APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report No. 50-298/92-02

Operating License No. DPR-46

Licensee: Nebraska Public Power District (NPPD)
P.O. Box 499
Columbus, Nebraska 68602-0499

Facility Name: Cooper Nuclear Station (CNS)

Inspection At: CNS, Brownville, Nebraska

Inspection Conducted: March 23-27, 1992

Inspectors: C. Paulk, Reactor Inspector, Plant Systems Section
Division of Reactor Safety

M. Runyan, Reactor Inspector, Plant Systems Section
Division of Reactor Safety

T. Scarbrough, Senior Mechanical Engineer, Office of
Nuclear Reactor Regulation

Approved: T. F. Westerman 4-23-92
T. F. Westerman, Chief, Plant Systems Section Date
Division of Reactor Safety

Inspection Summary

Inspection Conducted March 23-27, 1992 (Report 50-298/92-02)

Areas Inspected: Special, announced inspection of the licensee's program for implementing commitments to Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance."

Results: The licensee had initiated a program for motor operated valves (MOVs) that appeared to meet, with a few potential exceptions, its commitment to follow the recommendations and intent of GL 89-10. The licensee managed the program with knowledgeable personnel.

The inspectors found that the scope of the licensee's program in response to GL 89-10 appeared to be consistent with the GL. The NRC will evaluate the licensee's justification for the exclusion of specific MOVs from its program during future inspections of program implementation.

The inspectors identified many weaknesses. The more significant of the weaknesses were not evaluating the calculations using diagnostic uncertainties until after testing the MOV (paragraph 2.3.2), and not developing and implementing procedures to evaluate the validity of assumptions used in the calculations (paragraph 2.3.3).

The inspectors found that the licensee's design basis review methodology appeared to meet the intent of GL 89-10. The inspectors considered the lack of consideration of design basis parameters other than differential pressure a weakness. The licensee usually delayed consideration of other design basis parameters until the review of valve test data. The inspectors also found weaknesses in the procedures for MOV sizing and switch settings. The licensee acknowledged these weaknesses and said they would correct the weaknesses (paragraph 2.3.2).

The inspectors found weaknesses in the licensee's approach to testing. These weaknesses included evaluation of test line-ups, definition of test acceptance criteria, evaluation of test results, and feedback of test results. The licensee acknowledged these weaknesses and described plans for improving its MOV testing program. Further, the licensee committed verbally to the inspectors, and prior to the exit meeting, to revise the discussion in the MOV Program Plan on the two-stage approach to be consistent with the commitment to GL 89-10 (paragraph 2.3.3).

The inspectors identified weaknesses in the area of post-maintenance testing and the intended use of static testing for periodic verification. The NRC will review the licensee's actions for these weaknesses during future inspections (paragraph 2.3.4).

The inspectors concluded that the licensee had addressed the recommendation of GL 89-10 about evaluation and trending of MOV failures, but had not implemented the procedures. The NRC will assess the evaluation and trending of MOV failures by the licensee during the inspection of the implementation of the MOV program (paragraph 2.3.5).

The inspectors concluded that the licensee could meet its schedule commitments to GL 89-10 with continued management attention to the program. (Paragraph 2.3.6)

During the walkdown of the valves, the inspectors observed the conditions of the valves to be very good. The inspectors attributed this to the license refurbishing the valves prior to baseline testing. In addition, the inspectors identified Unresolved Item 298/9202-01 concerning the potentially inadequate installation of terminal lugs by electricians (paragraph 2.5).

DETAILS

1. PERSONS CONTACTED

NPPD PERSONNEL

*K. Almquist, Project Manager, General Office (G.O.)
*M. Bennett, Nuclear Licensing and Safety Engineer, G.O.
*L. Bray, Regulatory Compliance Specialist, CNS
*T. Cielocha, Engineer Technician, G.O.
*M. Dean, Nuclear Licensing and Safety Manager, CNS
*N. Dingman, Motor Operated Valve (MOV) Supervisor, CNS
*M. Estes, Acting Senior Manager of Operations, CNS
*R. Gardner, Acting Division Manager of Operations, CNS
*A. Gray, MOV Project Engineer, G.O.
*E. Mace, Senior Manager Staff Support, CNS
*D. McNamaman, Electrical Engineer, G.O.
*G. Smith, Quality Assurance Manager, CNS
*G. Smith, Nuclear Licensing and Safety Manager, G.O.
*M. Unruh, Maintenance Manager, CNS

NPPD Contractors

*M. Tumicki, MOV Project Engineer, ENERCON
*T. Vollmer, MOV Testing Consultant, Quest Technical Services

NRC Personnel

*R. Kopriva, Senior Resident Inspector, CNS
W. Walker, Resident Inspector, CNS
*T. Westerman, Chief, Plant Systems System

*Indicates persons present at the March 27, 1992, exit interview.

The inspectors also contacted other licensee personnel during the inspection.

2. GENERIC LETTER (GL) 89-10 "SAFETY-RELATED MOTOR-OPERATED VALVE TESTING AND SURVEILLANCE" (2515/109)

2.1 Background

On June 28, 1989, the NRC issued GL 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," which requested licensees and construction permit holders to set up a program to assure that they properly selected, set, and maintained switch settings for safety-related motor-operated valves (MOVs) and certain other MOVs in safety-related systems. The NRC held public workshops to discuss the GL and to answer questions about its implementation.

In GL 89-10, the NRC requested licensees to submit a response to the GL by December 28, 1989. On December 28, 1989, NPPD submitted a response to GL 89-10. In that letter, NPPD committed to meet the intent and schedule of the GL, as

qualified in its response. The NRC found that the only exception in the licensee's submittal concerned the extension of the GL 89-10 schedule. The licensee requested an extension of about 6 months to accommodate its refueling outage schedule. By a letter dated May 18, 1990, the NRC acknowledged NPPD's commitment to the recommendations. The NRC granted an extension to the schedule of 6-months based on NPPD's use of the two stage approach for testing MOVs they could not test under design basis conditions.

On June 13, 1990, the NRC issued Supplement 1 to GL 89-10 to provide the results of those public workshops. In Supplement 2 to GL 89-10 (August 3, 1990), the NRC stated that inspections of programs developed in response to GL 89-10 would not begin until January 1, 1991.

Licensees raised concerns about the results of NRC-sponsored MOV tests. In response, the NRC issued Supplement 3 to GL 89-10 on October 25, 1990. The NRC requested boiling water reactor licensees evaluate the capability of MOVs used for containment isolation in several systems. In Supplement 3, the NRC stated that all licensees and construction permit holders should consider the applicability of the information contained in the NRC-sponsored test reports to other MOVs within the scope of GL 89-10. The NRC also said that licensees should consider this information in the development of priorities for implementing the GL program.

The NRC issued Supplement 4 to GL 89-10 on February 12, 1992, in response to a backfit appeal on the recommendations for position changeable valves by the Boiling Water Reactors Owners' Group. On the basis of Supplement 4, the NRC will consider the recommendations for addressing inadvertent operation of MOVs from the control room outside the scope of GL 89-10 for boiling water reactors.

2.2 Inspection Plan

The inspectors followed Temporary Instruction 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 inspectors focused on Part 1 of the temporary instruction (TI). Part 1 involved a review of the program the licensee established in response to GL 89-10. The inspectors addressed Part 2 of the TI only where necessary to assess the development of the licensee's GL 89-10 program.

2.3 GL 89-10 Areas

As required by Section 04.01 of the TI, the inspectors reviewed the licensee's commitment to the GL. The inspectors reviewed the "CNS MOV Program Plan," Revision 5 (MOV Program Plan), and supporting documentation. In addition, the inspectors discussed the program in detail with licensee personnel.

As required by Section 04.02 of the TI, the inspectors reviewed each aspect of GL 89-10. The inspection findings are described below.

2.3.1 Scope of the GL Program

The NRC position is that the scope of GL 89-10 includes all safety-related MOVs and other MOVs that are position-changeable in safety-related piping systems. Through Supplement 1 to the GL, the NRC defined "position-changeable" as any MOV in a safety-related piping system that is not blocked from inadvertent operation from the control room.

The inspectors reviewed the MOV Program Plan and supporting documentation to assess whether NPPD was meeting its commitment to the scope of GL 89-10. The inspectors also reviewed piping diagrams of the core spray, high pressure coolant injection (HPCI), reactor core isolation cooling (RCIC), and residual heat removal (RHR) systems as well as certain emergency operating procedures. The licensee had identified 127 MOVs in safety-related systems with 93 of those MOVs within the scope of its GL 89-10 program. The licensee had justified exclusion of the remaining MOVs based on such factors as absence of a safety function or the valve already being in its safety position (without the need for later repositioning).

Finding

The inspectors found that the scope of the licensee's program in response to GL 89-10 appeared to be consistent with the GL. The NRC will evaluate the licensee's justification for the exclusion of specific MOVs from its program during future inspections of program implementation.

2.3.2 Design Basis Reviews and MOV Switch Settings

In recommended action "a" of GL 89-10, the NRC requested the review and documentation of the design basis for operating each MOV within the GL program. The licensee should determine the maximum differential pressure, flow, and other factors expected for both normal operations and abnormal conditions. In recommended action "b" of GL 89-10, the NRC requested licensees to review the methods for selecting and setting all MOV switches. The NRC also requested the licensees to revise, as necessary, the methods for selecting and setting all MOV switches.

The inspectors reviewed the MOV Program Plan and supporting procedures to assess the licensee's response to the recommendation for the performance of design basis reviews for MOVs within its GL 89-10 program. The inspectors reviewed "MOV Program Design Basis Review Procedure," MOV Program Project Engineering Procedure 60-2, Revision 1, and the emergency operating procedures.

The licensee showed that they determined the maximum differential pressures for each MOV in the program by evaluating the opening and closing of each MOV for normal, abnormal, surveillance, and emergency conditions. The licensee followed the methodology developed by Generic Electric (GE) for boiling water reactor plants in determining design basis differential pressures. The licensee stated that they had requested their contractor to confirm the acceptability of the GE guidelines for CNS. Although the MOV Program Plan stated that the licensee also would address other design basis parameters, the licensee had not fully considered, or documented, consideration of such parameters as flow, ambient

temperature, and seismic/dynamic effects. This evaluation and documentation of design basis parameters would assure that the licensee showed the capability of the MOV to operate under design basis conditions.

The licensee was revising the degraded voltage studies for safety-related MOVs. For example, the licensee was increasing the power factor assumed for the motors in determining voltage loss from the motor control center to the valve. The licensee was doing this to be consistent with recent vendor information. The licensee also stated that they would consider the resistance of the thermal overload devices in the voltage loss calculations.

The inspectors reviewed "Limitorque Actuator Configuration Control," Maintenance Procedure 7.0.11, Revision 0, and MOV Program Project Engineering Procedure 60-2. The inspectors found that the licensee was using the standard industry equation for sizing and setting MOVs. The licensee was assuming a valve factor of 0.3 for wedge gate valves and a stem friction coefficient of 0.15 in its calculations. However, the initial MOV tests (see paragraph 2.3.3) did not support those assumptions for all MOVs. Further, the licensee had not developed a mechanism for the feedback of information obtained from MOV test results, and other sources, to confirm the assumed valve factors and stem friction coefficients. The inspectors considered this a weakness.

The inspectors found that the MOV Program Plan stated that the licensee would address thrust and torque requirements and limits. The inspectors noted that the procedures for performing the sizing and setting calculations focused on thrust and did not provide enough attention to torque. Additionally, the inspectors found that the procedures did not consider inertia specifically in the MOV sizing and setting calculations. The inspectors considered this a weakness in the sizing and setting calculation procedures. However, the inspectors observed that the procedure for evaluating MOV test data addressed both thrust and torque, including inertia effects.

The inspectors identified another weakness in the use of running efficiency for evaluating actuator capability during valve closure. The licensee was not addressing limitations on stroke time and motor heatup. The licensee stated that they would address this issue according to recent industry guidance.

The licensee stated that they had addressed ambient temperature effects on direct current motor output according to vendor guidance on derating direct current motors. The licensee also stated that they would include the results of a vendor study about the effects of ambient temperature on alternating current motor capability. Additionally, the licensee planned to perform a specific analysis of the stroke times for MOVs within the sizing calculations, to assure stroke time requirements.

The licensee had not included margin for load sensitive behavior (often called "rate of loading" effects) in the MOV sizing and switch setting in the calculations. The licensee did not include the uncertainty of diagnostic equipment in the calculations either. The licensee stated that they would address such uncertainties during the analysis of MOV test results. The inspectors noted that this practice might not enable the licensee to identify

potential sizing and setting problems before they conducted MOV testing at some later date.

Findings

The inspectors found that the licensee's design basis review appeared to meet the intent of GL 89-10. The inspectors considered the lack of consideration of design basis parameters other than differential pressure a weakness. The inspectors considered the lack of evaluation of the calculations using diagnostic uncertainties a more significant weakness. The licensee usually delayed consideration of other design basis parameters, and evaluation of the effects of diagnostic uncertainties, until the review of valve test data. The inspectors also found weaknesses in the procedures for MOV sizing and switch settings. The licensee acknowledged these weaknesses and stated that they would correct the weaknesses.

The NRC will review the licensee's efforts to evaluate design basis parameters, update the degraded voltage studies, and upgrade the procedures for MOV sizing and switch settings during inspections of implementation of the MOV program.

2.3.3 Design Basis Differential Pressure and Flow Testing

In recommended action "c" of the GL, the NRC requested licensees to test MOVs within the GL program in situ under their design basis differential pressure and flow conditions. If testing in situ under those conditions was not practicable, the NRC would allow licensees to use alternate methods to demonstrate the capability of the MOV. The NRC suggested a two stage approach for a situation where design basis testing in situ was not practicable and the licensee could not justify an alternate method of demonstrating MOV capability. With the two-stage approach, a licensee would collect test data at the highest achievable conditions within the schedule of the GL and evaluate the capability of the MOV using the best data available for design basis conditions.

The inspectors reviewed the MOV Program Plan and supporting procedures to assess the licensee's response to its commitment to testing MOVs as recommended in GL 89-10. The inspectors reviewed "Testing of Motor Operated Valves Using Motor Operated Valve Analysis and Testing System (MOVATS)," Maintenance Procedure 7.3.35.1, Revision 2, and "MOV Data Analysis, Evaluation, and Report Preparation," MOV Program Project Engineering Procedure 60-6, Revision 0.

In its response to GL 89-10, NPPD committed to design basis testing of MOVs, as recommended in GL 89-10, where practicable. NPPD committed to follow the two-stage approach recommended by GL 89-10 for those MOVs they could not test under design basis conditions. In the MOV Program Plan, the licensee listed various factors it would consider in determining whether design basis testing of an MOV was practicable. One of those factors was that they would not implement design changes to make testing practicable. The inspectors discussed the licensee's intent of this statement. The licensee stated that they would amplify the MOV Program Plan to permit the use of temporary modifications to facilitate testing.

The licensee had tested 31 MOVs under zero differential pressure and flow (static) conditions. Dynamic differential pressure and flow tests had been performed on 10 of the 31 MOVs. The inspectors reviewed the procedures that the licensee had prepared for the performance of the tests. The inspectors found that the procedures contained only minimal acceptance criteria. For at least one test (RHR-MO-M016B, RHR Pump B and D Minimum Flow valve), the inspectors found that the licensee did not use the best possible test setup to get the highest achievable dynamic conditions for the MOV. The inspectors considered this a weakness in the licensee's testing program.

The inspectors reviewed the procedures that the licensee had prepared for the evaluation of MOV test data. The inspectors found that those procedures did not assure complete consideration of design basis capability or evaluation of the test results in a prompt manner. The inspectors reviewed the results of the MOV tests and the licensee's evaluation of those tests. The inspectors did not identify any design basis capability concerns and, in fact, found considerable margin in MOV design basis capability. However, the inspectors noted weaknesses in the consideration of weak link components, diagnostic equipment inaccuracy, valve factors, and increasing stem friction with differential pressure conditions.

In the test report for RHR-MO-M027B, RHR Loop A Injection Outboard Throttle valve, the inspectors noted that the thrust could have exceeded the maximum allowable thrust for the limiting component (valve seat) when the licensee included diagnostic system inaccuracies. The licensee's evaluation showed that the thrust would not exceed the valve seat limit if they considered the packing load would absorb part of the stem thrust. Because of the variability of packing loads, the inspectors did not consider the licensee's reliance on thrust absorption by the measured packing load to be an appropriate method to demonstrate that the thrust did not exceed that allowed for the weak link. In response to the inspectors' questions, the licensee stated that they were performing an evaluation to justify the revision of the limiting component thrust. The licensee told the inspectors, before the end of the inspection, that they found the allowable thrust for the valve seat to be greater than initially calculated. The licensee also told the inspectors that they would not consider the packing load to meet the thrust limits.

The inspectors noted that, in the test report for RHR-MO-M039B, Suppression Chamber Cooling Loop B Outboard Isolation valve, the thrust may exceed the limiting component (yoke legs) if the licensee considered diagnostic inaccuracies. In response to the inspectors' questions, the licensee determined that the actuator was the limiting component, providing additional margin.

The inspectors reviewed the results from testing RCIC-MO-M041, RCIC Supply From Torus. The inspectors found there was no flow during the opening of the MOV. The licensee did not provide justification to show that the test results apply to MOV performance under design basis differential pressure and flow conditions. The licensee stated that they would perform an evaluation to justify the relationship between testing at differential pressure with and without flow. If

the licensee cannot provide adequate justification, then additional testing according to the licensee's commitment to the recommendations of GL 89-10 will be necessary.

The licensee bypassed the close torque switch for 97 percent of valve stroke during accident signals and the open torque switch for the entire open stroke in all cases. The inspectors found that some MOVs did not have significant margin between the thrust delivered at torque switch trip and the thrust required to close the valve under differential pressure conditions (e.g., RHR-MO-M039B and RWCU-MO-M015, Reactor Water Cleanup (RWCU) Supply Inboard Isolation valve). This could result in the torque switch tripping before the limit switch reinserted the torque switch into the circuitry. If this occurred, the motor would deenergize when the valve was 97 percent closed. This could be a problem if the valve had leakage requirements for isolation. The licensee will need to assure that leakage will not exceed allowable limits if the torque switch had tripped before it was reinstated by the limit switch.

The inspectors found that the licensee had not developed procedures to provide for a feedback mechanism to include the results of MOV tests into the sizing and switch setting methodology, although the licensee discussed this in the MOV Program Plan. The inspectors considered this a more significant weakness. The absence of the feedback mechanism has prevented the licensee from confirming the assumptions used in its MOV sizing and switch setting calculations. This information is particularly important for MOVs that the licensee cannot test under design basis differential pressure and flow conditions. For example, the data for nine wedge gate MOVs tested under dynamic conditions revealed that eight of those MOVs had valve factors greater than 0.3 (actually up to 0.5). (Neither the inspectors nor the licensee could determine the valve factor for the other tested MOV because of the type of diagnostic equipment the licensee used on that MOV.) In addition, the test results showed that five MOVs tested under dynamic conditions had stem friction coefficients above 0.20 (compared to the assumed 0.15 stem friction coefficient used in the calculations). The increase in stem friction coefficient from static to dynamic conditions is a characteristic of load sensitive behavior ("rate of loading" effects). These higher valve factors and stem friction coefficients could significantly increase the thrust and torque requirements to operate the MOVs. Additionally, the licensee obtained this data from recently refurbished MOVs. This data would not represent data for an MOV just before its 5-year periodic verification.

In the MOV Program Plan, Section 5.3, the licensee described their two-stage approach. The MOV Program Plan stated "where the in-situ design basis testing has been determined impracticable for a given MOV, the design basis testing will be deferred and the torque switch shall be set during baseline testing in accordance with the best available data and less than the maximum allowable setpoint, including margin and instrument error." The inspectors stated that the MOV Program Plan was not consistent with the licensee's commitment to the two-stage approach of GL 89-10. In particular, Supplement 1 to GL 89-10 stated that if the licensees cannot test MOVs under design basis differential pressure and flow conditions, they should test the MOVs under the maximum achievable conditions as Stage 1 of the two-stage approach. Testing under maximum achievable conditions will provide useful information for that MOV. The licensee could identify possible incorrect assumptions of valve factors and stem friction

coefficients. By testing under maximum achievable conditions for Stage 1 of the two-stage approach, the licensee may gather enough information to obviate the need for dynamic testing of the MOV as part of Stage 2. The licensee could then complete the second stage by analytical means. The licensee committed verbally, and prior to the exit meeting, to revise the discussion in the MOV Program Plan on the two-stage approach to be consistent with its December 28, 1989, NPPD submitted response and commitment to meet the intent and schedule of GL 89-10 as discussed in paragraph 2.1.

In Attachment 2 of the MOV Program Plan, the licensee permitted the extrapolation of data to design basis conditions if they can attain at least 75 percent maximum expected differential pressure and comparable flow. The licensee stated that it had not excluded any MOV from testing based on an inability to achieve 75 percent of design basis differential pressure. The inspectors found, however, that the licensee had not developed data to support this position on extrapolation.

The inspectors also noted that Attachment 2 of the MOV Program Plan would permit grouping of MOVs to reduce the amount of design basis testing. The inspectors stated that MOV grouping by the licensee would be inconsistent with its commitment to test MOVs where practicable as recommended in GL 89-10. The inspectors stated that, if the licensee intended to change its commitment to GL 89-10, they should inform the NRC as described in GL 89-10. The licensee should keep the justification on site for NRC review during future inspections.

Finding

The inspectors found weaknesses in the licensee's approach to testing, including evaluating test arrangements, test acceptance criteria, evaluation of test results, and feedback of test results. Although part of the MOV Program Plan, the inspectors considered the absence of procedures to evaluate the test results to verify the validity of assumptions to be a more significant weakness. The licensee acknowledged these weaknesses and described plans for improving its MOV testing program. Further, the licensee committed to modify the MOV Program Plan to be consistent with its commitment to the recommendations of GL 89-10, particularly about the two-stage approach to testing MOVs.

2.3.4 Periodic Verification of MOV Capability

In recommended action "d" of the GL, the NRC requested that licensees prepare or revise procedures to assure that the licensees determined and maintained adequate MOV switch settings throughout the life of the plant. In paragraph "j" of the GL, the NRC recommended that the licensee base the surveillance interval on the safety importance of the MOV as well as its maintenance and performance history. The interval should not exceed 5 years or 3 refueling outages. Further, the licensee will need to verify the capability of a MOV to operate under design basis conditions after replacement, modification, overhaul, or maintenance that would affect the thrust or torque output of the MOV.

The inspectors found that the licensee had scheduled periodic verification of MOV capability every third refueling outage, as recommended in GL 89-10. The inspectors noted, however, that the licensee was considering the performance of static tests for this verification. The licensee had not developed justification

to show that such tests could confirm design basis capability. Such justification would be necessary because there is no known correlation between static and dynamic test results.

The inspectors noted that the licensee was developing a matrix to provide guidelines for the performance of post-maintenance testing to assure MOV capability. The inspectors also noted the weakness of relying on motor current to check the effects of valve packing adjustments on available stem thrust. This was a concern because the licensee could not show how much force the motor transferred to the valve through the operator gears.

Finding

The inspectors identified weaknesses in the area of post-maintenance testing and the intended use of static testing for periodic verification. The NRC will review the licensee's actions for these weaknesses during future inspections.

2.3.5 MOV Failures, Corrective Actions, and Trending

In recommended action "h" of the GL, the NRC requested that licensees analyze or justify each MOV failure and each corrective action. The documentation should include the results and history of each as-found deteriorated condition, malfunction, test, inspection, analysis, repair, or alteration. The licensee should keep all documentation and make reports according to plant requirements. The NRC also suggested that the licensee review the material (every 2 years or after each refueling outage after program implementation) as part of the monitoring and feedback effort to identify trends of MOV operating characteristics. Trends could provide the basis for a licensee revision of the testing frequency established to assure adequate MOV capability. The GL stated that a well-structured and component-oriented system would be necessary to track, capture, and share equipment history data.

The inspectors reviewed "MOV Tracking and Trending," MOV Program Project Engineering Procedure 60-8, Revision 0. The inspectors found that the licensee was developing improved methods for the trending of MOV problems.

Finding

The inspectors concluded that the licensee had addressed the recommendation of GL 89-10 on evaluation and trending of MOV failures. However, the licensee had not implemented the procedures at the time of the inspection. The NRC will assess the evaluation and trending of MOV failures during the inspection of the implementation of the MOV program.

2.3.6 Schedule

In GL 89-10, the NRC requested that licensees complete all design-basis reviews, analyses, verifications, tests, and inspections that they initiated to satisfy the GL recommended actions by June 28, 1994, or 3 refueling outages after December 28, 1989, whichever was later.

The NRC granted NPPD an extension of about 6 months to the recommended schedule of GL 89-10 to accommodate the scheduled refueling outages. The NRC based its acceptance of the licensee's schedule on the licensee's commitment to GL 89-10 including the two-stage approach.

Finding

The inspectors concluded that the licensee could meet its schedule commitments to GL 89-10 with continued management attention to the program.

2.3.7 Supplement 3 to GL 89-10

In Supplement 3 to GL 89-10, the NRC requested BWR licensees to assess the capability of MOVs used for containment isolation in the HPCI, RCIC and RWCU systems to perform their design basis functions in advance of the GL 89-10 schedule. The inspectors reviewed the supporting documents for the licensee's response to Supplement 3 to GL 89-10. In particular, the inspectors reviewed "GL 89-10 Supplement 3, 120 Day Response Report," Revision 1, dated January 13, 1992.

Finding

The inspectors noted that the licensee had modified RWCU-MO-M015 to improve its capability as stated in their submittal to the NRC. The inspectors found that the licensee had used the GE methodology to determine the design basis differential pressure for the Supplement 3 MOVs. The inspectors observed an inconsistency in the assumptions used in that methodology. The GE methodology assumed the worst case pressure was equal to the lowest safety relief setpoint (plus one percent) for the HPCI and RCIC MOVs, but assumed a less conservative nominal reactor pressure for the RWCU MOVs. The licensee stated that it would evaluate the use of nominal reactor pressure for the RWCU MOVs to determine if such a value was proper for CNS.

Although the inspectors did not identify any operability concerns with the Supplement 3 MOVs, the inspectors did find that the dynamic test results of other MOVs did not support the assumptions of a 0.15 stem friction coefficient. The inspectors also had questions about the valve factor assumptions applied to the MOVs within the scope of Supplement 3 to GL 89-10. The inspectors found that the static test results of RWCU-MO-M015, a Supplement 3 valve, did not support a 0.15 stem friction coefficient assumption. The inspectors calculated the stem friction coefficient for the recently refurbished and lubricated valve to be 0.157 from the test data.

The licensee acknowledged that they would evaluate the MOVs within the scope of Supplement 3 to GL 89-10 as part of the MOV program. The licensee stated that they would include the results of the MOV testing. Additionally, the licensee stated that they would use information from other sources to evaluate the Supplement 3 MOVs.

2.4 Other MOV Areas Addressed

Section 04.03 of the TI lists certain aspects of the licensee's overall program that the inspectors should review, as appropriate. Those aspects reviewed are discussed below.

2.4.1 MOV Setpoint Control

The inspectors reviewed: "Limit and Torque Switch Checkout and Adjustment for Rising Stem Limitorque Motor Operated Valves," Maintenance Procedure 7.3.36, Revision 6; "MOV Data Package File Control Procedure," MOV Program Project Engineering Procedure 60-3, Revision 2; "MOV Program Project Files Index," MOV Program Project Engineering Procedure 60-4, Revision 1; and, "MOV Data Packages," MOV Program Project Engineering Procedure 60-5, Revision 0.

The inspectors found that the licensee used Maintenance Procedure 7.3.36 to control MOV torque and limit switch settings. For each rising stem valve, this procedure listed the proper closed and open limit switches (in handwheel turns). The procedure also listed the maximum and minimum permissible settings for the torque switches. The inspectors observed that the licensee did not record the actual as-left torque switch settings in this document. The licensee stated that they could retrieve the as-left settings from testing or maintenance documents. The inspectors did not find any examples of incorrect data from a spot check. The inspectors considered the control of MOV switch settings to be according to the recommendations of the GL.

The inspectors noted that the licensee intended to establish the size for limiter plates as part of its MOV sizing and switch setting calculations. The licensee stated that 10 CFR 50.59 evaluations were not necessary because the procedural controls provided for MOV sizing and switch settings would encompass resizing of limiter plates. The inspectors noted that, if after the MOV sizing and switch setting calculations, the licensee determined that they needed to increase the switch setting above the maximum allowable, then the NRC would expect the licensee to perform an appropriate safety evaluation consistent with their procedures and regulatory requirements.

The licensee stated that they bypassed the motor thermal overloads for automatic safety actuations of all MOVs provided by the nuclear steam system supplier. Thermal overloads remained in the circuits for other safety-related MOVs. The licensee protected all MOVs, however, by thermal overloads for surveillance testing and normal operations. The inspectors reviewed a draft calculation (91-185) which documented the sizing of thermal overload protection for all safety-related Class 1E supplied MOVs and certain non-safety-related MOVs. The calculation appeared to address the overload sizing criteria. The inspectors did not review it for accuracy and completeness because of it being a draft document. The inspectors did not identify any concerns in this area.

2.4.2 Training

The inspectors discussed the licensee's training department with licensee personnel and toured the training facility. The inspectors observed that there

were no formal requirements for periodic refresher training on MOV testing procedures.

2.4.3 Industry Experience and Vendor Information

The NRC has evaluated the licensee's handling of industry experience and vendor information during previous inspections. The inspectors, therefore, only verified that the licensee had evaluated and incorporated the information supplied in the vendor maintenance updates. The inspectors found that the licensee had addressed the maintenance updates appropriately. The inspectors did not identify any concerns in this area.

2.4.5 Use of Diagnostics

The inspectors found that the licensee used the ITI-MOVATS 3000 system as a diagnostic tool to examine the characteristics and capabilities of its MOVs. The licensee may use several transducers with this equipment, either independently or in various combinations, to enhance the diagnostic capabilities. The inspectors noted that the licensee owned several thrust measuring devices (TMDs) and used the TMDs to measure spring pack displacement. The licensee also had a 50K load cell to measure stem thrust only in the opening direction. The licensee rented other transducers to facilitate outage testing. These included torque thrust cells (TTCs), stem load sensors (SLSs), a digital monitor, stem strain transducers (SSTs), and a Packmate spring pack tester. The licensee used the TTCs, SLSs, and SSTs to determine stem thrust measurements in the closing direction, providing better accuracy than the 50K load cell. This was because use of the 50K load cell had an open versus closed uncertainty factor in the range of 20 to 30 percent that a licensee must apply.

The inspectors found that the licensee had begun to evaluate the potential effects of the new information on the inaccuracy of the diagnostic equipment that relies on spring pack displacement to predict stem thrust. The licensee stated that they had not identified any operability concerns at the time of the inspection.

The licensee is currently renting diagnostic measuring equipment for the closing direction and bringing it on site on a when needed basis. Since it is not on site full time the inspectors observed that the unavailability of accurate diagnostic measuring devices for the closing direction could be a consideration in the timely completion of corrective maintenance activities.

The inspectors also found that the licensee was refurbishing MOVs to establish good MOV condition before obtaining baseline data. The inspectors considered this a strength. However, the results of testing have shown that certain assumptions made about various factors were not valid, even with the freshly refurbished valves.

2.5 Walkdown

The inspectors conducted a walkdown of five MOVs. The inspectors considered the cleanliness of the plant to be very good.

The MOVs inspected were:

RCIC-MO-M0131 - RCIC Steam Supply to RCIC Turbine
RCIC-MO-M041 - RCIC Supply from Torus
CS-MO-M05B - Core Spray Pump B Minimum Flow Recirc Isolation
CS-MO-M07B - Core Spray Pump B Suction
RHR-MO-M039A - Suppression Chamber Cooling Loop A Outboard Isol.

The inspectors found the material condition of the valves to be good. The inspectors found that the licensee appeared to lubricate the valve stems adequately, without any sign of scoring or hardened lubricant. The inspectors noticed grease leaking from the limit switches in CS-MO-M05B, accumulating on the limit switch contacts and internal control wiring. The licensee removed the excess grease where possible with the limit switch housing energized. The licensee initiated a work item to correct the condition during the next outage.

The inspectors were able to inspect inside the limit switch compartments on four of the five MOVs selected. The licensee did not open RCIC-MO-M041 for inspection of the limit switch compartment because of its size. The inspectors identified what appeared to be improperly installed terminal lugs in each of the limit switch compartments inspected. The licensee had removed the insulation on many of the wires such that they exposed bare conductors. The inspectors found that a power lead in CS-MO-M07B had some of the strands of the multi-stranded conductors broken. The inspectors also found several control wires in RHR-MO-M039A with broken strands. The inspectors questioned electrical training instructors about the observations. The instructors stated that they did not consider such installations proper. The instructors also stated that they did not teach the electricians to install terminal lugs with bare conductors or broken strands. The inspectors requested that the licensee provide additional information (e.g., vendor instructions, and plant specific instructions) for review. There have been no valve failures due to the potentially inadequate crimped terminal lugs. The licensee stated that all lugs will be inspected the next scheduled preventative maintenance. The inspectors considered this matter unresolved pending further NRC review. (Unresolved Item (URI) 298/9202-01, Improper Terminal Lug Installations) The inspectors informed the licensee of this on April 6, 1992, by telephone. Mr. Paulk, lead inspector, informed Mr. Dean, Nuclear Licensing and Safety Manager, CNS.

Finding

The inspectors identified an URI concerning the potentially inadequate installation of terminal lugs by electricians. The inspectors considered the condition of the valves to be good. However, this fact accentuated the inspectors' concerns associated with assumed valve coefficients as discussed in paragraph 2.3.3.

2.6 Conclusions

The inspectors concluded that the licensee's program would meet the intent of GL 89-10 upon completion of corrective actions for the identified weaknesses and final development of all portions of the program identified during the inspection. The NRC will review the licensee's corrective actions for the

weaknesses and the areas of the GL 89-10 program not currently developed ing a later inspection of the implementation of the licensee's GL 89-10 prog

3. EXIT INTERVIEW

The inspectors held an exit meeting with those persons indicated in paragraph 1 on March 27, 1992. The inspectors summarized the scope and findings of the inspection. The licensee stated that they did not provide proprietary information to the inspectors. The lead inspector informed Mr. Dean on April 6, 1992, of URI 298/9202-01, identified in paragraph 2.5.1