U.S. NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REACTOR REGULATION

Division of Reactor Inspection and Safeguards

NRC Inspection Report: 91-201 License No: DRP-23

Docket No.: 50-261

Licensee: Carolina Power & Light Company

Facility Name: H. B. Robinson Steam Electric Plant, Unit 2

Inspection Conducted: June 10-14, 1991

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EXECUTIVE SUMMARY

From June 10 through 14, 1991, a U. S. Nuclear Regulatory Commission (NRC) inspection team conducted a motor-operated valve (MOV) inspection at Carolina Power & Light Company's (CP&L) engineering offices in Raleigh, North Carolina. The inspection focused on CP&L's corporate program developed to address NRC Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," and was accomplished in accordance with NRC Temporary Instruction 2515/109, "Inspection Requirements for Generic Letter 89-10, Safety Related Motor-Operated Valve Testing and Surveillance." Implementation of the CP&L corporate program was reviewed for the H. B. Robinson site. The team reviewed the programs and program implementation for performing MOV design-basis reviews, for establishing MOV switch settings, for performing differential pressure and flow testing, for performing MOV training, and for performing MOV maintenance, as well as other related MOV activities.

The team found that portions of an acceptable MOV program had been developed by CP&L but the team identified many weaknesses, especially with the H. B. Robinson site implementing procedures. Nine of the weaknesses were classified by the team as being significant, including two instances in which CP&L failed to properly document and evaluate potential operability concerns with two safety-related MOVs. Other significant weaknesses identified by the team included the following:

- Inadequate procedures for controlling the performance and evaluation of diagnostic testing
- Thermal overloads that are not being periodically tested
- Flow not being considered during the design-basis review
- A post-maintenance test program that does not contain provisions for evaluating thrust
- A setpoint document that did not contain limit switch settings, thrust requirements, or torque switch settings for a large number of valves
- A periodic test program that allows valve stems to be cleaned and lubricated before diagnostic testing is performed
- Apparently undersized actuators for valves FW-V2-6A, 6B, and 6C
- Inadequate limit switch settings for the closed-to-open torque switch bypass

In addition, the team identified other less significant weaknesses, including the reliance on unjustified vendor data for establishing initial valve thrust requirements and CP&L's failure to account for inaccuracies attributed to torque switch repeatability and rate of loading. The team also noted that CP&L's stance on valve mispositioning as documented in their June 6, 1991 letter to the NRC is not consistent with the generic letter.

Apparent strengths within the generic letter program included the licensee's involvement with MOV industry groups, the MOV training program, and the design-basis reviews related to degraded voltage, thermal overloads, and the effects of high temperatures on motor torque. In addition, CP&L's plan for performing differential pressure testing on a high percentage of valves in the GL 89-10 program was considered a strength.

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1.0 INTRODUCTION

On June 28, 1989, the U. S. Nuclear Regulatory Commission (NRC) staff issued Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," requesting licensees and construction permit holders to establish a program to ensure that switch settings are selected, set, and maintained properly for safety-related motor-operated valves (MOVs) and certain other MOVs in all safety-related systems. This generic letter expanded the recommendations in the Office of Inspection and Enforcement Bulletin 85-03, "Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings" (November 15, 1985), and its Supplement 1 (April 27, 1988). The bulletin and its supplement were limited to MOVs in certain safety-related systems and did not involve the effort requested by GL 89-10.

The staff held public workshops to discuss the generic letter and to answer questions regarding its implementation. On June 13, 1990, the staff issued Supplement 1 to GL 89-10 to provide the results of these public workshops. Supplement 2 of the generic letter was issued on August 3, 1990, to delay onsite inspections of the licensees' programs until at least January 1, 1991, to allow time for licensees and construction permit holders to incorporate the information provided in Supplement 1 into their MOV programs.

In response to concerns raised by the results of NRC-sponsored MOV tests, the staff issued Supplement 3 to GL 89-10 on October 25, 1990, requesting licensees of boiling-water reactors to evaluate the capability of MOVs used for containment isolation in the steam supply lines to the high-pressure coolant injection and reactor core isolation cooling systems, in the supply line to the reactor water cleanup system, and in the lines to the isolation condenser, as applicable. The staff also indicated that all licensees and construction permit holders should consider the applicability of the information obtained from the NRC-sponsored tests to other MOVs within the scope of GL 89-10 and should consider this information in the development of priorities for implementing the generic letter program.

The NRC team followed Temporary Instruction (TI) 2515/109 (January 14, 1991), "Inspection Requirements for GL 89-10, Safety-Related Motor-Operated Valve Testing and Surveillance," in performing this inspection. The team concentrated on Part 1 of the temporary instruction and evaluated Carolina Power & Light's (the licensee's) program to provide assurance that the MOVs within the scope of GL 89-10 are capable of operating under design basis differential pressure and flow conditions. The inspectors also addressed Part 2 of the instruction and evaluated portions of the program implementation by sampling several H. B. Robinson MOVs that the licensee indicated had been sized, set, and/or tested in accordance with its program. The specific areas reviewed and the team's findings are described in Sections 2 through 4 of this report. Each finding that was designated an open item is provided in Appendix A. A list of persons attending the exit meeting is provided in Appendix B.

2.0 OVERALL ADMINISTRATION OF MOV ACTIVITIES

The team reviewed three documents that provide administrative requirements for the licensee's GL 89-10 MOV program at the Robinson plant. Two of these documents were applicable to all of the licensee's sites: "The CP&L GL 89-10

MOV Program Specification," Document No. Q9-MO-001; and "NED Scope Document for Work Tasks Authorized by CP&L's Nuclear Facilities in Response to GL 89-10 Motor-Operated Valves," Document No. Q9-MO-002. The third document was the Robinson site program: "Motor-Operated Valve Program", Technical Support Management Procedure TMM-032.

The team found that at the corporate level the licensee has a corporate MOV task force, chaired by the licensee's Nuclear Engineering Department, which provides direction for MOV program activities and coordinates assigning responsibilities and forecasting schedule completion. Also, there is an MOV Task Force Steering Committee composed of management representatives from the corporate Nuclear Engineering Department and each site's technical support organization, whose function is to provide managerial review of the generic letter activities and to resolve programmatic issues applicable to all plants. These responsibilities are described in Q9-MO-001.

At the site level, the licensee has assigned a Managed Valve Maintenance Program Coordinator at Robinson, who is responsible for the licensee's MOV and check valve programs. This individual's responsibilities relative to MOVs are described in procedure TMM-032. They include coordinating engineering, maintenance, testing, and other activities to support the MOV program; defining and communicating MOV preventive maintenance requirements to maintenance groups; reviewing and communicating MOV test and maintenance data to the Nuclear Engineering Department; ensuring review and appropriate incorporation of industry experience into plant procedures; developing and maintaining an MOV database and trending MOV failure data; and so forth. Because of the numerous MOV responsibilities assigned to this individual, as well as the responsibilities imposed by the licensee's check valve program, the team expressed their concern relative to the level of licensee support for these programs.

2.1 Generic Letter Program Scope

In CP&L's response to GL 89-10, dated December 27, 1989, CP&L indicated that a corporate task group was assigned to develop an MOV program consistent with the recommendations of the generic letter but indicated that more detailed information would be submitted to the NRC after evaluation of ongoing industry group studies. On June 6, 1991, CP&L submitted a supplemental response to the NRC on GL 89-10 program commitments. The licensee reiterated the intent to meet the recommendations of GL 89-10 but stated that only events within the current licensing basis will be evaluated for valve mispositioning.

The scope of the licensee's GL 89-10 program is described in the Nuclear Engineering Department (NED) Scope Document Q9-MO-002, dated May 31, 1991, and the Technical Support Management Manual Procedure TMM-032, dated June 5, 1991. Ninety-one MOVs in safety-related systems are identified in the GL 89-10 program scope.

The inspectors reviewed plant drawings to verify that all MOVs in selected safety-related systems were included in the MOV program. A review of the residual heat removal, safety injection, and auxiliary feedwater system drawings showed that all MOVs in these systems were included in the MOV program.

2.2 Design Basis Review

Recommended action "a" of GL 89-10, states that licensees should review and document the design basis for the operation of each MOV within the scope of the generic letter program to determine the maximum differential pressure and flow and other design basis parameters (such as voltage) expected for normal and abnormal conditions.

CP&L's corporate MOV program is detailed in program document Q9-MO-001, "GL 89-10 MOV Program Specification," which specifies that an MOV design basis review will be performed in accordance with program document Q9-MO-002," NED Scope Document for Work Tasks Authorized by CP&L's nuclear facilities in Response to GL 89-10." The team reviewed the procedures governing the individual aspects of the design-basis review, as well as implementation of these procedures for several preselected MOVs. The results of the review are discussed below.

2.2.1 Differential Pressure Requirements

The licensee is currently generating design-basis differential pressure (DBDP) reports for each MOV in a safety-related system. The DBDP reports are based on information contained in system descriptions, operations surveillance test procedures, vendor equipment specifications, pump curves, operational procedures, the final safety analysis report, technical specifications, flow diagrams, and other appropriate documents as necessary to obtain the maximum differential pressures in both the open and closed direction of each MOV. The licensee plans to complete the DBDP reports by the end of July 1991.

For the DBDP reports reviewed, the team found that, in general, the differential pressure specified was significantly higher (more conservative) than the maximum differential pressure that would likely be experienced by the MOV during any plant event. However, the team found one instance where the differential pressure specified in the DBDP report was not used in the calculation which was generated for determining valve-required thrust. In calculation RNP-M/MECH-1122, dated November 14, 1990, a closing differential pressure of 400 psid was used to compute the thrust and torque requirements of the valve even though Engineering Evaluation EE 90-001, dated May 1, 1990, indicated that the maximum closing differential pressure of valve AFW-V2-20A was 1200 psid. The value of 400 psid was obtained from a Robinson Nuclear Plant (RNP) design data input sheet. During the inspection, the licensee presented a draft copy of a new calculation which showed that the motor operator was adequately sized for the 1200 psid differential pressure. The team indicated to the licensee that future thrust and torque calculations should be based on the values of differential pressure specified in the DBDP reports.

2.2.2 Flow Requirements

As indicated in its response to NRC GL 89-10, the licensee stated that the flow rates are contained in various plant documents and will not be reevaluated for the generic letter MOV program. CP&L's position is that the flow rates that the MOVs covered under the GL 89-10 program will experience during differential pressure testing will be the rates that can be achieved with existing system configurations.

In Supplement 1 of GL 89-10 the response to Question 16 states that the effects of factors such as flow rate should be addressed analytically together with the most conservative differential pressure to ensure that design basis conditions are adequately accounted for by the testing program. Consequently, the licensee's MOV program is not in compliance with the recommendation of GL 89-10 as it does not consider the effects of flow in either the design basis review or the testing program. The exclusion of flow from the design basis review process is identified as Open Item 91-201-01 in Appendix A to this report.

2.2.3 Valve Mispositioning

In GL 89-10, the staff requested that valves not blocked from inadvertent operation from either the control room, the motor control center, or the valve itself should be considered capable of being mispositioned and should be included in the generic letter program.

In its response of June 6, 1991, to GL 89-10, Carolina Power & Light Company indicated that "valve mispositioning (inadvertently by an operator in the control room), in conjunction with an additional single failure, is beyond the current licensing basis for CP&L's plants. As such, only events within the current licensing basis are being considered in evaluating MOVs in the program." Consequently, CP&L is not planning to review the capability of valves to be repositioned to their safety position if that valve or system has a redundant train that can perform the safety function. This stance is not in agreement with the recommendations of GL 89-10 as the GL does not allow the exclusion of the valve from the mispositioning reviews solely on the basis that a redundant valve or system exists. CP&L's position on valve mispositioning is identified as Open Item 91-201-02 in Appendix A to this report.

2.2.4 Reduced Voltage Capability of MOVs

The licensee has issued Design Guide DG V.67 for evaluating the minimum and maximum torque output capability of the GL 89-10 actuator motors. The design guide includes requirements for calculating available motor torque under worst case degraded voltage conditions, including the consideration of cable resistance and reactance, overload heater resistance, motor resistance, and motor reactance. The design guide also includes provisions for adjusting all the above parameters, as required to compensate for high ambient temperature conditions. The licensee has developed a computer program entitled "ACTORQ" to perform the calculations associated with this design review.

Initial program runs for the Robinson MOVs were performed using the minimum transient criterion voltage at the applicable motor control center (MCC). This criterion voltage is a theoretical value established to ensure short-term operability of Class 1E motors and is justified by a system voltage regulation calculation that shows that during worst-case conditions, the expected MCC voltages will remain above the criterion voltage. This criteria voltage is also lower (i.e., more conservative) than the degraded grid relay setpoint.

For those valves for which the calculation showed less than 80 percent voltage at the motor terminals, a second less conservative computer run was conducted using the minimum steady-state voltage criteria for the applicable MCC (all MOVs were originally purchased to an 80 percent voltage specification). The

steady-state voltage criterion is a voltage that corresponds to 90 percent of pump motor rated voltage and is the voltage necessary to ensure long-term operability of motors and to ensure contactor pickup. This voltage (428 volts) is higher than the degraded grid relay minimum setpoint of 411, which is currently being reviewed for its acceptability. In the interim, until the degraded grid relay setpoints are raised, the licensee has instituted an abnormal operating procedure (AOP-027) to monitor and separate from the offsite supply should the grid voltage fall below 438 volts. The team considered the abnormal operating procedure acceptable for ensuring adequate voltage until the degraded grid relay setpoints can be raised.

The inspection team reviewed the output data from this program for several MOVs. From this review, the team determined that the design guide had been properly implemented for the Robinson MOVs.

2.2.5 Thermal Overloads

The licensee has issued Design Guide DG-V.12 for the sizing and selection of motor control center protective devices, including thermal overloads. The design guide contains four criteria for sizing the thermal overloads:

(1) The maximum overload trip time at locked rotor shall not exceed the allowable locked rotor time for the motor.

(2) The maximum relay trip time at the motor normal load current shall not be less than the duty cycle of the valve actuator.

(3) The minimum relay trip time at a current corresponding to twice the normal running load shall not be less than the stroke time of the valve actuator.

(4) The maximum relay trip time at a current corresponding to twice normal torque shall not exceed the time the motor can withstand this current.

The design guide also contains provisions for evaluating the effects of ambient temperature, high voltage, and low voltage on the thermal overload performance. The team reviewed calculations for several of the valves and found that the design guidance had been properly implemented. The design guide and sizing of thermal overloads was seen as a strength by the inspection team.

2.3 MOV Switch Settings

Recommended action "b" of GL 89-10, states that licensees should review and revise, as necessary, the methods for selecting and setting all MOV switches.

CP&L Design Guide DG-I.11 (Revision 3, May 31, 1991) described the licensee's process for sizing MOVs and setting their switches. To size and set the torque switch for an MOV, the licensee determines a minimum required opening and closing thrust based on the worst-case differential pressure determined from its design basis review. These minimum thrusts are also converted into actuator output torque values for both directions..

The licensee uses a torque wrench for initial setting of the torque switch. The minimum required output torque for the closed direction is used to generate

a torque switch setting range, which consists of a minimum value that has instrument tolerances added in, and a maximum value that considers the torque capacities of the actuator and related components. Torque switch limiter plates are left in place and are not modified.

The licensee defines the minimum required thrust as the thrust necessary to overcome the maximum differential pressure above the running load. The licensee uses the industry standard sizing calculations to generate these thrust values. Values for the disk factor and the stem factor have typically been provided by valve vendors. Assumed values were used by the licensee when factors were not provided by vendors.

The team's concerns regarding the licensee's methodology for calculating MOV switch settings are discussed below.

(1) The team noted that the licensee assumed certain valve factors (specifically, 0.3 for flex wedge gate valves and parallel disc gate valves) that have been shown to yield nonconservative results in some analytical thrust determinations. The team indicated that the use of low valve factors places a heavy emphasis on the performance of design basis testing of MOVs in-situ in order to verify the licensee's methodology for sizing MOVs and their switches. Where it is not practicable to test an MOV under worst-case differential pressure and flow conditions, the NRC staff will not accept such low friction factors without specific justification. The licensee will need to be prepared to evaluate its methodology, including appropriate consideration of MOV operability, when results of design basis testing are obtained.

(2) The licensee used values supplied by the vendor for stem factor when the vendor provided these values. Design Guide DG-I.11 directed the use of a conservative 0.20 stem friction coefficient for calculation of stem factor when values are not provided by the vendor. However, the licensee indicated that a 0.15 stem friction coefficient may have been used by some vendors. The assumption of 0.15 as the stem friction coefficient may not be valid unless specific maintenance and lubrication requirements and frequencies are implemented to ensure the continued high efficiency of torque-to-thrust conversion. The licensee needs to review the results of its D/P testing program to justify the use of a stem friction coefficient lower than the typical value of 0.20.

(3) The team noted that the licensee had not included margin to account for "rate of loading" effects that can reduce the thrust delivered by the motor operator under high differential pressure and flow conditions from the amount delivered under static conditions. In addition, the licensee did not include margin to account for inaccuracies associated with torque switch repeatability. These factors can have a significant effect on the capability of a motor operator to open and close its valve. The licensee indicated that its use of a torque wrench to perform initial setup of the torque switch automatically accounts for margin needed to compensate for rate of loading. No technical basis was provided for using this method to account for rate of loading. The licensee should justify their position related to torque switch repeatability and rate of loading and should

incorporate recommendations provided by diagnostic equipment vendors into its MOV program, as appropriate.

(4) During review of RNP-M/MECH-1205 (Revision 0, May 28, 1991), "Mechanical Analysis and Calculations for SI-860A," the team noted that the licensee's calculated maximum actuator closing thrust was incorrectly recorded in the "Test and Setup Parameters" table as the required closing thrust. Incorrectly using this upper limit for output thrust as the required minimum thrust could cause excessive torque switch settings and possibly lead to damage of valve components. Further review of other calculations revealed this problem to be a common error. It is the team's understanding that the licensee will correct the above errors.

(5) After review of several thrust calculation packages, the team noted that some actuator capability comparisons were incomplete and were identified in the documentation to be completed later. These comparisons are important to ensure that existing actuators are appropriately sized for their application. For example, the team reviewed RNP-M/MECH-1085 (Revision 0, November 12, 1991), "Calculations for FW-V2-6 A, B & C," and found that although adequately sized in the closed direction, the actuators appear to be undersized (by approximately 9000 lbs thrust) for operation in the open direction, based on a opening design basis differential pressure of 1525 psi and using actuator characteristic information provided by the licensee. The licensee needs to complete these reviews promptly in order to identify any existing actuators that may be incorrectly sized. The undersized V2-6A, B, and C actuators are identified as Open Item 91-201-03 in Appendix A to this report.

The team reviewed the licensee's methodology for setting torque and limit switches as described in corrective maintenance procedure CM-111 (Revision 13), "Limitorque Limit Switch and Torque Switch Maintenance." The licensee calculated the required actuator torque, and for rising stem valves used a torque wrench to set the closed torque switch to trip at the calculated actuator torque. The torque wrench was placed and torque applied on the actuator handwheel or worm shaft gear lock nut when the valve was in the shut position. The closed torque switch setting was increased or decreased as required so that the torque switch would trip at the required torque wrench setting. This method was only applicable for the closed torque switch. The open torque switch was then set at the same setting as the closed torque switch setting. The team was concerned that an "unbalanced" torque switch could cause a premature or delayed trip if not properly compensated for. Although CM-111 provided instruction for balancing torque switches, it did not require that torque switches be routinely balanced or be balanced before installation. The team noted that procedure MMM-004 (Revision 1), "Motor-Operated Valve Maintenance Requirements," required that new torque switches be balanced and that balancing of torque switches was a new MOV program requirement that was in the process of being implemented. The team indicated that because of the way the licensee is currently setting the torque switches, ensuring the torque switches are balanced is a crucial step in the procedure.

Limit switch settings were based on a percentage of valve stroke and set by counting the number of handwheel turns. Normally the open and closed valve indication switches were set at 96 percent and 4 percent of valve stroke

respectively. The open-to-closed torque switch bypass was set to allow actuation of the torque switch after the first 4 percent of valve stroke in the closed direction, and the closed-to-open torque switch bypass was set to bypass the torque switch for the first 5 percent of valve stroke in the open direction. The team's concerns regarding the licensee's methodology for setting MOV switches are discussed below.

(1) The team questioned the licensee's practice for setting torque and limit switches. Rather than using diagnostic equipment, the licensee is using a torque wrench for setting torque switches, and counting handwheel turns in the setting of limit switches. The current industry practice is to establish these settings with diagnostic test equipment, which provides a more accurate and comprehensive method than the torque wrench and counting handwheel methods.

(2) The setting of 5 percent of valve stroke for the closed-to-open torque switch bypass was considerably less than settings normally used by the industry. For example, Electrical Power Research Institute (EPRI) MOV guidelines recommend a minimum setting of 10 percent of valve stroke, and the guidelines state that a lower setting may not encompass the initial unseating for all valves. The inspectors were concerned that the low closed-to-open torque switch bypass setting, combined with an unbalanced torque switch, could result in a failure of the MOV to fully open under a high differential pressure. The team considered that in addition to balancing new torque switches before installation, it would be prudent to ensure that all installed torque switches were balanced on MOVs that used the open torque switch.

The above inadequacies related to setting torque and limit switches (including torque switch bypass) are identified as Open Item 91-201-04 in Appendix A to this report.

2.4 Design Basis Differential Pressure and Flow Testing

Recommended action "c" of the generic letter states that licensees should 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 staff allows alternate methods to be used to demonstrate the capability of the MOV. The staff suggested a two-stage approach for a situation in which design basis testing in-situ is not practicable. 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's written commitment to differential pressure testing is not definitive. However, the licensee's statements and actions to date indicate its intent to comply with the recommendations of the generic letter in this respect. In examining the licensee's actions specific to its Robinson plant, the team found that testing is to be completed over three refueling outages (RFs): RF13 (completed March 1991), RF14 (scheduled to begin April 1992), and RF15. Of 37 MOVs tested during RF13, 33 were reportedly tested at or near (80 percent) full design basis differential pressure. The remaining 4 of the 37 valves were static tested; 3 with diagnostic testing that included thrust

measurements and 1 with only current and switch setting checks (its thrust sensor became detached). Of the 33 valves tested at or near full differential pressure, 9 underwent full diagnostic testing (including thrust).

Although the amount of the testing performed to date appears to meet CP&L's stated commitments, the procedures and practices used to control the Robinson testing appear deficient, as exemplified by the test scheduling, performance, and evaluation during RF13:

(1) Although RF13 had been complete for approximately 3 months, none of the test results had been fully assessed. Licensee personnel stated that the results had been examined sufficiently, on an informal basis, to ensure that there were no operability concerns and that the Nuclear Engineering Department had not provided the support needed for assessing the test results because of commitments to another plant's refueling outage.

(2) Baseline diagnostic testing was reportedly not performed on the nine MOVs that were diagnostically tested at or near full differential pressure. The baseline testing can be performed later, but this is inefficient and may unnecessarily delay the availability of baseline test data for use in post-maintenance and periodic assessments of continued valve capabilities.

(3) Test records reviewed by the team did not have flow and differential pressure recorded in a way that was readily available to the individual who assesses the test results.

(4) Recommended testing priorities were not utilized in RF13. The informal schedule developed for RF14 and RF15 generally follows the recommended prioritization. The licensee stated that this was due to the fact that the decision to utilize VOTES diagnostic testing equipment was made a short time before RF13, and the testing was factored into the outage for valves that were already scheduled for work, rather than trying to follow a priority scheme.

(5) The licensee proposed to statically test a small sample of 2 inch and smaller gate and globe valves that are considered to have sufficient design margin to function under design basis conditions. If these tests produce predicted results, the licensee proposes to set up the remainder of valves in the group based on information gathered from this testing. The licensee did not have a technical justification for this proposed grouping of valves available for review.

The team reminded the licensee that grouping of valves may be acceptable as part of Stage 1 of a two-stage approach (as outlined in GL 89-10, Supplement 1) only if design basis testing of specific MOVs is not practicable. The licensee's proposal is further complicated by the intent to statically test the MOVs selected from the group. This is difficult to justify because of the uncertain relationship between the performance of an MOV under static conditions and under design basis conditions. As an additional consideration, if one of the valves in the group fails to function, then the operability of the remaining valves in the group must be reviewed. Grouping of MOVs requires a careful consideration of many factors (e.g., valve type, manufacturer, size, differential pressure, flow

rate, system temperature) and requires that a technical justification be prepared and available for review. The licensee should review the proposed testing for these MOVs in light of the team's concerns.

(6) The licensee proposed to use extrapolation to design basis differential pressures for all dynamic tests that were not performed at the maximum calculated design basis differential pressure. The licensee intends to extrapolate when test pressure is typically at least 80 percent of the maximum calculated design basis differential pressure. More extreme extrapolations are allowed by the licensee's current test program, but no specific guidance on how this extrapolation would be performed was available for review. The licensee should formalize and justify its proposed methodology for extrapolation of test results of design basis conditions.

The inadequate procedures and practices for controlling design basis testing are identified as Open Item 91-201-05 in Appendix A to this report.

2.5 Periodic Verification of MOV Capability

Recommended Action "d" of the generic letter states that licensees should prepare or revise procedures to ensure that adequate MOV switch settings are determined and maintained throughout the life of the plant. In paragraph j of the generic letter, the staff recommended that the surveillance interval be based on the safety importance of the MOV as well as its maintenance and performance history, but that the interval not exceed 5 years or three refueling outages. Further, the capability of the MOV will need to be verified if the MOV is replaced, modified, or overhauled to the extent that the existing test results are not representative of the MOV.

The licensee indicated that it intended to use periodic static testing in an effort to ensure the continued adequacy of MOV torque switch settings. The team stated that the use of static testing to verify continued capability of an MOV to operate under worst-case differential pressure and flow conditions is not considered adequate at this time because of the uncertain relationship between the performance of an MOV under static conditions and under design basis conditions. The team also indicated that this is a generic industry issue and that the NRC is following industry efforts in this area.

The team reviewed procedure PM-420 (Revision. 0), "VOTES 100 System MOV Testing Procedure." The purpose of this procedure was to periodically monitor valve performance with the use of diagnostic test equipment that measured stem thrust and switch settings. Step 3.9 of PM-420 required that the valve stem be cleaned and lubricated within 3 months before performing the diagnostic testing. The team questioned why it was necessary to clean and lubricate the stem before testing and was informed that when comparing the test results to the previous test results, the stem lubrication condition should be consistent. The team disagreed with this philosophy because the MOV would not be tested in its true as-found condition. The current station practice is to clean and lubricate each safety-related MOV valve stem on an every-other-refueling-outage cycle. The team considered that it would be more conservative to diagnostically test the valve just before performing any periodic maintenance that would enhance MOV operation. This would verify that the MOV had not degraded to a condition in which it could not have performed its safety function. Testing in

the as-found condition also would verify that periodic maintenance was being performed at the proper intervals. Cleaning and prelubricating valve stems before performing periodic maintenance are identified as Open Item 91-201-06 in Appendix A to this report.

2.6 MOV Failures, Corrective Actions, and Trending

Recommended Action "h" of the generic letter states that licensees should analyze or 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 2 years or after each refueling outage following program implementation) as part of the monitoring and feedback effort to establish trends of MOV operability. These trends could provide the basis for the licensee's revision of the testing frequency established to periodically verify the adequacy of MOV switch settings. The generic letter indicates that a well-structured and component-oriented system is needed to track, capture, and share equipment history data.

The licensee has established trending programs at several levels. Technical Support Guideline TSG-114, "Repetitive Failure Program," identifies repetitive failures for equipment, components, and parts. Through the Automated Maintenance Management System (AMMS), items that have failed more than once in 18 months are reviewed, and parts that have cumulative rates of failure of four or more in 18 months are investigated. This review is performed weekly and a monthly report is sent to the manager of technical support. When an adverse trend is identified, an adverse condition report (ACR) must be generated and tracked through Corrective Action Program PLP-026.

The current Corrective Action Program PLP-026 was implemented in January 1991 and describes the problem identification, failure analysis, corrective action, tracking, and resolution for conditions adverse to quality. The program provides for the screening activity to determine the significance of an item and establishes the appropriate investigative processes. It also provides for management overview. The inspector reviewed two ACRs, 91-124 and 91-093. ACR 91-124 involved poor maintenance planning practices and the return of equipment to service without adequate testing. The corrective actions delineated in the ACR adequately addressed the problems. ACR 91-093 involved MOVs inoperable because of bent stems. It is believed that the bent stems had existed 6 years or more and resulted in failure of the sample line valve to fully open. Inadequate attention to detail during surveillance testing was the cause of this problem. Corrective action involved valve repair, testing, and the upgrading of surveillance procedures. The inspectors concluded that the corrective action program was adequate.

Associated with the current corrective action program is a corrective action program guideline trending requirement, CAPG-006. This trending program is implemented to track and evaluate all ACRs to identify adverse and potentially adverse trends. Monthly reports covering the preceding 3 months and quarterly reports covering the preceding 6 quarters are generated. The inspectors concluded that the licensee has established a program to identify adverse

trends and broad generic issues. Trending more specific to MOVs is intended but is not fully developed at this time.

The inspectors reviewed the maintenance histories dating back to 1990 for MOVs AFW-V2-14A, AFW-V2-20A, FW-V2-6B, MS-V1-8B, SI-845A, SI-860A, V6-35B, and RHR-744B. As a result of this review, the team determined that corrective actions associated with a packing leak on valve RHR-744B were inadequate.

RHR-744B is the Train B low head safety injection valve that is required to automatically open on a safety injection signal. On February 1, 1991, the torque on the RHR-744B packing gland was increased from 46 foot pounds to 138 foot pounds to stop packing leakage. Also, on February 1, 1991, work request 91-ACEG1 was initiated because the RHR-744B motor moved slightly when the valve was opened. The work order stated that the stroke time was within allowed specifications and that no unusual noise was heard and requested that the movement of the motor be investigated. The repair instructions on the work order specified investigation of the problem and, if necessary, performance of a current trace and analysis of the current trace by the system engineer. The subsequent corrective action to resolve this deficiency was to stroke the valve twice while observing for any abnormal movement of the motor. The completed work order indicated that no problem was found and that the operator moved because of the location and size of the piping and valve.

The team was informed that an instrumentation and control (I&C) technician investigated this deficiency and decided that the condition was acceptable. The team indicated that because the RHR-744B actuator is an SB-3, which is a large actuator than can produce high stem thrust values, any abnormal actuator movement should be fully investigated. The team determined that the licensee's corrective action in response to the abnormal RHR-744B movement was inadequate. The fact that the packing gland torque had just been significantly increased should have been considered as a potential cause of the abnormal actuator movement. In addition, the packing torque increase would likely result in an increased thrust requirement for the valve. Engineering should have been involved in evaluating this condition and in making a decision as to the continued operability of this valve. The team noted the licensee does not require the measurement of stem thrust for post-maintenance testing. However, the licensee's MOV post-maintenance test program does require that MOV motor current be measured after packing adjustment. The team noted that motor current was not measured after the RHR-744B packing adjustment on February 1, 1991, and questioned why the motor current was not measured. The team was informed that procedure MMM-003 (Revision 26), "Maintenance Work Request," required that MOV motor starting and running current be measured after packing adjustment and that the licensee had failed to follow these requirements. After this issue was raised by the team, the licensee stroked MOV RHR-744B during the last day of the inspection and measured motor starting and running current. The results of this testing were satisfactory; however, the MOV is located in containment and was not inspected for movement during the test on June 14, 1991. During the next outage, the licensee plans to inspect the MOV for actuator movement.

In addition to the above concern, the team identified that during a recent plant walk-through by a licensee operator, galling was observed on the valve stem of valve V2-6A. This valve is a feedwater isolation valve that receives a

close signal in event of a design basis accident. The valve had been stroke tested and determined to be operable before plant startup in early March 1991. The galling condition was not observed at that time. The inspectors reviewed the licensee's actions after the problem was identified. Upon identification of the galling, a system engineer and technical support supervisor inspected the valve. However, an adverse condition report (ACR) was not generated and a formal operability review for this valve was not performed.

The team considered that the galled stem could be indicative of some internal problem with the valve and that the motor operator's capability to stroke the valve could be inhibited. CP&L had not evaluated the available thrust margin for this MOV and had not evaluated what effect the galled stem might have on valve operability. In addition, the team noted that the licensee has had numerous problems with operability of this valve (including thermal overload trips) and was issued a violation as a result of its failure to have previously documented and evaluated these conditions (NRC Inspection Report 50-261/89-200).

As a result of this issue, the team performed calculations for this valve that indicated that adequate margin exists in the closed direction (safety direction); however the actuator appears to be undersized in the valve opening direction (see Section 2.3.(5)). Although the team feels that the operability of this valve is no longer in question, it appears that the root cause of the problems associated with this valve has not been identified or corrected.

In addition, the team was concerned that conditions found that could affect component system operability are not being properly documented or evaluated. The licensee's failure to properly document, review for operability, and correct the problems associated with valves RHR 744B and V2-6A is identified as Open Item 91-201-07 in Appendix A to this report.

2.7 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 actions recommended by the generic letter by June 28, 1994, or three refueling outages after December 28, 1989, whichever is later. The licensee committed to comply with the schedule specified in the generic letter to the extent practicable (letter to NRC dated December 27, 1989).

The licensee's schedules for design basis differential pressure determinations, switch setting calculations, and testing for its Robinson plant were evaluated by the team and found to be consistent overall with the schedule specified in the generic letter. The team was given two schedule documents at the beginning of the inspection: the licensee's corporate "MOV Testing Detailed Action Plan" and the licensee's "Schedule for MOV Testing" at Robinson. The action plan was a schedule of activities to be performed to complete all of the licensee's generic letter commitments. The Robinson "Schedule for MOV Testing" at Robinson listed MOVs to be tested during the three consecutive refueling outages following issuance of the generic letter, the first of which had been completed between September 1990 and March 1991. In reviewing the action plan, the team noted that while it included many details and indicated overall completion of the generic letter recommendations within the recommended schedule, it did not

provide the level of detail necessary to show completion of differential pressure determinations and switch setting calculations in support of the Robinson test schedule, particularly with regard to the recently completed outage. The team asked whether there was a more detailed schedule that would permit management to better monitor and control the design engineering work to support the site testing.

The licensee responded with a "Preliminary Draft Copy, H. B. Robinson MOV Calculations Preparation and Approval Status Report and Preliminary Work Completion Schedule," dated June 12, 1991, which gave more detailed dates for completion of the design engineering work. It indicated that the design basis differential pressures would be established by the end of 1991 and that thrust and torque calculations would be completed in October 1992 - about 10 months later than indicated on the action plan previously provided to the team. The licensee's design personnel explained that they were being delayed by the slow response of vendors in providing valve thrust allowable information needed to determine maximum allowable torque and thrust settings. Neither the action plan nor the status report indicated completion of any differential pressure determinations or switch setting calculations before the testing already performed at Robinson. The team questioned how the information had been provided and expressed concern that design support needed to evaluate the test results and aid in any necessary design changes had not been scheduled and had not been provided for the initial testing outage. Further, the team noted that none of the schedules, including the site "Schedule for MOV Testing," indicated the specific tests performed or intended. The licensee informed the team that the testing for the initial outage had been hurriedly planned with the intention of gaining initial experience in performing the testing and in using newly acquired VOTES diagnostic equipment. As a consequence, it had been necessary to use preliminary design data for the valves tested, and the design personnel were unavailable because of previous commitments to support another plant's outage.

The team examined the licensee's use of prioritization in scheduling testing. Recommended testing priorities were provided for each Robinson MOV in a "Tabulation of Operations Surveillance Tests to Identify Those Which Produce Differential Pressures Comparable to Design Basis Differential Pressures". According to licensee personnel, the recently completed Refueling Outage (RF) 13 did not use the priorities. On the basis of discussions with site personnel and examination of the Robinson "Schedule for MOV Testing", the team found that most of the higher priority MOVs were tested during RF13 and the remainder are scheduled to be tested during the next outage, RF14. However, the testing of high-priority MOVs during RF13 was incomplete (e.g., no static baseline tests were performed). In addition, there is no schedule for completion of this testing, and the results of the completed testing have not been evaluated.

The team concluded that the licensee's schedule appeared generally satisfactory at this early state of implementation but that it would benefit from the addition of scheduling and status details regarding design support for site testing and specific tests performed during each outage. These additions would permit better monitoring and control of the GL 89-10 work to ensure its completion within the recommended schedule.

3.0 IMPLEMENTATION OF THE LICENSEE'S PROGRAM IN RESPONSE TO GENERIC LETTER 89-10

Because a large portion of CP&L's MOV program relies on the results of D/P testing and preliminary tests results have not yet been analyzed for the Robinson plant, the inspection team was unable to fully review implementation of the MOV program. Portions of program implementation are described as applicable elsewhere in this report.

4.0 ASSOCIATED PROGRAMMATIC REVIEWS

The team reviewed certain other aspects of the licensee's MOV program as described below.

4.1 MOV Setpoint Control

As stated in procedure CM-111 (Revision 13), "Limitorque Limit Switch and Torque Switch Maintenance," one of the purposes of this procedure is to list MOV torque and limit switch settings. When making torque or limit switch adjustments, I&C technicians are required to obtain the proper settings from CM-111. The site MOV coordinator is responsible for keeping the switch settings in CM-111 current, and the corporate engineering division is responsible for developing the proper switch settings.

During the review of CM-111, the team noted that torque switch values were not provided for all safety-related valves. The inspectors were informed that calculations for torque switch setpoints were in different stages of development. When a torque switch setting is required that is not in CM-111, the MOV coordinator obtains the torque value from corporate engineering and relays the information verbally to the I&C technicians, who in turn set the torque switch accordingly. The team indicated that the torque switch setpoint is a critical parameter that affects the MOV's ability to function as designed and should be controlled formally, even prior to incorporation in CM-111. The above process involving verbal communication is not adequate. The team also noted that there is no process that outlined how the MOV coordinator was supposed to obtain switch settings from corporate engineering and at what point in the setpoint development stage the switch setting should be incorporated into CM-111.

In addition, the team determined that CM-111 does not contain MOV limit switch settings. These settings are provided in several other station procedures but not in CM-111, the MOV setpoint control document, which is supposed to be used by I&C technicians when setting limit switches. The team determined that the MOV program would be more effective if all MOV setpoints were clearly identified in one document.

CM-111 also does not provide stem thrust requirements. One of the parameters monitored by the station's diagnostic test equipment is stem thrust. The licensee is in the process of calculating the required stem thrust for safety-related MOVs but does not plan to incorporate stem thrust values into CM-111. The team determined that the MOV program would be significantly enhanced if stem thrust values were incorporated into CM-111 and used to set MOV switches. Normal industry practice is to use stem thrust values to set MOV switches. CP&L's failure to have torque switch, limit switch, and thrust

settings available to plant personnel is identified as Open Item 91-201-08 in Appendix A to this report.

4.2 Maintenance

The team reviewed the licensee's MOV corrective maintenance, periodic maintenance, and post-maintenance procedures. The team reviewed corrective maintenance procedures CM-111 (Revision 13), "Limitorque Limit Switch and Torque Switch Maintenance," CM-113 (Revision 9), "SMB-000, SMB-00, and SMB-00, and SB-00 Motor Actuator Overhaul," and CM-114, "SB-3, SMB-0, Through SMB-4 Motor Actuator Overhaul", Revision 7. With the exception of issues concerning MOV setpoint controls and balancing of torque switches (issues associated with procedure CM-111 that have been previously discussed) the team determined that these corrective maintenance procedures were adequate.

Periodic maintenance procedures PM-112 (Revision 9), "Limitorque Inspection No. 1," PM-113 (Revision 4), "Limitorque Inspection No. 2," and PM-423 (Revision 8), " Limitorque Inspection No. 3," were also reviewed. Environmentally qualified actuators installed inside the reactor containment building are equipped with grease relief valves. EPRI recommends that the grease relief valve be periodically removed and inspected for corrosion, fouling, paint, and freedom of the ball inside the grease relief valve. The team concluded that, with the exception of verifying proper operation of the grease relief valve, all other EPRI-recommended MOV periodic maintenance items were being performed. The licensee agreed to consider the need for periodically checking the grease relief valves.

The team reviewed procedure MMM-004 (Revision 1), "Motor-Operated Valves Maintenance Requirements." The purpose of this procedure was to provide post-maintenance testing requirements. As discussed in Question 38 to Supplement 1 of GL 89-10, switch settings should be verified after performing maintenance or modifications to an MOV. Simple operations such as tightening valve packing could increase the thrust requirements for a valve and invalidate switch settings and the design basis review that were based on previous testing of the valve. Contrary to the above, the team noted that MMM-004 does not require that the MOV's thrust margin be verified following maintenance. The lack of adequate post-maintenance testing requirements is identified as Open Item 91-201-09 in Appendix A to this report. In addition, the team determined that the thermal overload devices in the MOV motor circuits at the Robinson plant are not bypassed during a safety injection signal and are not periodically tested. Incorrect overload setpoints could result in failure of an MOV to perform its intended function because of a premature motor trip. The failure to periodically test thermal overloads for MOVs is identified as Open Item 91-201-10 in Appendix A to this report.

4.3 Training

The CP&L training program accredited by the Institute of Nuclear Power Operations (INPO) on motor-operated valve actuators is designed to qualify mechanics, I&C technicians, and electricians in the troubleshooting and repair of MOV actuators. The initial training consists of 5 days of classroom lectures using detailed lesson plans, laboratory practical exercises, and self-study. Written tests and laboratory performance evaluations are given during the training.

Topics of instruction include valve types, their components, valve operation, troubleshooting techniques, disassembly, assembly, valve failures, lubrication, and torque switch and limit switch adjustments. In addition, the training department reviews and evaluates plant events, NRC bulletins, notices, INPO significant event reports, and industry information to determine whether this material should be incorporated into the training program. A review of lesson plans by the team confirmed the use of the aforementioned information. Plant training procedures establish requirements for the retraining needed by plant personnel in order to maintain their qualifications.

CP&L has purchased valve operation test and evaluation system (VOTES) diagnostic equipment for all its nuclear plants. Babcock and Wilcox (B&W) has given three 5-day training sessions to selected mechanics, I&C technicians, and engineers. The B&W training on the use of the VOTES consisted of classroom lectures, hands-on use of the VOTES hardware and software, the evaluation of MOV diagnostic traces, data interpretation, and sensor location and calibration. CP&L is planning additional B&W training sessions on VOTES diagnostic equipment during 1991. The CP&L training department is developing its own VOTES diagnostic equipment training, scheduled to be completed January 1992.

The training department laboratory setup to provide hands-on MOV actuator training and a mobile training van, which is frequently sent to the nuclear sites to provide MOV training, were considered strengths by the inspectors. CP&L's training program on MOVs was considered a strength by the inspection team.

4.4 Modifications

The team reviewed portions of modification package MOD 988, "V2-14, V2-16 and V1-8 Valve Operator Upgrade." This package is a collection of 10 calculations, and each calculation addresses part of the modification. Project 89-0055 (Revision 2), "Effect of Lengthening the Stroke Time of the HBR2 AFW Motor-Operated Valves," October 13, 1989, investigated the effect of adding 4 seconds to the stroke time of MOVs AFW-V2-14A, B, and 14C and AFW-V2-16A, B, and 14C. The calculation indicated that the additional delay of the auxiliary feedwater flow would not result in steam generator dryout during a loss-of-normal-feedwater event. Engineering Evaluation EE-90-001 (Revision 0), "Evaluation of AFW System Differential Pressures," May 1, 1990, defined the maximum differential pressure for valves AFW-V2-14A, 14B and 14C and AFW-V2-16A, 16B, and 16C (Revision 0). EE 89-104, "Evaluation of Main Steam System Differential Pressures," December 18, 1989, defined the maximum differential pressures for valves MS-V1-8A, 8B, and 8C. Both engineering evaluations contained a safety review report in which the licensee determined that 10 CFR 50.59 or 10 CFR 72.48 reviews were not required.

The team reviewed these three documents and found them to be well prepared and the conclusions reasonable. The team, however, did not review the entire modification package.

4.5 Diagnostic Test Equipment

CP&L has recently procured VOTES diagnostic equipment for use in establishing thrust requirements during differential pressure testing of the GL 89-10

motor-operated valves. The inspectors reviewed documentation of the VOTES diagnostic system accuracies, dated February 26, 1990. The documentation provided to Carolina Power & Light Company by Liberty Technology stated that the overall accuracies of the VOTES equipment was ±9.2 percent or ±9.8 percent, depending the type of clamp used for the calibration. The licensee rounds these values to an even 10 percent and increases the calculated minimum torque values by this factor to account for these instrument tolerances.

The licensee has recently received NRC Inspection Report 99901225/91-01, which evaluates the basis used for determining the VOTES diagnostic test equipment accuracies listed above. The vendor uses a statistical methodology to describe many of the uncertainty terms, including the final overall error. The inspection report questions the adequacy of the vendor's 95 percent statistical confidence level for the equipment's stated accuracies and identifies the need for testing to verify these computed values.

The licensee indicated that no modification of the 10 percent accuracy value is currently planned but agreed to review any information or verification test results related to the stated accuracy values for the VOTES diagnostic equipment as the information becomes available. The inspectors indicated that the licensee would be expected to apply this new information to its diagnostic program, as appropriate, or to provide technical justification for not doing so.

4.6 Industry Experience and Vendor Information

Plant procedures RP-006 (Revision 0), "Operating Experience Feedback (OEF) and PLP-038 (Revision 3), "Technical Manual/Vendor Recommendation Review Program," control the evaluation of industry information and experience and vendor recommendations. Depending upon the type of document, the Regulatory Compliance staff or the Document Control staff is responsible for appropriate distribution of the information. Management responsibility is assigned to ensure that appropriate evaluations are performed, required actions are defined and scheduled, and affected groups are notified.

The licensee's evaluation and implementation of five industry issues concerning motor-operated valves selected by the inspectors showed that the licensee is adequately implementing the OEF and vendor recommendation program. The inspectors determined that for 10 CFR Part 21 notifications, actions were taken to identify the affected equipment and correct the identified problem. In addition, the team verified that training, procedure changes and Technical Manual revisions were implemented for Limitorque maintenance updates.

APPENDIX A

Inspection Findings

FINDING CATEGORY AND NUMBER: OPEN ITEM 91-201-01

FINDING TITLE: Determination of Design Basis Flow Rate

DESCRIPTION OF CONDITION:

To determine the conditions under which the MOV must perform its safety function, the generic letter directs licensees to consider all relevant factors that may affect the capability of the MOV to perform its function. These factors include differential pressure and flow conditions. Contrary to the generic letter, the licensee indicated that fluid flow will not be evaluated for design basis conditions. The licensee elaborated on this position by indicating that a component for flow does not exist in the current industry equations for MOV sizing or in the proposed INEL thrust equation.

REQUIREMENTS OR GENERIC LETTER PROVISION:

The response to Question 16 of Supplement 1 to GL 89-10 states that the effects of factors such as flow rate should be addressed analytically as part of the design basis review process.

FINDING CATEGORY AND NUMBER: OPEN ITEM 91-201-02

FINDING TITLE: Failure to Review Mispositionable MOVs

DESCRIPTION OF CONDITION:

CP&L is not planning to review the capability of valves to be repositioned to their safety position if that valve or system has a redundant train that can perform the safety function. As such, CP&L's position on valve mispositioning is not in accordance with the recommendations of GL 89-10. Specifically, the generic letter does not allow the exclusion of a valve from the recommended design basis reviews solely on the basis that a redundant valve or system exists.

REQUIREMENTS OR GENERIC LETTER PROVISION:

Responses to Questions 4, 6, and 7 in Supplement 1 to GL 89-10 explain the NRC position on valve mispositioning, including the fact that the single-failure criterion is not to be used as a means for excluding mispositionable MOVs from design basis reviews and testing.

FINDING CATEGORY AND NUMBER: Open Item 91-201-03

FINDING TITLE: Undersized Actuators for Valves FW-V2-6A, 6B, and 6C

DESCRIPTION OF CONDITION:

During the team's review associated with the galling of the V2-6A valve stem, the team performed a rough calculation that indicated that the actuators for valves FW V2-6A, 6B, and 6C appear to be undersized. The problem is only apparent in the valve's close-to-open direction, which the licensee has stated is not a safety function of the valve. The stated safety function of these valves is to close on a safety injection signal, separating the auxiliary and main feedwater systems. Although the actuators appear to be sized adequately to stroke the valves to their safety positions, problems associated with stroking the valve to the open position could damage or degrade the MOV and, hence, prevent the MOV from performing its safety function.

REQUIREMENTS OR GENERIC LETTER PROVISION:

Criterion III of Appendix B to 10 CFR Part 50, requires that measures be established for the selection and review for suitability of materials and equipment that are essential to the safety-related functions of the systems.

Recommended action e of GL 89-10 states that a design basis review should be performed; this review includes an examination of all pertinent design and installation criteria used in the selection of the particular MOV.

FINDING CATEGORY AND NUMBER: OPEN ITEM 91-201-04

FINDING TITLE: Setting of Closed-to-Open Torque Switch Bypass Limit

DESCRIPTION OF CONDITION:

The setting of 5 percent of valve stroke for the closed-to-open torque bypass limit switch was considerably less than settings normally used by industry. EPRI MOV guidelines recommend a minimum setting of 10 percent of valve stroke, and the guidelines state that a lower setting may not encompass the initial unseating for all valves. The low closed-to-open torque switch setting could result in a failure of the MOV to fully open under a differential pressure. The fact that not all torque switches may have been balanced heightens the concern in this area.

REQUIREMENTS OR GENERIC LETTER PROVISION:

Paragraph b of GL 89-10 states that a program should be established to review and revise, as necessary, the methods for selecting and setting all switches (i.e., torque, torque bypass, position limit, overload) for each valve operation (opening and closing).

FINDING CATEGORY AND NUMBER: OPEN ITEM 91-201-05

FINDING TITLE: Procedures for Controlling Design Basis Testing

DESCRIPTION OF CONDITION:

The procedures used to control the Robinson design basis testing appear deficient as exemplified by the test scheduling, performance, and evaluation during Refueling Outage 13, which was completed in March 1991:

- Baseline static diagnostic testing was reportedly not performed on the nine MOVs that were diagnostically tested at or near full differential pressure. All nine MOVs had been assigned high priorities (licensee priority 1 or 2) for performance of GL 89-10 testing. The static testing can be performed later but this is inefficient and may unnecessarily delay the availability of baseline test data for use in post-maintenance and periodic assessments of continued valve capabilities.

- Although RF13 had been complete for approximately 3 months, none of the test results had been fully assessed. Licensee personnel stated that the results had been examined sufficiently, on an informal basis, to ensure that there were no operability concerns.

- Test records reviewed by the team did not have flow and differential pressure recorded in a way that was readily available to the individual who assesses the test results.

REQUIREMENTS OR GENERIC LETTER PROVISION:

Criterion V of Appendix B to 10 CFR Part 50 requires that activities affecting quality be prescribed and performed in accordance with documented procedures, instructions, and drawings, which contain criteria to assure satisfactory performance of the activities.

FINDING CATEGORY NUMBER: OPEN ITEM 91-201-06

FINDING TITLE: Periodic Verification of MOV Operability

DESCRIPTION OF CONDITION:

PM-420 required that the valve stem be cleaned and lubricated within 3 months before performing diagnostic testing. The team determined that it would be more conservative to test the valve just before performing any periodic maintenance that would enhance MOV operation. This process would verify that the MOV had not degraded to a condition where it could not have performed its safety function. Testing in the as-found condition would also verify that periodic maintenance was being performed at the proper intervals.

REQUIREMENTS OR GENERIC LETTER PROVISION:

Paragraph d of GL 89-10 states that procedures should be prepared to ensure that correct switch settings are maintained throughout the life of the plant. Paragraph h of GL 89-10 states that MOV data should be periodically examined as part of a monitoring and feedback effort to establish trends on MOV operability.

FINDING CATEGORY AND NUMBER: Open Item 91-201-07

FINDING TITLE: Inadequate Documentation and Corrective Action for MOV Deficiencies

DESCRIPTION OF CIRCUMSTANCE:

In two instances, the team determined that the licensee had failed to properly document and evaluate deficient conditions that questioned MOV operability. In the first case, valve packing for the RHR-744B valve was tightened from 46 to 138 foot pounds without performing an engineering review or a post-modification test necessary to ensure that the motor operator thrust capability and switch settings were consistent with any increased valve thrust requirements resulting from the increased packing load. In addition, valve movement during stroking, documented on the work order for the packing adjustment, was evaluated as being inconsequential without providing the basis for this determination.

In the second case, valve stem galling, identified by a licensee operator on the main feedwater V2-6A valve, was also not adequately evaluated. The galling, which could be the result of another valve problem, could inhibit the ability of the motor actuator to transfer thrust to the valve. Again, no formal operability determination was performed for this valve. In addition, the team determined that this valve had a history of problems, including thermal overload trips, and the licensee's failure to adequately document and evaluate these discrepancies was cited in NRC Inspection Report 50-261/89-200.

REQUIREMENTS OR GENERIC LETTER PROVISION:

Criterion XVI of Appendix B to 10 CFR Part 50 Appendix B requires that conditions adverse to quality be promptly identified and corrected.

FINDING CATEGORY AND NUMBER: OPEN ITEM 91-201-08

FINDING TITLE: MOV Setpoint Document Control of Switch Settings

DESCRIPTION OF CONDITION:

Procedure CM-111 did not provide torque switch settings, limit switch settings, or thrust values for numerous safety-related MOVs. This deficiency resulted in torque switches being set by I&C technicians at setpoints obtained verbally from the MOV coordinator.

REQUIREMENTS OR GENERIC LETTER PROVISION:

Criterion III of Appendix B to 10 CFR Part 50 requires that measures be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to assure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled.

FINDING CATEGORY NUMBER: OPEN ITEM 91-201-09

FINDING TITLE: MOV Post-Maintenance Testing

DESCRIPTION OF CONDITION:

MMM-004 did not require that the MOV thrust margin be verified with diagnostic test equipment following maintenance that could affect MOV performance.

REQUIREMENTS OR GENERIC LETTER PROVISION:

Paragraph d of GL 89-10 states that procedures should be prepared to ensure that correct switch settings are maintained throughout the life of the plant. Paragraph h of GL 89-10 requires that MOV data be periodically examined as part of a monitoring and feedback effort to establish trends on MOV operability.

FINDING CATEGORY AND NUMBER: OPEN ITEM 91-201-10

FINDING TITLE: Failure to Periodically Test Thermal Overloads

DESCRIPTION OF CONDITION:

Thermal overloads in MOV motor circuits are not periodically tested at the Robinson plant. Incorrect overload setpoints could result in failure of an MOV because of a premature motor trip and therefore should be tested accordingly.

REQUIREMENTS OF GENERIC LETTER PROVISION:

Criterion XI of Appendix B to 10 CFR Part 50 requires that a test program be established to assure that all testing required to demonstrate that components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents.

APPENDIX B

Exit Meeting

An exit meeting was held on June 14, 1991, to discuss the inspection team's findings with the licensee. Individuals who attended the meeting are identified below.

Carolina Power and Light Company

J. Pearson, Nuclear Engineering Department
M. Grantham, Nuclear Engineering Department
A. Redpath, Nuclear Engineering Department
M. Bridges, Nuclear Engineering Department
R. VanMetre, Manager, Harris Engineering Site Support
J. Sheppard, Robinson Nuclear Plant
T. Bowman, Nuclear Engineering Department
G. Attarian, Chief Electrical, Nuclear Engineering Department
R. Stewart, Nuclear Engineering Department
L. Rowell, Nuclear Licensing
R. Crook, Regulatory Compliance, Robinson Nuclear Plant
O. Hudson, Nuclear Licensing
S. McCutchen, MOV Coordinator, Robinson Nuclear Plant
J. Kozyra, Nuclear Licensing
B. Prunty, Manager, Nuclear Licensing
J. Walter, Brunswick Plant Technical Support
J. Kuech, Nuclear Engineering Department
M. Terry, Nuclear Engineering Department
M. McDaniel, Nuclear Engineering Department
G. Young, Harris Plant Technical Support
M. Pugh, Manager, In-Service Inspection, Harris Plant
D. Kanning, Harris Plant Technical Support
J. Thomason, Nuclear Engineering Department
R. Gallagher, Nuclear Engineering Department
R. Parsons, Nuclear Engineering Department
H. Farmer, Robinson Nuclear Plant, Manager, Engineering Programs

U.S. Nuclear Regulatory Commission

J. Jacobson, Team Leader, NRR, DRIS
S. Tingen, Surry Resident Inspector, RII
R. Lo, Project Manager, NRR
D. Norkin, NRR/DRIS
C. Julian, Chief, Engineering Branch, Region II
F. Jape, DRS/TPS, Section Chief, Region II
H. L. Whitener, Reactor Inspector, Region II
E. H. Girard, Reactor Inspector, Region II
H. Wang, Operations Engineer, NRR
M. R. Holbrook, INEL Contractor, Engineering Specialist
P. Taylor, Reactor Inspector, Region II