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

Report Nos.: 50-321/92-04 and 50-366/92-04

Licensee: Georgia Power Company
P. O. Box 1295
Birmingham, AL 35201

Docket Nos.: 50-321 and 50-366 License Nos.: DPR-57 and NPF-5

Facility Name: Hatch 1 and 2

Inspection Conducted: February 24-28, 1992

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SUMMARY

Scope:

This special, announced inspection examined the program developed in response to NRC Generic Letter (GL) 89-10, "Safety-Related Motor Operated Valve Testing And Surveillance." The inspection was the first of two or more that will be conducted for each nuclear plant in accordance with NRC Temporary Instruction 2515/109, issued January 14, 1991.

Results:

The inspectors determined that a basic program had been developed which addressed most of the generic letter recommendations. Concerns were identified in some areas; strengths were also noted. Additionally, a written response is

requested to clarify licensee's commitments concerning program schedule and testing requirements.

Concerns - Written Response Requested

There is an apparent conflict between the Licensee's generic letter 89-10 Program Description and their letter of December 28, 1989. A written response is requested to clarify the Licensees commitment to the generic letter recommendations concerning program schedule and testing requirements. (Reference Section 3.g).

Concerns - No Written Response Requested

1. The Licensee needs to complete development of a procedure to be used for validating General Electric methodology for calculating worst case differential pressure (Reference Section 3.b).

2. Program description needs to be revised to document performance of EOP reviews. (Reference Section 3.b).

3. Program description needs to be revised to document use of flow velocities in calculating maximum differential pressure for select MOVs. (Reference Section 3.b).

4. The A.C. degraded voltage calculation does not consider the degraded voltage relay setpoint as recommended by the generic letter. This is an open item in the EDSFI Inspection report 50-321, 3[illegible]-202, (Reference 3.b.)

5. The A.C. degraded voltage calculation for GL 89-10, Supplement 3 MOVs needs to be revised to include effects of TOLs and to evaluate circuit resistances at HELB temperature. NRC review of A.C. degraded voltage calculations for Non-Supplement 3 MOVs will be reviewed upon their completion in June 1992. (Reference 3.b).

6. Program description does not provide for evaluating the effects of high ambient temperature on motor developed torque (Reference Section 3.b).

7. The Licensee needs to justify the use of 0.3 valve factor for gate valves (Reference Section 3.C.)

8. The Licensee will need to justify, using test results, the use of a SFC of 0.15 and 0.08 for the 18 month stem lubrication period. (Reference Section 3.c)

9. Thrust windows should include torque switch repeatability and diagnostic equipment accuracy. Site procedure 53 IT-TET-002-0S needs to be revised to account for these margins. (Reference Section 3.c)

10. Program description needs to be revised to include maximum torque ratings in weak link analysis. (Reference Section 3.c)

11. Program description needs to be revised to be consistent with Supplement 1 to GL 89-10 concerning the two stage approach to testing MOVs in situ under design-basis condition. (Reference Section 3.d)

12. Licensee needs to develop procedures to ensure that information obtained from test results are fed back into their current methodology. (Reference Section 3.d)

13. The technical basis for using static tests to verify continued capability of an MOV to operate under worst case differential pressure and flow needs to be developed. (Reference Section 3.e)

14. Program description needs to be revised to include requirements for identifying test parameters to be documented during performance of static tests. Revision should also include requirements for evaluating test data. (Reference Section 3.e)

15. NRC will followup the Licensee evaluations to ascertain the licensing basis for Units 1 and 2 concerning the use of TOLs in safety related MOV circuits (Reference Section 3.e)

16. Program description needs to be revised to establish requirements for specifying post-modification test requirements and test acceptance criteria for modified MOVs. (Reference Section 3.e)

17. Program description needs to be revised to establish requirements for performing failure analysis for all failures associated with GL 89-10 MOVs. (Reference Section 3.f)

18. Program description needs to be revised to establish requirements for a controlled process involving changes to torque switch setpoints. (Reference Section 3.i)

Strengths

1. Personnel assigned to the GL 89-10 Program were knowledgeable regarding the issues and were actively involved in the program implementation. (Reference Section 3.h)

2. Strong corporate involvement in the program development and assistance with implementation at the site was identified. Communication between the site and corporate office was good. (Reference Section 3.h)

3. The Licensee's training facility for electricians was considered a strength. (Reference Section 3.j)

4. The Licensee industry experience and vendor information program was considered a strength. (Reference Section 3.k)

5. The scope and extent of testing completed by the Licensee, including 30 dynamic tests, was considered a program strength. (Reference Section 3.d)

6. The D.C degraded voltage study and the design controls implemented during preparation of plant modifications was identified as a program strength. (Reference Section 3.b)

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REPORT DETAILS

NRC Inspection of the Program Developed in Response to Generic Letter 89-10 for Plant Hatch

1. Background

On June 28, 1989, the NRC staff issued Generic Letter (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 are selected, set and maintained properly. 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 result of those public workshops. In Supplement 2 to GL 89-10 (August 3, 1990) the staff 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 staff 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 staff indicated that all licensee 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. Supplement 3 specifically requested BWR licensees to evaluate the capability of MOVs used for containment isolation in the steam supply lines of the High Pressure Coolant Injection (HPCI) and the Reactor Core Isolation Cooling (RCIC) Systems, in the supply line to the Reactor Water Cleanup (RWCU) Systems, and in the lines to the isolation condenser, as applicable. This latter request applied to Hatch, since both of its units are BWRs. On February 12, 1992, Supplement 4 was issued to remove from the scope of GL 89-10 the recommendations for inadvertent operation of MOVs from the control room for BWR.

Generic letter 89-10 requested the Licensees to submit a response to the generic letter by December 28, 1989. Georgia Power Company submitted a response to the generic letter on December 28, 1989. In this response the Licensee stated their intent to complete design basis reviews and static differential pressure testing within five years or three RFO, whichever is later. The Licensee also stated their exceptions to the following specific generic letter recommendations:

- Considering inadvertent mispositioning of MOVs, including MOVs in safety related systems which do not have on active safety function.

- Testing MOVs at maximum differential pressure.

Supplement 3 to GL 89-10 requested several responses for BWRs, such as Hatch. The first was to be provided within 30 days of receipt of the Supplement. It was to indicate the completion of a plant-specific safety assessment report addressing factors stated in the supplement and to indicate whether MOVs with deficiencies of greater safety significance than those in the HPCI, RCIC, RWCU and isolation condenser lines referred to above were believed present. A second response was requested to be provided within 120 days of receipt of Supplement 3. BWR owners were asked to provide the criteria applied in determining whether deficiencies existed in the above HPCI, RCIC, RWCU and isolation condenser line MOVs and in any MOVs considered to be more safety significant. This latter response was also to identify any MOVs found to have deficiencies and to give a schedule for any necessary corrective action.

Georgia Power Company submitted the information requested for both the 30 day and 120 day response in their letter of December 11, 1990. In their response to the 30 day information request the Licensee stated that GPC had prepared a safety assessment for Plant Hatch Units 1 and 2 showing that failure of the HPCI, RCIC, or RWCU isolation valves to promptly isolate following a design basis guillotine line break is not a significant safety concern. The Licensee also stated that they were not aware of any MOVs with deficiencies of greater significance than the subject valves. The response to the 120 day information request identified a need for implementing plant modifications to Unit 1 and Unit 2 HPCI steam supply and the RWCU water supply isolation MOVs; and Unit 2 RCIC steam supply isolation MOVs. Unit 2 plant modifications could not be completed within the 18 months time frame specified in the generic letter because of unavailable design change packages and procurement difficulties. The Licensee proposed completing Unit 2 MOV modifications during Unit 2 cycle 10 RFO scheduled for the fall of 1992. The schedule for implementing Unit 1 MOV modifications was stated as Unit 1 Fall 1991 maintenance/RFO.

In addition to the responses referred to above, Supplement 3 requested that the NRC be notified of any changes to the related corrective actions or schedule. The licensee in their letter dated March 15, 1991 stated that is was necessary to extend the implementation schedule for Unit 1 beyond the Fall 1991 outage because of unavailable qualified equipment. The new date given for implementing the MOVs modifications was Unit 1 maintenance/RFO scheduled for the Spring of 1993.

2. Inspection Plan

The NRC inspectors followed Temporary Instruction (TI) 2515/109 (January 14, 1991), "Inspection Requirements for Generic Letter 89-10, Safety-Related Motor-Operated Valve Testing and Surveillance," in performing this inspection. The inspection focused on Part 1 of the TI which involves a review of the program being established by the licensee in response to GL 89-10. Part 2 of the TI, which involves a detailed review of program implementation, was not performed. Implementation was examined only where this aided in evaluating the program.

3. Program Areas Inspected and Findings

a. Scope of the Generic Letter Program

The scope of GL 89-10 included all safety-related MOVs and other MOVs that are position-changeable in safety-related piping. 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 Boiling Water Reactors Owners' Group (BWROG) submitted a backfit appeal on the recommendations for position-changeable valves. In response, the NRC issued Supplement 4 to GL 89-10 on 2/12/92, which stated that the staff no longer considers the recommendations for inadvertent operation of MOVs from the control room to be within the scope of GL 89-10.

The licensee originally identified 291 MOVs to be evaluated to determine if inclusion into their GL 89-10 program was necessary. From this total number of valves, the licensee has completed 223 design basis reviews (68 remaining), and has determined that 159 MOVs have active safety functions and should be included within the scope of GL 89-10.

The inspectors reviewed piping and instrumentation drawings for the Unit 1 residual heat removal system, the Unit 1 core spray system, and the Unit 2 high pressure coolant injection system as a sample check of the scope of the licensee's program. From this review, the inspectors concluded the licensee's Program scope was consistent with the Generic Letter recommendations.

b. Design Basis Reviews

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

The inspectors discussed with licensee personnel the performance of design basis reviews for the MOVs identified in the licensee GL 89-10 program. The licensee was relying on a General Electric (GE) methodology for determining worst case differential pressure for all GE supplied systems such as RWCU, HPCI, RCIC, CS and RHR. Southern Company Services (SCS) intends to use this methodology for the non GE supplied systems. The inspectors questioned the licensee whether a procedure was in place to validate GE's methodology. Licensee personnel indicated that an administrative procedure was being developed to review GE methodology. This review may result in revisions to some of the differential pressure results and thrust calculations which could have an effect on the use of existing test results. Out of 291 MOVs, 223 MOVS have had their design basis

reviews completed. The licensee plans to complete their design basis reviews by the end of 1992.

The inspectors reviewed PED-62-1189, "Edwin I. Hatch Residual Heat Removal (RHR) System Motor-Operated Valve (MOV) Operating Differential Pressure Methodology for NRC GL 89-10", January 1990 and SMNH 90-00E "RHR Motor Operated Valve Differential Pressures," Rev 1, January 29, 1991. PED-62-1189 documented all of the MOVs in the RHR system, identified each valve function, and identified mispositioning events. In addition, this document identified the maximum worst case differential pressure that could be expected during opening and closing of the MOV, and scenarios that contributed to the maximum differential pressures. PED-62-1189 contained equations developed by GE to be used to calculate the maximum differential pressure expected across each MOV.

The inspectors observed that PED-62-1189 required that the FSAR, operating procedures, and system design basis requirements be reviewed to determine maximum differential pressures. However, the inspectors could not determine from the documentation whether the licensee's EOPs were reviewed. The licensee's Generic Letter 89-10 MOV Program Description, dated February 19, 1992, took exception to reviewing EOPs which they considered contrary to the recommendations of GL 89-10. Licensee personnel indicated that their EOPs were reviewed in determining the actual sequence of events for the design basis scenario, but this review was not formally documented. The licensee stated that their review of the EOPs would be formally documented and the program description would be revised accordingly. The NRC inspectors will evaluate these efforts during future inspections.

The inspectors reviewed SMNH 90-00E "RHR Motor Operated Valve Differential Pressures" which documented the calculated maximum differential pressure results using the equations developed in PED-62-1189. Flow velocities were used to determine the maximum differential pressure for certain MOVs even though Hatch's program description stated that process flows have not been accounted for. Licensee personnel stated that test procedures were developed to establish flow near design basis conditions with existing pumps. The licensee Program Description needs to be clarified in regard to the use of flow. The NRC inspectors will review this effort during a future inspection.

Electrical design basis reviews were performed under REA HT-90689 for GL 89-10 Supplement 3 DC operated MOVs and revealed that some MOVs did not have the required 70 percent rated voltage at the motor terminals. Design change packages DCP 91-048 and DCP-91-054 were prepared for replacing the motor feeder cables to MOVs 1G31-F004, 1E41-F003 and 1E41-F006. The inspectors reviewed the design change packages and supporting design basis calculation number SENH 91-013, D.C. MOV Voltage Analysis, to verify the technical adequacy of plant

modifications. The DC operated MOV design basis calculation included the recommendations of the generic letter and was found to be technically adequate. Plant modifications involving replacement of motor feeder cables were also prepared for Unit 2 MOVs 2E41-F006, and 2E41-F007. The scope of the plant modifications were documented in design change package DCP 91-05. The inspectors reviewed this design change package and supporting design basis calculation SENH-91-059, Voltage Evaluation for DC MOVs, and did not identify any technical inadequacies. Generic Letter 89-10 Supplement 3 MOV plant modifications documented in design change packages (1) DCP 90-240, MOV 2E41-F003 (HPCI) Upgrade, Revision 0 and (2) DCP 90-238, MOV 2E51-F008 (RCIC) Upgrade, Revision 0, were also reviewed without identifying any deficiencies. The inspectors considered the design basis reviews of the DC operated MOVs to be a program strength based on the scope and depth of the evaluations performed and the effectiveness of the design controls implemented during the plant modifications packages preparation.

The Licensee Generic Letter 89-10 Program Description stated that detailed calculations to determine minimum terminal voltage of A.C. operated MOVs had begun under REA HT-91680. Unit 2 Generic Letter 89-10, Supplement 3 MOVs plant modifications were being developed at the time of the inspection. The inspectors were provided a copy of the design change package related to this effort for review; DCP 92-236, MOV 2E41-F002, (HPCI) Upgrade, Revision 0. The scope of the plant modifications involved replacement of the motor operator and yoke assembly for valve 2E41-F002.

Based on review of the above design change package and supporting design basis calculation number SENH 91-060, Voltage Evaluation for A.C. MOVs, the inspectors identified the following deficiencies. The A.C. degraded voltage calculation does not consider the degraded voltage relay setpoint as recommended by the Generic Letter. The calculation is based on the offsite grid having a minimum degraded voltage of 1.013 P.U. with a resulting MCC minimum bus voltage greater than a value slightly above the degraded voltage relay setpoint. The inspectors were informed by Licensee management that a similar concern related to the degraded voltage relay setpoint had been identified during the EDSFI. Licensee management is presently engaged in ongoing discussions with the NRC for resolution of this issue. Additional deficiencies related to the A.C. degraded voltage calculation included omission of the effects of the TOL from the circuit calculation and failure to evaluate circuit resistances based on HELB accident temperatures. In discussions with Licensee's engineering personnel the inspectors were informed that the calculation would be redone to address the concerns identified. The Licensee has not yet completed the A.C. degraded voltage calculations for GL 89-10 non-supplement 3 MOVs. The current schedule calls for completion of Unit 1 A.C. Voltage Calculation by June 1, 1992, and Unit 2 by September 1, 1992.

March 31, 1992, the Licensee reiterated their intention to complete the A.C. degraded voltage calculations by the dates shown. Licensee management further added that upon completion of the A.C. degraded voltage calculations the Torque Switch Setting Guide, Drawing #A-43830, would be revised to include the effects of degraded voltage on torque switch setting. Existing torque switch setpoints contained in this guide are based on an unverified assumption that 90 percent of system voltage (600 volts) would be available at the motor terminals. The A.C. degraded voltage calculations will be based on a value of degraded voltage at the 4160 Volt Class 1E buses that has not yet been determined by the Licensee. Upon completion of the A.C. degraded voltage calculations the NRC may re-inspect this area.

The effect of high ambient temperature caused by DBA upon motor developed torque was discussed with licensee's engineering personnel. Licensee management is aware of the study being done by Limitorque concerning the effect of high ambient temperature on A.C. motor developed torque. Upon completion of this study an evaluation of the temperature effect on motor performance will be performed by the Licensee. Additional inspections in this area will be completed during future inspections.

c. MOV Switch Settings

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

The NRC inspectors discussed with licensee personnel the process of sizing MOVs and setting their switches. The licensee was using a dBase IV program which uses Limitorque standard equations to calculate the minimum required thrust from design information and differential pressure results, and calculate the available thrust under degraded voltage conditions. These results were summarized in Drawing #A-43830, "Motor Operated Valve Torque Switch Setting Guide," Rev. 8 February 22, 1991. SCS will update Drawing #A-43830 when new design information becomes available from valve vendors, degraded voltage calculations are completed, and field verifications are done.

According to Drawing #A-43830, a 0.30 valve factor was assumed for all gate valves and a 1.10 valve factor was assumed for all globe valves. The licensee's justification for the use of 0.30 valve factor was based on valve vendor recommendations. The inspectors indicated that the use of a 0.30 valve factor has been shown to be non-conservative in some industry testing. For example, the inspectors reviewed test results for MOV 1E11-F015B to determine an apparent valve factor. The apparent valve factor was approximately 0.40. The licensee also performed a similar evaluation. The apparent valve factor determined by the licensee was in the range of 0.26 to 0.47. The licensee indicated that instrument inaccuracies may have contributed to this range of uncertainties. In either case,

the licensee needs to provide justification for the use of the 0.30 valve factor. The NRC inspectors will evaluate this effort during future inspections. As the licensee begins to evaluate test data from dynamic tests, the continued use of a 0.30 valve factor may not be appropriate.

The licensee's program description assumed a Stem Friction Coefficient (SFC) of 0.15 for MOVs with a standard ACME thread configuration; and actuators using a ball screw utilized an assigned SFC of 0.08 based on the licensees's 18 month stem lubrication period. The licensee had not performed both thrust and torque measurements to validate a SFC of 0.15 and 0.08. However, the licensee developed data sheets based on torque values provided by Limitorque spring pack curves, which could be used during testing to provide an estimate of thrust at SFC values of 0.125, 0.15 and 0.20. The NRC inspectors reviewed test data under static and dynamic conditions to determine a SFC for MOVs 1E11-F007A, 1E11-F0028 and 1E21-F031A. By using these data sheets, the inspectors determined that these MOVs had a SFC greater than 0.20. The licensee will need to use test results to justify the use of a SFC of 0.15 and 0.08 for their 18 month stem lubrication period. The NRC inspectors will review this effort during future inspections.

The inspectors reviewed Hatch's program description to determine how minimum and maximum thrust ratings were established. Minimum required thrust was calculated using the methodology defined in the Torque Switch Setting Guide. Maximum thrust ratings were based on the lesser of the valve structural limits, actuator limits, and motor capability at degraded voltage conditions. However, the inspectors observed that maximum torque ratings were not addressed in the program description as part of the weak link analysis. The licensee agreed to revise their program description. Both minimum and maximum thrust ratings were adjusted for instrument inaccuracies in accordance with Site Procedure 53IT-TET-002-0S "Limitorque Valve Operator Diagnostic Testing (VOTES) and Set-up," Rev. 0, July 27, 1992.

The inspectors observed that torque switch repeatability was not accounted for when determining minimum and maximum thrust ratings. Typically torque switch repeatability ranges from 5% for actuator output of 50 ft-lbs and greater, and 10% for less than 50 ft-lbs. The licensee was waiting for Limitorque to formally issue an accuracy value for torque switch repeatability. When this information becomes available, the licensee needs to establish new thrust windows by including torque switch repeatability with diagnostic equipment accuracy. The licensee also needs to revise Site Procedure 53IT-TET-002-0S to account for these margins. The NRC inspectors will review these efforts during future inspections.

The licensee evaluated rate of loading (or load sensitive behavior) for the MOVs tested and could not determine any consistent method of predicting or quantifying rate of loading effects. The licensee also participates in the EPRI Performance Prediction Program which is attempting to develop a model to predict and quantify rate of loading. The licensee's current approach in handling rate of loading was to continue collecting data from static and dynamic testing for future use, and ensure that dynamically tested valves performed properly. For MOVs which cannot be tested under dynamic test conditions, the torque switch was set at the upper end of the allowable thrust range.

The inspectors reviewed several thrust calculations documented on Drawing #A-43830. The inspectors observed a SFC of 0.01 for MOV 1E-11-F015B (which uses a ball screw actuator) instead of 0.08 as previously specified. An incorrect stem nut coefficient will produce an incorrect indication of available stem thrust. The licensee's assumption for SFC should be consistently identified and applied throughout their program.

In general, Hatch safety related MOVs were controlled by the torque switch in the closed direction and the open limit switch in the open direction.

The licensee accounted for degraded voltage conditions through the use of an undervoltage factor that is part of the motor actuator capability calculation. This factor was determined for each MOV based on the minimum value of terminal voltage that would exist at the motor under degraded voltage conditions. The inspectors reviewed the design input voltage ratios used in the actuator capability calculation and did not identify any concerns for the DC operated MOVs. Deficiencies related to the A.C. degraded voltage calculation were identified and are addressed in paragraphs 3.b and 3.m.

d. Design-basis Differential Pressure and Flow Testing

In recommended action "c" of the generic letter, the staff 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 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 where design basis conditions in situ is not practicable and at this time, an alternate method of demonstrating MOV capability cannot be justified. With the two stage approach, a licensee would evaluate the capability of the MOV using the best data available and then would work to obtain applicable test data within the schedule of the generic letter.

The NRC inspectors reviewed Hatch's GL 89-10 Program Description, Special Test Procedures (34SP-10181-DF-1-1S, 34SP-082291-DF-1-1S), and Site Procedure 53IT-TET-002-0S "Limitorque Valve Operator Diagnostic Testing (VOTES) and Set-up" to evaluate the licensee's generic letter program for differential pressure testing. The NRC inspector also conducted discussions with licensee personnel.

In a December 1989 letter written to the NRC, the licensee has committed to test where practicable. However, the licensee's program description was not clear in meeting this commitment. The licensee personnel agreed to revise their program description accordingly. Also, in regard to the two stage approach, the licensee needs to revise the program description to be consistent with the discussion in Supplement 1 to GL 89-10. The NRC inspectors will evaluate these efforts during future inspections.

The licensee completed static base line testing for 131 MOVs and dynamic testing for 30 MOVs. Special Test Procedures and Site Procedure 53IT-TET-002-0S were used to perform dynamic testing. The acceptance criteria for the Special Test Procedures were to establish system configurations, establish flow and pressure conditions near design basis conditions and ensure that the valve opened and closed at these conditions. The inspectors considered the progress made in performing dynamic tests to be a program strength.

Section 2.2 of Site Procedure 53IT-TET-002-0S stated that: "This procedure is for the collection of data only, and does NOT impact the operability of a motor-operated valve (MOV) as defined in Technical Specifications." The acceptance criteria for the Site Procedure 53IT-TET-002-0S were to ensure that the measured thrust was within a thrust window which was based on assumptions made as part of the thrust calculations. At the time of the inspection, the licensee had not evaluated the test data to ensure these assumptions were justified. For example, the licensee's prediction of thrust required to operate the valve is based on an assumed valve factor. If the licensee had underestimated the valve factor, then the thrust actually required to operate the valve would be greater than predicted. The acceptance criteria for the test should ensure that there is adequate margin between the thrust actually required to operate the valve and the thrust delivered at torque switch trip to account for differences between test conditions and design-basis conditions (such as differential pressure and flow). The licensee established the upper limit of its thrust window based on a weak link analysis (including motor capability under degraded voltage conditions). However, the licensee derived the thrust limit for motor capability based on an assumed stem friction coefficient. If the licensee underestimated the stem friction coefficient, the motor would have to produce more torque (than the licensee calculated) to deliver the thrust needed to operate the valve and might not have sufficient capacity to deliver the necessary torque under degraded voltage conditions. Although the Site Procedure 53IT-TET-002-0S

included possible torque wrench testing of the torque switch and recording of the motor current, it was not apparent that the licensee had evaluated these parameters for design-basis operability of the tested MOVs. The licensee indicated that test data will be evaluated, but did not provide a specific time frame. On March 31, 1992, the Licensee informed the NRC staff that thrust and torque calculations are based on assumptions which are the subject of industry research. The licensee further added that when reliable data becomes available it will be evaluated and incorporated as appropriate, using actual plant test data as part of the overall evaluation.

Following completion of dynamic tests, the licensee concluded that the valves were operable and passed the test. Discussions were held with NRC and the licensee on site, by telephone on March 4, 1992 and on March 31, 1992 at the corporate office in Birmingham, Ala.

The licensee presented the preliminary results of their evaluation of the dynamic test data. The preliminay results show that among the MOVs tested, there is a wide variation in margin between the thrust required to close the MOV and the thrust delivered at torque switch trip. No example of an MOV having negative margin was identified. Based on these results the NRC agreed that the Licensee had demonstrated that there is reasonable assurance that the MOVs are capable of performing their design functions. Objective evidence was presented by the Licensee regarding the final results of MOVs tested at Hatch Nuclear Plant.

e. Periodic Verification of MOV Capability

In recommended action "d" of the generic letter, the NRC staff requested that licensees prepare and revise procedures to ensure that adequate MOV switch settings are determined and maintained throughout the life of the plant. In Section j of the generic letter, the staff 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 five 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 an extent that the existing test results are not representative of the MOV.

The Licensees upper-tier program document, Generic Letter 89-10 MOV Program Description, dated February 19, 1992, has established requirements for performing a periodic static base-line test on each generic letter 89-10 MOV with an active safety function. A surveillance period of five years or three RFO has been specified for these tests. Site level procedure 50 AC-MNT-008-0S, Motor Operated Valve Maintenance and Testing, Revision 0, paragraph 8.33, implements these requirements and Attachment 1 identified those MOVs that were within the scope of the generic letter program. This procedure further

implements requirements for changing the surveillance frequency based upon evaluation of the MOV performance.

Discussions with licensee engineering personnel revealed that static diagnostic testing would be performed periodically to reverify design basis capability of the MOVs within GL 89-10 program scope. The inspector informed licensee management that the use of static testing to verify continued capability of an MOV to operate under worst case differential pressure and flow conditions was not considered adequate at this time. The reason given was the unknown relationship between the performance of an MOV under static conditions and under design basis conditions. Additional concerns related to static periodic tests involved failure of the generic letter program description to identify what test parameters were to be documented during performance of periodic tests. Neither were requirements for evaluating test data established in the upper-tier program document. The process by which base-line tested MOVs were incorporated into the PM program was also not described and site level procedures used for this task were not referenced in the Program Description.

The generic letter program has assigned responsibilities and established requirements for performing post-maintenance reviews of generic letter 89-10 MOVs. The objective of these reviews is to determine the appropriate diagnostic tests which will verify that the MOV is still capable of performing its design function. Lower-tier site level procedures 50 AC-MNT-008-0S, and 50 AC-MNT-002-0S, Maintenance Program, implement these requirements. Specifically, procedure 50 AC-MNT-008-0S, paragraph 8.4 identified typical maintenance activities for which PMTRs have been established. Also, requirements for performing MOV diagnostic post-maintenance tests have been established for maintenance activities on an actuator which could result in altering the valve seating characteristics. Eighteen month inspections are performed on MOVs to ensure proper lubrication as delineated in procedure 52 PM-MNT-005-0S, Limitorque Valve Operator Inspection, and guidance for performing MOV lubrication is given in Plant E. I Hatch Lubrication Guide.

The Licensee PM program requires that TOLs be checked at specified frequencies of 54 months to 60 months in accordance with the requirements of approved site level procedures. These requirements are not imposed as part of the generic letter program. The Licensee in their response to the Generic Letter stated that TOLs on most safety related MOVs were jumpered during plant operation. The Licensee committed to perform an engineering review for MOVs with TOLs that were not jumpered. At the time of the inspection the Licensee was involved in an effort to determine site commitments on TOLs; evaluate the use of TOLs; and provide recommendations to site personnel for specific MOV TOL configuration. Upon completion of this activity in June 1992, additional NRC inspection in this area may be required.

Based on review of three design change packages prepared for Unit 2 Generic Letter 89-10, Supplement 3 MOVs, the inspectors determined that post modification test requirements were not clearly defined. In discussions with Licensee's engineering personnel the inspectors were informed that future design change packages would specify post-modification test requirements and test acceptance criteria which will clearly demonstrate the achievement of design objectives. If plant staff determined that it is not practicable to perform post modification testing in situ under design basis condition the test requirements will be revised with a documented reason for the change.

f. MOV Failures, Corrective Actions, and Trending

In recommended action "h" of the generic letter, the NRC staff requested that the licensee analyze and justify each MOV failure and corrective action. The documentation should include the results and history of each as-found deteriorated condition, malfunction, test, inspection, analysis, repair, or alteration. All documentation should be retained and reported in accordance with plant requirements. It also suggested that the material be periodically examined (every two years or after each refueling outage after program implementation) as part of the monitoring and feedback effort to establish trends of MOV operability. These trends could provide the basis for a Licensee revision of the testing frequency established to periodically verify adequate MOV capability. The generic letter indicated that a well structured and component oriented system is necessary to track, capture, and share equipment history data.

Step 8.6.1 of procedure 50AC-MNT-008-0S, Motor Operated Valve Maintenance and Testing, Revision 0, requires review of NPRDS reported MOV failures and causes every two years. The inspectors reviewed the listing of MOV failures that occurred from 1984 to 1991 documented in a licensee inter-office memorandum from P. Roberts to P. Fornel dated January 28, 1992. The inspectors also reviewed the work orders associated with the nine MOV failures that occurred in 1991. Results of this review indicated that the licensee did not perform any type of failure analysis for the majority of the MOV failures that occurred in 1991. The work orders did document corrective actions. Examples of corrective actions for MOV failures included replacement of torque switch, increase torque switch setting, replace motor, adjust limit switch, and replacement of actuator internal components. Analysis was not performed to determine the causes for these component failures. The licensee does have a root cause program but only one of the nine MOV failures that occurred in 1991 met the criteria to be evaluated for root cause. The inspectors concluded that in order to comply with GL 89-10, the licensee needs to modify its program to require a failure analysis for all failures associated with GL 89-10 MOVs.

Question 39 in Supplement 1 to GL 89-10, suggests that the licensee utilize the examples listed in Attachment A to the generic letter for trending MOV data. In reviewing the licensee's program, the inspectors noted that the program did not specifically address what was required to be trended other than MOV failures. The inspectors also noted that the licensee's philosophy for what constituted a MOV failure was less conservative than the examples identified in the attachment to the GL. For example, item 31 of the attachment to the GL considers that incorrect reassembly or adjustment after maintenance and/or testing as an item to be trended. If an MOV failure occurred as a result of poor maintenance and was identified prior to returning the valve to service, the licensee did not consider it a failure and it was not trended. Also, the program did not require that diagnostic test data be trended. The inspectors consider that this information would be useful in determining an MOV periodic test basis. The inspectors consider that the MOV program could be enhanced by being more descriptive on what is required to be trended.

The inspectors reviewed procedure 10AC-MGR-004-0S, Deficiency Control System, Revision 6, in order to evaluate if MOV deficiencies were being properly documented. In 1991 there were approximately 2600 deficiencies written against valves in general and the inspectors concluded that deficiencies were being documented. The inspectors discussed with several shift supervisors the normal response to MOV failures. The shift supervisors indicated that there was some discretion in determining who was required to initially troubleshoot the failure and in determining if a deficiency card was required. If an MOV failure occurred, operations would check if the thermal overload tripped. If the thermal overload was tripped, operations would reset it, operate the MOV and probably initiate a deficiency card. Another corrective action of an MOV failure would be to attempt to cycle the valve a second time, and if the valve operated a deficiency card would probably be initiated for future valve maintenance. The inspectors considered that development of a procedure to outline immediate actions for an MOV failure would be an enhancement to the licensee's MOV program. This would ensure that the failure was properly documented and if plant condition permitted, allow troubleshooting to occur while the condition existed. Often it is difficult to reproduce a MOV failure because the pressures and temperatures of the system when the failure occurred cannot be reproduced if troubleshooting is not immediately performed.

g. Schedule

GL 89-10 requests that licensees complete all design-basis reviews, analyses, verifications, tests, and inspections that are initiated to satisfy the generic letter recommendations by June 28, 1994, or 3 refueling outages after December 28, 1989, whichever is later.

The inspectors reviewed the licensee's response to the generic letter, dated December 28, 1989. The response stated that the licensee's intent is to complete the design basis review and static (zero) differential pressure testing, in addition to some differential pressure testing, within five years or three refueling outages, whichever is later. The inspectors reviewed the licensee's Generic letter 89-10 MOV Program Description, in which it states that an exception to the GL was taken for the completion schedule and scope for in-situ dynamic testing. From discussions with licensee personnel, it was not clear to the inspectors which schedule exceptions and testing exceptions the licensee had taken in their original response to the GL (December 28, 1992). In addition, licensee personnel indicated that, contrary to the Program Description, the five year schedule would be satisfied in accordance with GL recommendations. The licensee also stated that in situ dynamic testing would be performed, where practicable, for those valves where design basis differential pressure could be achieved. For those valves where design basis differential pressure could not be achieved, a maximum achievable differential pressure test would be performed, if practicable. Due to the apparent conflict between the licensee's Program Description and discussions held with personnel during the inspection, the inspectors requested the licensee to provide a written response clarifying schedule and testing intent. In addition, revisions to the Program Description may be necessary to reflect these clarifications.

The inspectors also reviewed the licensee's schedule for completion of activities recommended in Supplement 3 of the generic letter. This supplement documented NRC concerns regarding the ability of BWR MOVs on certain high energy lines to fully close under guillotine line break conditions. In a letter dated March 15, 1991, the licensee extended its original implementation schedule for Unit 1 beyond the Fall 1991 outage due to the unavailability of qualified equipment. The licensee has determined it will be necessary to implement the necessary changes requested by Supplement 3 during the subsequent Unit 1 maintenance/refueling outage, currently scheduled for the Spring of 1993. The schedule for Unit 2 implementation remains unchanged (Fall 1992). The NRC has not provided a written response to the licensee's March 15, 1991, letter.

The inspectors reviewed the status of the licensee activities related to completion of the GL 89-10 schedule within the five year period. Areas reviewed included design basis reviews, static testing, dynamic testing, and development of implementation procedures at the site. The licensee stated that of the 291 MOVs which were identified as potential candidates for inclusion into their Program, design basis reviews had been completed for 223. Of these 223 MOVs, 159 were identified as having an active safety function (and thus would be included in the GL 89-10 program). Of these 159 MOVs, 131 had been

statically tested with diagnostic equipment. The licensee had performed 30 dynamic tests thus far on these 159 valves, and had identified 60 valves for which dynamic tests could not be performed. Based on this review, the inspectors determined the licensee has made good progress towards completion of design basis reviews, static and dynamic testing, and associated implementing procedures. The licensee stated that no problems were anticipated with completion of the GL 89-10 Program within the recommended schedule.

h. Overall Administration of MOV Activities

The inspectors reviewed the licensee's Generic Letter 89-10 MOV Program Description, dated February 19, 1992. This document provides an overall description of the MOV Program, including purpose, scope, responsibilities, program documents, schedule, training, activities and considerations involved with design basis review, and the site testing program. The Program Description provides a detailed listing of the principal MOV Program documents.

The Hatch Nuclear Maintenance and Support group is responsible for overall MOV Program development, including coordination between the site, the A/E, contractors, and diagnostic equipment procurement. From discussions with licensee personnel, the inspectors noted a strong corporate involvement in the program development and assistance with implementation at the site. Communication between the site and corporate (Birmingham) was good. The inspectors also noted that the Program Manager (corporate) is actively involved in a leadership role and as a member in a number of industry groups which pursue MOV related issues. The inspectors held extensive discussions with the Program Manager, the site testing coordinator, and other personnel involved with design basis reviews, and found them to be very knowledgeable regarding the generic letter issues and technical problems.

i. MOV Setpoint Control

The Licensee's Generic Letter 89-10 Program Description, paragraph 5.0, described the process used for determining torque switch setpoints. The licensee controlling document for determining torque switch setpoints is Torque Switch Setting Guide, Drawing No. A-43830, Revision B. The methodology delineated in this document involves determination of thrust range during the design basis review. This "window" is based on a minimum required thrust to operate the valve and a maximum allowable thrust as determined by the valve weak link analysis. Provisions have been made to incorporate diagnostic equipment error within the window to ensure adequate thrust margin.

The inspectors determined that the licensee's torque switch setpoint values do no presently include errors associated with torque switch repeatability. The program description does, however, address the need to include these errors in the future.

The inspectors determined that the Generic Letter 89-10 Program Description does not address the ANSI N45.2.11-1974 design controls that would be implemented during this change process. Also the program description does not reference applicable site level implementing procedures that would be used during setpoint changes. The omission of these setpoint change controls from the program description is identified as a concern for future NRC followup.

Limit switch setpoint changes were determined to be controlled by the design control program and were implemented via drawing changes involving limit switch setpoints that are specified on approved design drawings. Sizing of TOLs and the change control process for TOLs was not described in the Licensees Generic Letter 89-10 Program. The licensee is presently involved in an ongoing effort to determine what is their commitment to Regulatory Guide 1.106, Thermal Overload Protection for Electric Motors on Motor-Operated Valves. This activity is scheduled to be completed by June 1992 at which time the licensee will provide guidance to site personnel concerning the use of TOLs. This item is identified as a concern which requires additional NRC review upon completion of the licensee's evaluation of the licensing basis with regard to Regulatory Guide 1.106.

j. Training

The inspectors reviewed the required training for maintenance personnel who work on MOVs; operate diagnostic test equipment; and evaluate diagnostic test data. Procedure DI-MNT-11-02a7N, Qualification of Maintenance Personnel, Revision 2, defines the process for qualifying personnel. In order to work on MOVs, maintenance personnel must pass MOV courses given at the onsite training center by station instructors. Different MOV courses are given to electricians and mechanics. Both courses contain a specified number of hours for classroom and lab work. A vendor provided a one week course for the operation of MOV diagnostic test equipment and evaluation of diagnostic test data. The licensee reviewed the qualifications of the vendor's instructors.

The inspectors toured the licensee's MOV training facility. The electricians training facility MOVs were modeled after the plants MOVs and control circuitry. When working on MOVs at the training facility, electricians were able to utilize the same drawings that would be used in the plant. The training facility for electricians was identified as a strength.

The inspectors noted that general refresher training was routinely given to maintenance personnel. The inspectors verified that operating experience, NRC Information Notices, and Part 21 notices associated with MOVs were discussed during refresher training. The inspectors noted that Limitorque maintenance updates were evaluated by the licensee but not included in maintenance personnel refresher

training. The inspectors consider that Limitorque maintenance updates should be discussed in refresher training. The licensee agreed and initiated actions to include Limitorque maintenance updates in refresher training.

The inspectors reviewed the training guide that is utilized to train operators on MOVs. The training was very basic but considered adequate. The inspectors noted that there were not any formal training requirements for these positions; however, personnel had adequate training and were knowledgeable of MOVs.

k. Industry Experience and Vendor Information

The licensee is actively involved in a number of MOV industry groups. The MOV coordinator is a member of the BWROG MOV Testing Committee, BWROG Valve Technical Resolution Group, EPRI MOV Performance Prediction Program, MOV Users Group, and VOTES Users Group. The licensee has developed three administrative procedures to ensure that industry experience and vendor information is properly incorporated into plant procedures and training programs. The inspectors reviewed procedures 10AC-MGR-005-08, Operating Experience Program and Corrective Action Program, Revision 7, 20AC-ADM-05, Vendor Manual Control, Revision 3, and 03RC-CPL-002-05, Defects and Noncompliance, Revision 0. The inspectors also reviewed selected Part 21 notices, NRC Information Notices, and Limitorque manual updates to verify that they had been properly reviewed and implemented. The licensee's industry experience and vendor information program was considered a strength.

l. Use of Diagnostics

The licensee was currently using TES to measure thrust during static and dynamic testing. Site Pro re 53IT-TET-002-05 controls the use of VOTES diagnostics test equipment. As indicated earlier, when torque switch repeatability information becomes available and new thrust windows are established, the licensee needs to revise Site Procedure 53IT-TET-002-05 to account for these margins. The NRC inspectors will review this effort during future inspections. The licensee also uses Motor Actuator Characterizer (MAC) test equipment to measure torque measurements. However inspectors were concerned that torque measurements were only taken when problems were identified with a MOV. An understanding of available thrust and torque is important for evaluating MOV performance at design basis conditions. Also, this allows the licensee to validate their assumptions for SFC. Other than the above concern, the NRC inspectors considered the use and control of diagnostics to be adequate.

m. Supplement 3

The inspectors reviewed the licensee's response to Supplement 3 of GL 89-10; modification packages; and thrust and degraded voltage calculations. The licensee identified 2 MOVs in the RCIC system, 2 MOVs in the RWCU system, and 2 MOVS in the HPCI system for Hatch's Units 1 and 2 to be within the scope of Supplement 3 of GL 89-10. According to the response to Supplement 3, the licensee assumes a valve factor of 0.50 based on NRC-sponsored MOV research. To meet the thrust requirements of a 0.50 valve factor, modifications to the motor, actuator, valve, and power cables were required. These modifications were developed and were applicable to Units 1 and 2 HPCI steam supply MOVs, the RWCU water supply isolation MOVs, and Unit 2 RCIC steam supply isolation MOVs. The design changes for Unit 2 will be implemented during the fall of 1992. The design changes for Unit 1 will be implemented during the spring of 1993. At the time of the inspection the NRC had not provided a written formal approval of the Licensee's extended schedule for completing modifications to the MOVs within the scope of GL 89-10, Supplement 3.

The inspectors reviewed thrust calculation SMNH 90-015 "Blowdown Valves MOV Sizing" Rev 0, November 30, 1990, to determine MOV capability according to the new design changes. The inspectors did not identify any immediate concerns regarding the capability of the MOVs to perform their design basis function to isolate containment in the event of pipe break downstream of the valves.

The inspectors reviewed A.C. degraded voltage calculation SENH 91-060, Voltage Study for A.C. Operated High Energy Line Break Valves, that was prepared in support of plant modifications for Unit 2 MOV 2E41-F002. This calculation assumed a minimum degraded grid voltage of 101.3 percent of 230 kv. The starting system voltage of 1.013 PU is too high to activate the degraded voltage relay and is not consistent with the recommendations of the Generic Letter. A similar issue was identified during the EDSFI and the licensee has made a presentation to NRC management concerning this inspection finding. On March 31, 1992, the Licensee stated that A.C. degraded voltage calculations would be performed for Units 1 and 2. The starting system voltage would be based on a value of degraded voltage at the 4160 volts Class IE buses that has not yet been determined by the Licensee. Scheduled completion dates for these calculations are June 1, 1992 for Unit 1, and September 1, 1992, for unit 2. Additional concerns were identified and involved failure of the licensee to include the TOLs in the calculation and failure to correct circuit resistances for high accident temperature. Licensee's engineering personnel have agreed to re-do the calculation to address the concerns identified.

4. Conclusions

The Licensee had developed a basic program which adequately addressed most of the generic letter program recommendations. The inspectors identified both strengths and concerns in various program areas. One item concerning licensee's evaluation of test data obtained during MOVs dynamic tests was discussed with Licensee management in a telephone conversation on March 4, 1992 and on March 31, 1992.

A written response is requested to clarify the Licensee's commitment to the generic letter recommendations concerning program schedule and testing requirements. The concerns will be examined during subsequent NRC inspections.

5. Exit Interview

The inspection scope and results were summarized on February 28, 1992 with those persons indicated in Appendix 1. The inspectors described the areas inspected and discussed in detail the concerns listed in the "Summary". Proprietary information is not contained in this report. Dissenting comments were received from the Licensee concerning the review of test data following MOVs dynamic tests. The issues was discussed with Licensee and NRC management during a telephone conversation on March 4, 1992 and Corporate Office on March 31, 1992.

Appendix 1

Persons Contacted

*D. Atwood, Senior Engineer, Hatch Nuclear Maintenance and Support
*S. Brunson, Senior Engineer 1
*D. Dismukis, Engineering Supervisor, Bechtel
*H. Dougherty, Nuclear Associate, Oglethorpe Power Corporation
*P. Fornel, Manager Maintenance, Plant Hatch
*O. Fraser, Site Supervisor, Safety Audit and Engineering Review
*R. Glisson, Maintenance Engineering Supervisor
*R. King, Acting Manager, Engineering Support
*L. McWhorter, Senior Engineer, Southern Company Services
*T. Metzler, Acting Manager, Nuclear Safety and Compliance
*R. Miller, Engineering Group Manager, Hatch Project
*W. Mock, Junior Engineer, Plant Hatch
*J. Payne, Senior Engineer 1
*D. Read, Assistant General Manager, Plant Operations
*P. Roberts, Manager, Outage and Planning
*K. Russell, Nuclear Specialist, Safety Audit and Engineering Review
*B. Snider, Supervisor, Hatch Project
*L. Summer, General Manager, Plant Hatch
*A. Wehrenberg, Manager, Nuclear Support, Southern Company Services
*P. Wells, Acting Manager, Operations

NRC Resident Inspectors

*L. Wert, Senior Resident Inspector
*K. Jabbour, Senior Project Manager, NRR

*Attended Exit Interview

Appendix 2

ACRONYMS AND INITIALISMS

AC - Alternating Current
BWR - Boiling Water Reactor
BWROG - Boiling Water Reactor Owners Group
CS - Containment Spray
DBA - Design Basis Accident
DC - Direct Current
DCP - Design Change Package
EDSFI - Electrical Distribution System Functional Inspection
EOP - Emergency Operating Procedures
EPRI - Electric Power Research Institute
FSAR - Final Safety Analysis Report
GL - Generic Letter
HELB - High Energy Line Break
HPCI - High Pressure Coolant Injection
MOV - Motor Operate Valve
NPRDS - Nuclear Plant Reliability Data System
NRC - Nuclear Regulatory Commission
NRR - Nuclear Reactor Regulation
PM - Preventive Maintenance
PMTR - Post Maintenance Test Requirements
RCIC - Reactor Core Isolation Cooling
RFO - Refueling Outage
RHR - Residual Heat Removal
SCS - Southern Company Services
SFC - Stem Friction Coefficient
TOL - Thermal Overload
VOTES - Valve Operation Test and Evaluation System