APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report No. 50-285/91-22

Operating License No. DPR-40

Licensee: Omaha Public Power District (OPPD)
444 South 16th Street Mall
Omaha, Nebraska 68102-2247

Facility Name: Fort Calhoun Station (FCS)

Inspection At: FCS, Fort Calhoun, Washington County, Nebraska

Inspection Conducted: August 26-30, 1991

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

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Approved: _____ 9/27/91
T. F. Stetka, Chief, Plant Systems Section Date
Division of Reactor Safety

Inspection Summary

Inspection Conducted August 26-30, 1991 (Report 50-285/91-22)

Areas Inspected: Special, announced inspection of the licensee's program for implementing commitments to Generic Letter (GL) 89-10. Also, licensee actions on a previously identified item were evaluated.

Results: Within the areas inspected, a violation was identified for the failure to perform appropriate safety evaluations for the selection of torque switch settings on motor operated valves (MOVs) (paragraph 3.4.2).

Additionally, there were many weak areas identified in the licensee's program for implementing the commitments to GL 89-10. The licensee agreed to provide a

written response addressing each of the items identified as a Response Item within 90 days of receipt of this report. The Response Items are as follows:

Response Item 1 - Paragraph 3.3.1

The scope of the program did not include feedwater regulating valve isolation valves, HCV-1103 and 1104. Additional information is needed to ensure that these MOVs are capable of performing their intended function, or that emergency operating procedures and training alert the operators to the potential failure of these MOVs.

Response Item 2 - Paragraph 3.3.2

The licensee committed to the use of design basis parameters in establishing the setpoints for the torque switch settings. The implementation of this provision on the pressurizer power operated relief valve (PORV) block valves did not utilize the design basis value, but a lower value. Additional information is required to clarify the licensee's position on the issue of use of design basis values.

Response Item 3 - Paragraph 3.3.2

The licensee was using valve factors of 0.3 for flexwedge gate valves and 0.2 for double disk gate valves. These values have been shown to be inadequate for some MOVs during industry and research tests. The licensee needs to address the capability of their tested valves and to assess its methodology to be used in selecting the valve factors.

Response Item 4 - Paragraphs 3.3.2 and 3.4.2

The licensee indicated that actuator, motor, and valve limitations would be addressed for the torque switch settings. This would imply that inertia effects would be addressed. Information is required to ensure that all applicable limitations including inertia effects, are considered in establishing the torque switch settings and incorporated into the final guidance document.

Response Item 5 - Paragraph 3.3.2

The licensee indicated a stem friction coefficient of 0.15 would be used. This is less than the industry standard of 0.2. The licensee must provide justification for the use of the 0.15, the use of its selected lubricant, and the frequency of preventive maintenance to support these positions.

Response Item 6 - Paragraph 3.3.3

The licensee committed to perform design basis testing, however, the Project Plan listed exceptions to design basis testing. The licensee needs to provide information addressing any deviations from its commitments to GL 89-10 and incorporate that information into plant documents.

Response Item 7 - Paragraph 3.3.4

The licensee had not established plans for periodic verification of MOV operability. The licensee must provide information regarding how it intends to address the commitment for periodic verification of MOV operability.

Response Item 8 - Paragraphs 3.3.4 and 3.4.4

The licensee had not implemented an effective program to evaluate vendor information. The licensee needs to provide its evaluation of how they will evaluate vendors information, including what actions will be taken, if necessary, to address any items of concern.

In addition to those items requiring a response, the inspectors identified other areas of weaknesses that will require further licensee effort to complete and subsequent NRC review. They are:

1. Develop justification for use of selected globe valve opening and closing factors.

2. Address the results of the MOV Utility's Group (MUG) testing.

3. Address rate-of-loading effects on the torque switch setting.

4. Address temperature effects on the motors.

5. Evaluate the effects of degraded voltage on the MOVs after the degraded voltage study is completed.

6. Complete preventive maintenance procedure improvement.

7. Complete post maintenance matrix.

8. Complete program to address MOV failures, corrective actions, and trending.

## DETAILS

### 1. PERSONS CONTACTED

CPPD Personnel

*R. Andrews, Division Manager, Nuclear Services
*C. Boughter, Supervisor, Special Services Engineering
*G. Cook, Supervisor, Station Licensing
*S. Gambhir, Division Manager, Production Engineering
*W. Gates, Division Manager, Nuclear Operations Division
*R. Jaworski, Manager, Station Engineering
*W. Jones, Senior Vice President
*J. Knight, Lead Engineer, Special Services
*T. Kusek, Manager, Nuclear Safety Review
*M. Lazar, Supervisor, Training
*T. Mathews, Nuclear Licensing Engineer
*T. McIvor, Manager, Nuclear Projects
*T. Patterson, Manager Fort Calhoun Station
*R. Phelps, Manager, Design Engineering
*S. Resch, Engineer, Special Services
*R. Schwartzbeck, Engineer, Nuclear Projects
*R. Short, Manager, Nuclear Licensing and Industry Affairs
*C. Simmons, Station Licensing Engineer
*M. Tesar, Supervisor, Technician and Radiation Training

NRC Personnel

*R. Azua, Resident Inspector, FCS
*R. Mullikin, Senior Resident Inspector, FCS
*T. Stetka, Chief, Plant Systems Section, Region IV

*Denotes persons present at the August 30, 1991, exit interview.

The inspectors also contacted other licensee personnel during the course of the inspection.

### 2. FOLLOWUP TO PREVIOUS INSPECTION FINDINGS (92701)

#### 2.1 (Closed) Inspector Followup Item (285/9036-02): Operating Times on Valve HCV-865 in Alert Range

The inservice inspection (ISI) coordinator had noted that the opening and closing times for Valve HCV-865 were in the alert range and that a retest of the valve was necessary to evaluate the situation and determine corrective actions. The licensee determined that the changes in recorded stroke times were not the result of valve operation. Instead, they resulted from a procedural change in the way the operating times were measured. Under the new procedure, the interval between actuation of the control switch and the illumination of

the full open and closed remote indicating lights is measured. The old procedure measured strictly the interval between operation of the open and closed lights. The licensee has determined that the stroke time for Valve HCV-865 is satisfactory.

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

### 3.1 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 establish a program to ensure that switch settings for safety-related motor-operated valves (MOVs) and certain other MOVs in safety-related systems were selected, set and maintained properly. The NRC held public workshops to discuss the generic letter and to answer questions regarding its implementation. 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. In response to concerns raised by the results of NRC-sponsored MOV tests, the NRC issued Supplement 3 to GL 89-10 on October 25, 1990, which requested that boiling water reactor licensees evaluate the capability of MOVs used for containment isolation in several systems. In Supplement 3, the NRC 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.

In GL 89-10, the NRC requested licensees to submit a response to the generic letter by December 28, 1989. OPPD submitted a response to the generic letter on December 28, 1989, stating that it would meet the recommendations and schedule of the generic letter. The NRC acknowledged that commitment in a reply on May 30, 1990. Consistent with Item 1 of GL 89-10, the NRC stated that the licensee should incorporate any differences between its program and the generic letter in the licensee's program description. The licensee notified the NRC in writing on March 21, 1991, that its GL 89-10 program plan was available on site.

### 3.2 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 inspection focused on Part 1 of the temporary instruction (TI) which involves a review of the program being established by the licensee in response to GL 89-10. The inspectors did not address Part 2 of the TI because of the early stages of implemeniation of the licensee's GL 89-10 program.

3.3 Generic Letter 89-10 Areas

As required by Section 04.01 of the TI, the inspectors reviewed the licensee commitments to the generic letter. The inspectors reviewed the licensee's GL 89-10 MOV Program Project Plan (Revision 1, April 17, 1991) 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.

3.3.1 Scope of the Generic Letter Program

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

The licensee identified 33 MOVs to be included in its GL 89-10 program. The inspectors reviewed piping and instrumentation drawings for several plant systems as a sample check of the scope of the licensee's program. The inspectors found the scope of the licensee's program to be consistent with the intent of GL 89-10.

The inspectors identified two MOVs in the feedwater system (HCV-1103 and 1104) that were not in the safety-related portion of the system, but were relied upon in several emergency procedures and received steam generator isolation and feedwater isolation signals. The inspectors were concerned that these MOVs had been assigned a safety-related function without adequate consideration of the capability of the MOVs to perform that function. The inspectors indicated that the licensee should ensure that these MOVs are capable of performing their intended function, or that emergency procedures and training alert the operators to the potential failure of the MOVs. [Response Item 1]

3.3.2 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 the operation of each MOV within the generic letter program to determine the maximum differential pressure and flow (and other factors) expected for both normal operations and abnormal conditions. In recommended action "b" of Generic Letter 89-10, the NRC requested licensees to review, and to revise as necessary, the methods for selecting and setting all MOV switches.

The licensee included both recommendations "a" and "b" of GL 89-10 under its design basis reviews. The licensee stated that no design basis reviews were considered to be complete. The licensee's Project Plan stated that maximum differential pressure, temperature, flow, fluid phase, and seismic effects would be determined. The licensee will review the Updated Safety Analysis

Report, normal and emergency procedures, and other plant documents to determine the design basis parameters for MOVs within its GL 89-10 program. The Project Plan also stated that differential pressure because of valve mispositioning or inadvertent operation would also be determined. The inspectors considered these plans to be consistent with recommendations of GL 89-10.

The inspectors had a concern with the ongoing implementation of the design basis reviews of the licensee's GL 89-10 program. In particular, the licensee's draft Calculation 602512-MPS-5CALC-004 determined that the worst-case differential pressure for the pressurizer power operated relief valve (PORV) block valves (HCV-150 and 151) to be 2485 psid. Nevertheless, the draft calculation assumed that these MOVs would only need to close under 2285 psid because of an emergency procedure statement to close these valves if pressure fell below 2285 psig. The inspectors stated that this would constitute a deviation from the licensee's commitment to GL 89-10 if the calculation were complete. [Response Item 2]

The licensee was developing its methodology for verification of MOV sizing and switch settings. The licensee indicated that it intended to use valve factors of 0.3 for flexwedge gate valves and 0.2 for double disk gate valves. These valve factors have been shown to be inadequate for some MOVs during industry and research tests. For example, valve factors for closing flexwedge gate valves have been shown to range up to 1.1, with a 0.4 to 0.6 range as the average. For valves manufactured by Crane, the licensee will include additional thrust to account for seating load in accordance with the manufacturer's instructions. The inspectors indicated that the use of low valve factors placed additional emphasis on the performance of design basis testing. If such testing demonstrated that the valve factors were inadequate, the licensee would need to address the capability of the tested MOVs and other applicable MOVs, as well as assess its methodology. [Response Item 3]

The licensee stated that all globe valves within its GL 89-10 program were installed with flow over the seat such that the differential pressure loads assisted in closing the valve. Consequently, the licensee assumed 1.1 and 0.9 for the valve factors during opening and closing of globe valves, respectively. The licensee needs to better document its justification for the use of these valve factors. This justification will be reviewed during a future inspection.

In establishing minimum torque switch settings, the licensee indicated that the calculated required thrust will be increased to account for diagnostic equipment inaccuracy. The licensee stated that the results of the MOV Users' Group (MUG) testing of diagnostic equipment will be addressed. The inspectors stated that, during the time period when the results of the diagnostic testing are being finalized by the MUG, the licensee will be expected to evaluate each MOV for which diagnostic equipment had been used to establish switch settings. The final MUG report is scheduled to be released in January 1992. By that time or earlier, the licensee will be expected to take prompt action in response to the MUG findings (or adequately justify alternative tests) to make appropriate operability determinations, and to reset MOV switches or make hardware modifications, as necessary. The licensee's efforts in this regard will be evaluated during a future inspection or in response to NRC issuances.

The licensee was attempting to address to some extent the rate-of-loading phenomenon which can reduce the thrust delivered by the motor actuator during design basis conditions from the amount of thrust delivered under static conditions. In draft valve thrust methodology PED-91-NP-177 (August 22, 1991), the licensee stated that, based on information from its diagnostic equipment vendor (ITI-MOVATS), the minimum thrust values for gate valves with flow during design basis conditions (other than Crane valves which include the additional seating load in their calculations) will be increased by 30 percent to account for rate of loading effects. The licensee did not intend to include margin to account for rate-of-loading for gate valves that do not have to close against flow during design basis conditions because of its belief that rate-of-loading was primarily a flow phenomenon. The licensee also stated that rate-of-loading effects will not be included for globe valve thrust calculations because (1) the licensee believed that rate-of-loading was associated with the type of valve disk and (2) no information on rate-of-loading effects in globe valves was available. The inspectors stated that the licensee's methodology may not fully address the rate-of-loading phenomenon because of the licensee's assumptions. The licensee responded that it will evaluate its rate-of-loading methodology during design basis testing. Where the licensee intended to periodically verify MOV capability by testing at less than design basis conditions, the licensee will be expected to perform MOV tests (with diagnostics as necessary) that can provide assurance that the rate-of-loading phenomenon was adequately quantified. The licensee's consideration of rate-of-loading will be addressed during future inspections.

For maximum torque switch settings, the licensee indicated that actuator, motor, and valve limitations would be addressed. However, in the draft thrust methodology (August 22, 1991), it was not apparent that motor capability would be considered. Although that document addressed the effects of inertia of the motor actuator following torque switch trip in terms of the thrust limits of the actuator, it did not include consideration of the effects of inertia with respect to actuator torque or valve thrust limits. In draft Project Instruction 159-90-05.03 (Revision 0), "Switch Setting Determination," the licensee addressed motor capability but did not discuss inertia effects for structural limits. The licensee will need to ensure that all applicable limitations will be considered in establishing the maximum torque switch settings and incorporated into the final guidance document. [Response Item 4]

The licensee's calculations indicated the use of a stem friction coefficient of 0.2 which was the typical industry value. However, the licensee stated during the inspection that it intended to use 0.15 as the stem friction coefficient based on its current lubrication program and the use of Mobilux EP-1 grease. During their walkdown, the inspectors observed several dirty valve stems (see paragraph 3.5). Some of these valves were said to have preventive maintenance performed approximately 17 months ago. Considering that the licensee was also attempting to justify a preventive maintenance schedule of approximately 36 months, this frequency for valve stem lubrication was inadequate to support the assumption of a 0.15 stem friction coefficient without additional justification. Further, the licensee had not justified the use of Mobilux EP-1 in high temperature

environments for long time periods. The licensee will need to provide better justification for the assumed value for FCS. [Response Item 5]

The licensee had not included ambient temperature effects on motor performance. However, the licensee provided an internal memorandum (August 23, 1991) that discussed its plans in this area. The NRC will review the licensee's actions in future inspections.

The licensee was evaluating its degraded voltage studies in response to NRC Inspection Report 50-285/91-01. The licensee will be expected to incorporate the results of that effort into its GL 89-10 program. The inspectors cautioned the licensee to ensure that its degraded voltage studies were completed in a timely manner so as not to delay its GL 89-10 program.

In most cases, the licensee bypassed its motor thermal overload protection except during MOV testing. The licensee indicated that 4 MOVs (LPSI HCV-2914, -2934, -2954, and -2974) did not have their thermal overload protection bypassed, but that these MOVs did not need to move to perform their safety function. The licensee's approach to thermal overload devices was one of the methods outlined in Regulatory Guide 1.106. The inspectors stated that GL 89-10 recommended consideration of appropriate thermal overload protection. The licensee indicated that its thermal overload protection methodology would be evaluated as part of its GL 89-10 program.

3.3.3 Design Basis Differential Pressure and Flow Testing

In recommended action "c" of the generic letter, the NRC requested licensees to test MOVs within the generic letter program in situ under their design basis differential pressure and flow conditions. If testing in situ under those conditions was not practicable, the NRC would allow alternate methods to be used 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, at this time, an alternate method of demonstrating MOV capability cannot be justified. With the two-stage approach, a licensee would evaluate the capability of the MOV using the best data available and then would work to obtain applicable test data within the schedule of the generic letter.

The licensee had completed static diagnostic tests of all of the MOVs in its GL 89-10 program. The licensee has committed to perform design basis testing for each MOV within its GL 89-10 program where practicable. The licensee believed that most of its GL 89-10 MOVs could be tested at or near design basis conditions. The licensee stated that it had performed design basis testing of 8 MOVs in response to NRC Bulletin 85-03, and that it would attempt to take credit for the performance of 4 of those MOV tests under GL 89-10. The licensee indicated that prototype testing for its PORV block valves was being planned as part of its effort to demonstrate the capability of those MOVs.

The licensee was preparing procedures for design basis testing. The NRC expects those procedures to include acceptance criteria for the tests. The licensee intended to use the two-stage approach outlined in GL 89-10 and its

supplements for those MOVs that cannot be tested under design basis conditions. The inspectors considered the licensee's stated plans regarding design basis testing to be consistent with the recommendations of GL 89-10. However, on page 6-38 of its Project Plan, the licensee listed exceptions to the performance of design basis testing. One of the listed exceptions suggested that, rather than design basis testing each MOV where practicable, design basis test data from similar valves may be applied. That exception was not consistent with the licensee's commitment to GL 89-10 to test MOVs, where practicable. The licensee indicated that the Project Plan would be revised to be consistent with its commitments to GL 89-10. [Response Item 6]

3.3.4 Periodic Verification of MOV Capability

In recommended action "d" of the generic letter, the NRC requested that licensees prepare or revise procedures to ensure that adequate MOV switch settings were determined and maintained throughout the life of the plant. In paragraph j of the generic letter, the NRC 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 3 refueling outages. Further, the capability of the MOV will need to be verified if the MOV is replaced, modified, or overhauled to an extent that the existing test results would not be representative of the MOV.

The licensee stated that it may perform static tests of MOVs in an effort to demonstrate their continued capability to perform under design basis conditions. The NRC does not accept static tests, at this time, to demonstrate design basis capability because of the uncertainties in the relationship between the performance of MOVs under static and design basis conditions. Further, the licensee had not established a schedule for these periodic tests. The licensee will need to justify its periodic testing methodology during future NRC inspections. In addition, the licensee will be expected to establish a frequency for periodic testing (verification) consistent with its commitments to GL 89-10. [Response Item 7]

The licensee's Station Engineering Instruction SEI-13 (Revision 2) controlled the performance of periodic preventive maintenance and stem lubrication on the MOVs in the GL 89-10 program. For some MOVs, the frequency exceeded the 18 month interval for stem lubrication recommended by Limitorque. The licensee's Justification of Deviation from Vendor Recommended Maintenance (February 8, 1991) simply stated that the licensee's MOV Engineer allowed the preventive maintenance frequency to be extended to every other refueling outage (about 36 months) based on plant specific experience. An internal licensee memorandum (August 20, 1991) on stem lubrication referenced an analysis of gear case lubrication by the NRC for another nuclear facility, but that analysis was not applicable to stem lubrication for FCS. Observations by the inspectors during the walkdown (see paragraph 3.5) did not support a lubrication frequency beyond the manufacturer's recommendation. The inspectors did not consider the licensee's justification for extending the stem lubrication frequency to be adequate. [Response Item 7]

The inspectors reviewed the licensee's procedure for preventive maintenance EM-PM-VX-0400 (June 26, 1991), "Limitorque Operator Maintenance." The inspectors noted that Section 6.5.8 of that procedure required that the limit switch gears be covered with grease, but did not specify a maximum amount of grease. Overfilling of the limit switch gearbox can lead to leakage of grease into the limit switch compartment. The inspectors found an instance of such leakage in HCV-1384 during their walkdown (see paragraph 3.5). The inspectors noted this weakness to the licensee. The licensee indicated that its preventive maintenance procedures were being reviewed for improvement. The upgraded maintenance procedures will be evaluated during a future inspection. The licensee's Standing Order Procedure SO M-102 (December 6, 1990), "Post-Maintenance Testing," allowed the measurement of a change in motor current in evaluating the effect of valve packing adjustments. The licensee did not have justification for relating motor current to packing load. The licensee indicated that a new post-maintenance test matrix was to be developed. The post-maintenance matrix will be evaluated during a future inspection.

The licensee did not have an MOV refurbishment schedule nor had MOVs been refurbished before performing baseline diagnostic testing. The licensee indicated that the need for refurbishment was determined as a result of preventive maintenance and diagnostic test results. The inspectors stated that these efforts have been found to be insufficient at other facilities to identify all aspects of MOV degradation. The inspectors' review of several maintenance work packages also did not support the licensee's assumption that preventive maintenance and diagnostic test results obviated the need for periodic refurbishment. The inspectors stated that if MOV failure occurred as a result of wear not detected from preventive maintenance or diagnostics, the licensee will need to evaluate the condition of all MOVs and make appropriate operability determinations. Further, the lack of refurbishment before baseline diagnostic testing could mask degradation present during and subsequent to baselining.

The inspectors reviewed Procedure EM-RR-VX-0400 (Revision 1, April 12, 1990), "Motor Operator Valve Operator Inspection and Overhaul (SMB-00)." The inspectors did not find clear discussion of evaluations for spring pack relaxation or hydraulic lock. These potential degradations of the MOV were the subject of Limitorque Maintenance Update 90-1. The inspectors indicated that the licensee should ensure that its overhaul procedures for size SMB-00 valve actuators and other Limitorque actuators reflect current guidance from Limitorque to ensure that degradation of the MOV was identified during overhaul. If a spring pack was found to have relaxed, the licensee would be expected to evaluate the operability of the MOV prior to the overhaul, to determine the generic implications of the deficiency to other MOVs, and to consider the adequacy of the overhaul frequency. A similar evaluation may be necessary if excess grease in the spring pack area indicates that hydraulic lock might have occurred. [Response Item 8]

3.3.5 MOV Failures, Corrective Actions, and Trending

In recommended action "h" of the generic letter, the NRC requested that licensees 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 was also suggested that the material be periodically examined (every 2 years or after each refueling outage after program implementation) as part of the monitoring and feedback effort to establish trends of MOV operability. These trends could provide the basis for a licensee revision of the testing frequency established to verify adequate MOV capability on a periodic basis. The generic letter indicated that a well-structured and component-oriented system would be necessary to track, capture, and share equipment history data.

The inspectors reviewed several MOV maintenance work packages. The inspectors did not identify any concerns regarding those work packages. The licensee used Systems Engineering Instruction SEI-19 (Revision 1, December 8, 1989) for the performance of maintenance history review and trending. The licensee stated that the portion of its program to respond to the recommendation of GL 89-10 regarding MOV failures, corrective actions, and trending was still under development. This area of the licensee's GL 89-10 program will be reviewed during a future inspection.

3.3.6 Schedule

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

The licensee committed to meet the GL 89-10 schedule.

3.4 Other MOV Areas Addressed

Section 04.03 of the TI lists certain aspects of the licensee's overall program that should be reviewed by the inspector, as appropriate.

3.4.1 Administration of MOV Activities

The licensee assigned a dedicated MOV engineer to coordinate the GL 89-10 program. The licensee will need to ensure that adequate resources will be applied to the program. In addition, the licensee will need to demonstrate adequate control over the efforts of its architect engineer (Combustion Engineering) and its contractors. During the inspection, the inspectors noted the following examples where adequate control was not demonstrated.

- Combustion Engineering identified several MOVs as possibly being insufficient to perform their functions in a draft calculation package. However, the licensee did not document its evaluation to ensure that an operability concern was not present

- The draft valve thrust methodology (August 22, 1991) by its contractor ERIN on page 6 incorrectly implied that the resolution of the concerns regarding MUG diagnostic test results did not need to be resolved promptly.

- Draft Project Instruction 159-90-05.04 by ERIN on page 3 stated that static testing might be justified for MOVs with design basis differential pressure despite the licensee's commitment to the GL 89-10 recommendation to perform design basis tests where practicable. In accordance with Item 1 of GL 89-10, the licensee will need to notify the NRC as to where its commitment to the generic letter would be changed.

- The contractor's description of the two-stage approach in Draft Project Instruction 159-90-05.4, on page 7, does not reflect the need to verify the initial setup of the MOV at a later date.

- In Project Instruction 159-90-05.06 (August 16, 1991), "Design Basis Review," by ERIN, the discussion of single failure in Section 4.2.2 was not consistent with the intent of GL 89-10 and the discussion of single failure in Supplement 1 to the generic letter.

These and other efforts by the licensee's architect engineer and contractors should be reviewed for accuracy and consistency with the licensee's commitments.

3.4.2 MOV Setpoint Control

The licensee used diagnostic equipment to determine the appropriate thrust settings for its MOVs. The procedures used to perform diagnostic testing contained steps to record "as found" and "as left" torque switch setpoints. This information was then forwarded to the MOV engineers where it was reviewed, recorded, and stored for future use.

OPPD Memorandum PED-91-NP-178, (August 23, 1991), "Current MOV Valve Stem Thrust Window Determination", specified the current methodology for determining valve stem thrust target windows for safety related MOVs at FCS. The target thrust window was calculated using the formula: Window = [(Required Stem Thrust) x (1.25)] plus or minus 10%. This resulted in a minimum thrust window setting of 115 percent of the required stem thrust. The inspectors were concerned that this minimum setpoint margin of 15 percent may not bound the effects of rate-of-loading and/or diagnostic equipment inaccuracies in all cases.

Memorandum PED-91-NP-178, Step 1.1.4, specified that if 135 percent of the required stem thrust was greater than the actuator's nominal thrust rating, the maximum allowable thrust value would be the nominal thrust rating of the actuator. This did not account for the effects of inertia. The inspectors reviewed corrective maintenance work orders on MOVs which indicated that the licensee has experienced several instances of overthrusting on their actuators. This may be directly related to the licensee's current methodology of setting and controlling MOV switch setpoints. The licensee should address this concern about the current lack of consideration of inertia for maximum torque switch settings as part of Response Item 4 discussed above.

The licensee bypasses MOV torque switches for the first 15 to 20 percent of valve travel in both the open and closed direction with the exception of a few valves. These exceptions were the feedwater isolation valves, HCV-1385 and -1386, and containment sump isolation valves, HCV-383-3 and -383-4, which utilized the close limit switch to stop motor operation. The inspectors were concerned that these four valves may not seat completely and consequently leak. In response, the licensee indicated that the feedwater isolation valves were listed as ASME Section XI, Category B valves with no specified leakage limits. The licensee indicated that the containment sump isolation valves, HCV-383-3 and -383-4, were normally closed valves.

The licensee intended to maintain torque switch limiter plates on all MOVs, but did not have documentation indicating whether limiter plates were currently installed on all 33 MOVs in its GL 89-10 program. The inspectors questioned the licensee on the need to perform engineering evaluations or 10 CFR 50.59 reviews when torque switch settings were set above the Limitorque maximum recommended value. The licensee indicated that an engineering evaluation would be performed in such cases. The inspectors indicated that a licensee should perform an evaluation in accordance with 10 CFR 50.59 when torque switches are set above the manufacturer's maximum allowable setting because such changes could involve an "unreviewed safety question" in that "the probability of . . . malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased" and "the margin of safety as defined in the basis for any technical specification is reduced."

The inspectors reviewed the licensee's documents containing the current torque switch setpoints and the Limitorque recommendations for maximum torque switch settings for the licensee's actuators. The inspectors found two MOVs, HCV-348 and -1041C, with torque switch settings above the Limitorque recommended maximum value. These MOVs had their torque switch settings increased during the outage that was in progress in April 1990. The licensee had not performed an engineering evaluation of these torque switch settings. In response to the inspectors' concerns, the licensee performed engineering evaluations and determined that no structural limits were exceeded for HCV-348, but that the gear train rating for HCV-1041C had been exceeded. In response to a Limitorque requirement to inspect the internals of the actuator in such cases, the licensee declared HCV-1041C inoperable, verified that the valve was shut, and removed power from the motor actuator by opening its breaker. The licensee stated that the safety position for HCV-1041C is closed, and that no Limiting

Condition for Operation was entered. The inspectors noted that the licensee had reported problems with the control of MOV switch settings (specifically, low switch settings) in Licensee Event Report 89-12. The licensee setting of torque switches above the manufacturer's maximum allowable values without adequate evaluation constitutes a violation of the requirements of 10 CFR Part 50.59. This is identified as Violation 50-285/9122-01, failure to control torque switch settings on motor operated valves.

3.4.3 Training

The inspectors discussed the licensee's training department with licensee personnel, reviewed training outlines and records, and toured the training facility. The licensee's mechanics and electricians must complete training involving MOV overview (8 hours), MOV disassembly and assembly (8 hours), MOV laboratory exercises (8 hours), MOV performance testing (8 hours), and MOV industry information and procedures (8 hours). In addition, electricians must complete on-the-job instruction before being considered qualified for MOV work. The licensee was contracting with ITI-MOVATS to provide training for licensee personnel in the collection of MOVATS data and the performance of signature analysis with periodic refresher training. The licensee participated in an audit of ITI-MOVATS by the Nuclear Procurement Issues Committee (NUPIC) in May 1989 and the inspectors reviewed that audit report. The licensee stated that contractors were not being used to perform MOV maintenance activities at FCS. The inspectors discussed with the licensee the lack of refresher training for MOV mechanics and electricians, and the evaluation of MOVATS training programs during future licensee audits of that organization. The inspectors did not identify any concerns in this area.

3.4.4 Industry Experience and Vendor Information

The inspectors reviewed the following communications from Limitorque to determine whether the licensee had evaluated and incorporated this information into their MOV program:

1. Part 21 Notification (11/3/88) concerning melamine torque switches

2. Part 21 Notification (11/3/88) concerning dc motors

3. Part 21 Notification (9/29/89) concerning SMB-000and SMB-00 torque switch with fiber spacers

4. Part 21 Notification (3/20/90) concerning motor pinion keyway depth

5. Maintenance Update (8/17/88)

6. Maintenance Update 88-2

7. Maintenance Update 89-1

8. Maintenance Update 90-1

9. Letter dated March 3, 1986 concerning motor rotors

10. Letter dated July 26, 1990 concerning actuator ratings

The inspectors determined that, for the Part 21 notifications, the licensee had evaluated the notification for applicability to FCS and had taken, where necessary, acceptable corrective actions. The inspectors noted that the Limitorque maintenance updates had been placed into the controlled Limitorque vendor manual, but neither the maintenance updates nor the two letters had been subjected to a formal, documented evaluation. The licensee could not provide any information detailing if, or how, the information contained in the updates and letters had been considered in the MOV program. NRC Inspection Report 50-285/91-09, conducted June 3-7, 1991, at FCS, had expressed a concern that "it was not procedurally evident that a requirement existed for a review to be performed by technical personnel in order to determine if the received vendor technical information had any impact on operability or maintenance activities." On July 30, 1991, the licensee issued a memorandum entitled "Recommendation to Ensure Vendor Manual Changes Are Incorporated Into Applicable FCS Operating and Maintenance Procedures." This memorandum outlined a program whereby evaluations of revisions to vendor manuals will be performed and documented by system engineering and operations. The program was in the process of being implemented. Despite what appeared to be a satisfactory program for processing vendor information, there remained a concern regarding whether the licensee properly addressed the safety issues discussed in Limitorque communications Nos. 5 through 10 above. This issue will be tracked as Open Item 285/9122-02, evaluation of vendor communications. (Response Item 8)

3.4.5 Use of Diagnostics

The licensee was using ITI-MOVATS as a MOV diagnostic tool. The licensee was part of the MUG and was aware of the current MUG diagnostic equipment accuracy testing. In OPPD Memorandum PED-91-NP-174 (August 19, 1991), the licensee stated that ITI-MOVATS was reviewing the MUG test results and intended to reevaluate and retest their equipment. The ITI-MOVATS retest results were scheduled to be released mid-September 1991. The licensee was waiting for the results of the ITI-MOVATS testing and was evaluating its switch settings in response to the MUG report. The licensee was waiting the completion of these activities before retesting any MOVs or taking any NRC reporting actions. The inspectors cautioned the licensee regarding any passive approach to the problem. The inspectors also indicated that, where the MUG test results will not be applied, the licensee will be expected to justify accuracy values based on a testing program equivalent to the MUG testing.

As referred to earlier, the licensee was including margin to account for rate-of-loading effects to only a limited extent. This was despite the ITI-MOVATS recommendation to increase the calculated thrust requirements by 30 percent to provide margin for the rate-of-loading phenomenon. The licensee's consideration of rate-of-loading will be addressed during future inspections.

3.4.6 Inservice Testing

The inspectors reviewed the Fort Calhoun ISI Plan, 1983-1993 Interval, Revision 5, specifically regarding those motor-operated valves included in the GL 89-10 scope. Four GL 89-10 valves were identified which were not being tested in the ISI program. These valves were the four safety injection tank outlet isolation valves: HCV-2914,-2934,-2954,-2974. These valves were normally locked open and were needed only to bring the plant to cold shutdown. Since the design basis for FCS required only the capability to bring the plant to a hot shutdown, the exclusion of these valves from the ISI program was acceptable. The inspectors noted that the guidance contained in NRC Generic Letter 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," had been incorporated into the FCS ISI program.

3.5 Walkdown

The inspectors conducted a walkdown of several MOVs and viewed HCV-1384 with its switch compartment cover removed. With respect to HCV-1384, the inspectors observed grease dripping from the limit switch gearbox onto the wiring inside the switch compartment, from the spring pack cap area of the actuator, and between the motor and actuator. During the inspectors' external observation of MOVs, the inspectors found rust on the stem of HCV-1041C, grease dripping under the actuators of HCV-1103 and 1104, nicks on the stem of HCV-1386, dirt and dust in the yoke area of HCV-1385, significant boron deposits near the stem of HCV-258, dirt and dust on the stem of HCV-265, and paint on the stem of HCV-268. The inspectors alerted these deficiencies to the licensee who indicated that corrective action would be taken. The inspectors did not believe that the current condition of the observed MOVs supported the licensee's plan to have preventive maintenance (including stem lubrication) intervals longer than the manufacturer's recommendation of 18 months or to assume a stem friction coefficient less than the 0.20 value typically used by the manufacturer.

3.6 Conclusions

The inspectors considered the licensee to have made a good beginning in developing a program in accordance with its commitments to GL 89-10. The inspectors concluded that the licensee's program would meet the intent of GL 89-10 upon completion of corrective actions and development of certain portions of its program identified during the inspection. The areas of the licensee's GL 89-10 program not currently developed will be reviewed during a subsequent inspection of the implementation of the licensee's program.

4. EXIT INTERVIEW

An exit meeting was held with those persons denoted in paragraph 1 on August 30, 1991. The scope and findings of the inspection were summarized. Licensee personnel acknowledged the inspection findings and agreed to respond to the areas of weakness denoted as "Response Items" in the report within 90 days of receipt of the report. No proprietary information was provided to the inspectors.