee has taken in the performance of the industry study, as project manager for the group of licensees that sponsored the study, is a strength.

3.I Use of Diagnostics

The licensee is using VOTES diagnostic equipment. As indicated earlier, minimum and maximum thrust/torque ratings were adjusted to include 10% to account for diagnostic instrument inaccuracies. A TMD was used to measure spring pack displacement to determine actuator torque. The inspectors reviewed IP/0/A/3820/04A "Testing MOVs Using VOTES," Rev. 6, October 18, 1991. This procedure provides the guidelines for testing Rotork and Limitorque actuators to obtain the thrust values applied to a valve seat under static or dynamic pressure conditions. This procedure was used on all rising stem valves except Kerotest valves. The diagnostic procedure used for Kerotest valves was IP/O/A/3820/03 " Testing of Limitorque Actuators on Kerotest Valves using Force Transducers." This procedure provided the guidelines for the use of MOVATS Series 2150/2151 System and force transducers for Limitorque Valve Operators on Kerotest Globe Valves.

Walkdowns

The inspector walked down a selected number of readily accessible MOVs. An inspections was made of the material condition, presence of lubrication on the valve stems, and proper mounting of VOTES sensors on the yoke of the valves In all cases, the MOVs examined were found to be in acceptable condition. The sensors were properly aligned and mounted on the valve yoke.

4. EXIT INTERVIEW

The inspection scope and results were summarized on May 7, 1992, with those persons indicated in Appendix A. The inspectors described the areas inspected and discussed in detail the inspection results listed in the report. Although reviewed during this inspection, proprietary information is not contained in this report. Dissenting comments were not received for the licensee.

APPENDIX A

LICENSEE EMPLOYEES

A. Bhatnager, Component Engineering (CE)
C. Boyd, Mechanical/Nuclear Engineering (MNE)
T. Cline, Nuclear Maintenance Services (NMS)
A. Dickard, Electrical Engineering (EE)
T. Edwards, MNE
N. Estep, NMS
J. Forbes, Catawba Nuclear Station, (CNS) Engineering Manager
R. Futrell, CNS Compliance Manager
H. Henkel, MNE
J. Lowery, Compliance Specialist
P. McIntyre, CE
T. Schwallie, CE
M. Teague, CE
M. Tuckman, CNS, Site Vice President
D. Ward, MNE
R. Winn, CE

# APPENDIX B

## ACRONYMS & INITIALISMS

C/I CONTAINMENT ISOLATION
CLB CURRENT LICENSING BASIS
CST CONTROL SWITCH TRIP
D/P DIFFERENTIAL PRESSURE
DPC DUKE POWER COMPANY
EMO ELECTRIC MOTOR OPERATOR
EOP EMERGENCY OPERATING PROCEDURE
FSAR FINAL SAFETY ANALYSIS REPORT
GL GENERIC LETTER
IAE INSTRUMENTATION AND ELECTRICAL
LLI LOW LEVEL INTAKE
MOV MOTOR OPERATED VALVE
NC NUCLEAR COOLANT SYSTEM
ND RESIDUAL HEAT REMOVAL SYSTEM
NV CHEMICAL AND VOLUME CONTROL SYSTEM
P&ID PIPING AND INSTRUMENT DRAWINGS
PMT POST MAINTENANCE TEST
RC RECIRCULATING COOLING WATER SYSTEM
RFO REFUELING OUTAGE
RN NUCLEAR SERVICE WATER
ROL RATE OF LOADING
RV CONTAINMENT VENTILATION SYSTEM
SCF STEM COEFFICIENT OF FRICTION
SG STEAM GENERATOR
TMD THRUST MEASURING DEVICE
TOL THERMAL OVERLOAD