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

Report Nos.: 50-335/91-18 and 50-389/91-18

Licensee: Florida Power and Light Company
9250 West Flagler Street
Miami, FL 33102

Docket Nos.: 50-335 and 50-389 License Nos.: DPR-67 and NPF-16

Facility Name: St. Lucie

Inspection Conducted: September 9-13, 1991

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SUMMARY

Scope:

This special, announced team 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 licensee committed to comply with the recommendations of the generic letter without exception and a basic program was found to have been developed which adequately addressed most of the recommendations. Much of the program was in an early phase of implementation. Concerns were identified in some areas. Strengths were also noted.

The concerns involved potential deviations from the recommendations of the generic letter, a vendor recommendation that was not being met, and

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programmatic details that were not sufficiently well defined to assess at this time. A written response is being requested for two concerns which involve potential deviations from the recommendations of the generic letter. One is a concern that the schedule recommended by the generic letter will not be met due to delays resulting from the licensee's recent decision to alter its diagnostic test method because of deficiencies disclosed in the previous method through recent industry testing. The other is that differential pressure and flow testing was omitted for several valves in a group and was being considered for an additional group, even though these valves could have been tested and the omission conflicted with a generic letter recommendation to test if practicable.

The concerns and strengths identified are listed below, with the concerns separated into those for which a written response is being requested and those for which none is being requested:

Concerns - Written Response Requested

(1) The licensee may not meet its generic letter schedule commitment due to delays caused by the its recent decision to alter its diagnostic test method. The decision to alter the diagnostic test method stems from recent industry test results which indicate deficiencies in the capabilities of the method formerly used. The alteration in diagnostic test method is expected to especially impact the testing planned for the October 1991 Unit 1 refueling outage. There may be insufficient time to assess and gain experience needed for selection and application of a different or altered method before the start of the outage. The licensee has no experience with other equipment and/or measurement methods and the diagnostic testing personnel, equipment, and procedures for the refueling outage beginning in October 1991, are to be contracted. The contractor and equipment to be used have not been determined and other licensee's are expected to be competing for similar equipment and services during the same time period. This may lead to difficulties in obtaining equipment, procedures, and qualified personnel. The future refueling outages in which most of the MOV testing and related work are to be performed are currently planned to be of short duration (45 to 55 days), limiting the time available to accommodate any difficulties encountered. [Ref. Sections 3.g and 3.l]

(2) Design-basis differential pressure and flow testing was being omitted on a number of GL 89-10 valves even though testing was practicable. During the inspection licensee personnel indicated that credit might be taken for Bulletin 85-03 testing on 56 valves even though only 23 had been tested. Further, the licensee's status report indicated that GL 89-10 testing of 12 Unit 2 butterfly valves was complete but that differential pressure and flow testing had not been performed on 6 of the valves even though they were practicable to test. This omission of differential pressure testing on valves where it is practicable is contrary to the recommendations of GL 89-10 and to the licensee's commitment to comply with GL 89-10. [Ref. Section 3.d]

Concerns - No Written Response Requested

(1) There was currently no procedure or programmatic guidance for determining how the torque switch setpoint window determined through design calculations would be transformed into a plant setpoint window and target. [Ref. Section 3.c]

(2) The valve factors used in gate valve thrust setting calculations were increased to 0.5 from the 0.2 and 0.3 values previously applied. This was done to account for the effects of rate of loading and other factors that have not been quantified. It is not clear that the increase is adequate to account for the uncertainties. Additionally, no provision was made to account for the effects of similar factors on globe valves. [Ref. Sections 3.b and 3.c]

(3) The St. Lucie NRC Generic Letter 89-10 Program Description (JPN-PSL-SEMP-30R1) indicated that FPL was evaluating the application of two exceptions to the generic letter's recommendation to perform design-basis testing on all valves in the program if practicable. The first exception was for MOVs which have a sufficiently low design-basis differential pressure, such that the ratio of the thrust (or torque, by implication) required to overcome the differential pressure to the actual thrust (or torque) delivered by the operator would be very small. The second exception was for MOVs with a high margin between the thrust (or torque) required at design-basis conditions and the operator available thrust (or torque). The exceptions may be justifiable but, if applied, represent further deviations from the licensee's present commitment to the NRC. [Ref. Section 3.d]

(4) The licensee's program indicated that the periodic verification of continued MOV capabilities to perform their design-basis functions will be accomplished through static diagnostic testing. The ability of static diagnostic testing to demonstrate the continued capabilities of MOVs to perform their design-basis functions has not been justified. [Ref. Section 3.e]

(5) A valve stem friction coefficient of 0.15 was utilized in calculating torque switch settings for St. Lucie GL 89-10 valves located outside containment. The valve actuator manufacturer indicates this stem friction coefficient is to be applied where good stem lubrication is assured and, in practice, the manufacturer normally utilizes a more conservative 0.20 stem friction coefficient for its calculations. Also, the actuator manufacturer recommends an 18 month preventive maintenance frequency for valve stem lubrication and the licensee permits a 36 month frequency on its non-equipment qualification valves. This results in many MOVs outside containment receiving the longest period between stem lubrications but having the best assumed stem friction coefficient. The licensee will be expected to justify its use of the 0.15 coefficient from its testing or another appropriate source. [Ref. Section 3.c]

(6) Some of the St. Lucie Unit 2 butterfly valves are seated on torque. This practice is not recommended by the manufacturer (Limitorque) of the actuators (Type HBC) used on the valves. Licensee personnel were unable to explain the reasoning for torque seating these butterfly valves. [Ref. Section 3.c]

(7) The program was unclear regarding how results of tests performed at less than full differential pressure would be extrapolated to verify the adequacy of thrust settings. In addition, it was indicated that prototype testing may be used to justify some thrust settings. Criteria for the extrapolations and use of prototype test results have not been developed and documented. [Ref. Section 3.d]

(8) Guidance for documenting and trending MOV degradation and failure information was not adequately defined. [Ref. Section 3.f]

Strengths

(1) The personnel involved in the program were very knowledgeable of the issues involved in the generic letter. [Ref. Section 3.h]

(2) Good refresher training was being provided for the upcoming October 1991 outage. [Ref. Section 3.j]

(3) The licensee's recognition that the standard industry valve factors are not wholly adequate for gate valve setting calculations. [Ref. Section 3.b]

(4) Positive efforts had been undertaken to address recent industry concerns regarding the capabilities of the diagnostic testing equipment previously used. [Ref. Section 3.l]

(5) Preventive maintenance procedures provided very definitive information regarding the attributes to be assessed. [Ref. Section 3.f]

No violations or deviations were identified.

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REPORT DETAILS

NRC Inspection of the Program Developed in Response to Generic Letter 89-10 at the St. Lucie Plant

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 results 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 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 staff requested licensees to submit a response to the generic letter by December 28, 1989. Florida Power and Light (FPL) submitted a response to the generic letter for its St. Lucie facility on December 28, 1989 and provided additional details in a second response on June 27, 1990. In those responses, FPL indicated it would comply with the recommendations of the generic letter, including its 5-year schedule (completion by June 28, 1994).

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

3.a Scope of the Generic Letter Program

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

The inspectors reviewed and discussed the scope of the GL 89-10 program with FPL personnel. It included 80 Unit 1 and 105 Unit 2 MOVs. The screening criteria used to identify the St. Lucie MOVs within the scope of GL 89-10 were found described in Section 3.1 of the "NRC Generic Letter 89-10 Program Description, St. Lucie Units 1 & 2", JPN-PSL-SEMP-91-30R1, which is a St. Lucie Production Engineering Group document. The criteria given in this document were for determining what MOVs should be excluded from the scope. It was stated that all St. Lucie MOVs were screened using these criteria. With one exception, the criteria were consistent with the generic letter and the clarification provided by its Supplement 1. The exception was a statement indicating that other exclusions were acceptable if documented justification was provided. The engineering Program Description document stated that the evaluation in accordance with the exclusion criteria had been performed and was documented in Engineering Evaluation JPN-PSL-SEMJ-90-072.

The inspectors reviewed the above Engineering Evaluation and determined (subject to a more detailed review during a program implementation inspection) that all of the exclusions appeared adequately justified, though for two groups the exclusions were not strictly in accordance with the generic letter criteria. These two groups involved valves in Hydrogen Purge low pressure air piping and in low pressure Heating Ventilation and Air Conditioning system piping. Omission of these valves was based on their similarity to other valves which Supplement 1 to the generic letter indicated could be excluded, namely valves in low pressure ventilation system ducting.

As an audit of the completeness of the scope of the program, the inspectors reviewed the four piping and instrumentation drawings that encompassed the entire Unit 1 Low Pressure Safety Injection system and the two that contained the Unit 2 Auxiliary Feedwater system. No valves were identified that had been improperly excluded from the GL 89-10 program.

No concerns were identified in this area.

3.b Design-Basis Reviews

In recommended action a of GL 89-10, the NRC 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. FPL committed to comply with the recommendations of GL 89-10 in letters to the NRC dated December 28, 1989 and June 27, 1990.

Accordingly, the inspectors examined the FPL GL 89-10 Program Description document (JPN-PSL-SEMP-91-030) and a sample of design-basis review calculations, identified PSL-1FJM-91-011, to determine that the review methodology and criteria were consistent with the recommendations of GL 89-10 and Supplement 1.

In Section 3.2.2 of the Program Description FPL described the methodology for performing the design-basis review for the MOVs. The method consisted of a two-phase approach as recommended in the EPRI Application Guide for Motor Operated Valves in Nuclear Power Plants (NP-6660-D). In Phase 1 of the design-basis review a bounding calculation is performed to determine the maximum expected differential pressure for each MOV during opening and closing for both normal and abnormal events and including valve mispositioning conditions. Phase 1 yields a conservative differential pressure; however, it does not address design flow effects and other factors discussed in the staff response to Question 16 of Supplement 1 to GL 89-10. In Phase 2 of the design-basis reviews a more detailed systems analysis is required to determine realistic differential pressures, expected flow rates, and system temperatures. The guidance of EPRI NP-6660-D, Appendix C is required to be followed for this review. Data for input in this analysis is taken from existing plant documentation such as the FSAR, plant drawings, system descriptions, plant operating and emergency procedures.

FPL had completed Phase 1 for all Unit 1 valves. Unit 2 calculations were in progress. Two detailed (Phase 2 format) calculations (covering a total of 8 valves) had been completed in support of Unit 1 testing at the upcoming outage in October 1991. FPL stated that a detailed Phase 2 design-basis review will be completed for each MOV prior to testing at design-basis conditions. In accordance with its GL 89-10 Program Description, FPL is required to revise current settings and verify design-basis capability for the valves in the NRC Bulletin 85-03 program. The Program Description, Section 3.6, specified a screening process to be completed in 1991 to verify that the original NRC Bulletin 85-03 design-basis and differential pressure calculations insure MOV operability at design-basis conditions. Phase 2 detailed reviews were specified to be completed in 1992 for all NRC Bulletin 85-03 valves.

Treatment of the additional factors which can affect the thrust required to operate a MOV were discussed in Section 3.2.4 of the Program Description. Licensee personnel stated that seismic effects are expected to be negligible. Engineering was in the process of developing a FPL position on this matter. Degraded voltage and cables and power supply were considered in the analysis. Other factors such as high temperatures, flow rate, rate of loading and internal valve clearances were not quantified for use in the calculations. The Program Description indicated these factors were accounted for in the FPL calculations for gate valves by using a valve factor of 0.5 rather than the 0.2 to 0.3 previously applied in the industry. No provision was made for the effects of rate of loading or other factors in globe valve calculations. Licensee personnel indicated that test results would be provided to Engineering for analysis to verify that the valve factor of 0.5 results in adequate conservatism for switch settings. This will be reviewed by NRC Region II in the GL 89-10 implementation inspections.

Worst case degraded voltages were established in documented calculations. The methodology used for AC degraded voltage calculations was contained in Calculation Nos. PSL-1-J-E-90-002 (May 10, 1991, Rev. 1) for Unit 1 and PSL-2-J-E-90-003 (April 18, 1990, Rev. 0) for Unit 2. The licensee determined the voltage at the motor terminals by calculating the voltage drop of the cables from the Motor Control Center (MCC) to the motor terminals. The

calculation utilized motor locked rotor current, the total resistance of the cable and the postulated elevated temperatures (200 degrees F inside containment and 104 degrees F outside containment) above ambient. The inspectors did not identify any concerns with the AC degraded voltage calculations.

The methodology used for DC valves was contained in Ebasco Report No. FLO-124-37.5001 (December 1, 1989, Rev. 0) for Unit 1 and FLO-124-37.5000 (May 24, 1990, Rev. 0 Draft) for Unit 2. These reports address concerns expressed in INPO Significant Event Report 25-88 and the NRC Information Notice 88-72. FPL had sent the calculations contained in the reports to the actuator supplier (Limitorque) for comparison with their motor curve information for determination of worst case expected torque. Unit 1 had been completed and was verified by the inspectors. FPL stated that the Unit 2 determination was still in progress with a scheduled completion date of December 31, 1991.

The inspectors questioned whether the ambient temperatures caused by design-basis accidents had been determined, as they might increase the temperatures of valve motors and thereby reduce the available torque to unacceptable levels. FPL determined that four Unit 1 MOVs experienced design-basis accident temperature increases which might cause significant output torque reductions. At the postulated maximum accident temperature of these four valves, which was 240 degrees F, it was determined that there would be a conservative 8 percent decrease in torque. The inspectors found that these four MOVs each had a calculated margin of torque in excess of 53 percent. FPL personnel noted that Limitorque was currently conducting testing to determine the affects of high ambient temperature on torque and stated that they will review Limitorque's test results and take appropriate action if required.

Licensee personnel indicated that the plant's application of thermal overloads (TOLs) for valve motors was being modified. Plant Change/Modification (PC/M) 171-191 had been initiated for Unit 1 and PC/M 161-290D for Unit 2 for thermal overload (TOL) sizing and replacement. The inspectors determined from a review of these PC/Ms that the methodology used to select the TOLs was in accordance with IEEE Standard 714-1990. The inspectors were informed that the Unit 1 and Unit 2 TOL changes would be implemented by the end of the Unit 1 1993 and Unit 2 1994 refueling outages, respectively.

3.c MOV Switch Settings

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

The inspectors reviewed the licensee's PSL-1FJM-91-015 (September 9, 1991, Rev. 3 Draft) "NRC Generic Letter 89-10 MOV Thrust Calculation" and PSL-1FJM-91-017 (September 10, 1991, Rev. 2) "NRC Generic Letter 89-10, Gate/Globe Valve Motor Operator Evaluations." The inspectors also discussed the process for sizing MOVs and setting their switches with FPL personnel.

FPL had completed sizing and switch setting calculations for approximately 39 gate and globe valves in its GL 89-10 program at St. Lucie. A standard industry equation was used for determining the required minimum thrust for gate and globe valves. The worst case differential pressures identified in each MOV's design-basis calculation were applied in sizing and setting the MOVs for opening and closing capability. As noted in Section 3.b above, the valve factor assumed had recently been revised from 0.20 and 0.30 to 0.50 for its gate valves. This step was taken to add thrust margin to account for factors such as high temperature, flowrate, rate of loading, and variation associated with internal valve clearances. However, FPL could not provide information that would justify the assumption that this change in valve factor bounds the effects of rate of loading and the other identified uncertainties. Thrust calculations for globe valves were observed to utilize a valve factor of 1.1, as recommended by Limitorque. FPL assumed that rate of loading does not effect globe valve thrust determinations. If its testing fails to demonstrate that the calculations are adequate to account for rate of loading (or other factors) for gate and/or globe valves, further revisions to setting calculations will be necessary. The NRC will review FPL's consideration of rate of loading effects during subsequent inspection of the implementation of the generic letter program.

FPL assumed a stem friction coefficient of 0.15 for MOVs outside containment and 0.20 for MOVs inside containment. An 18 month lubrication frequency was applied to Equipment Qualification (EQ) MOVs and a 36 month frequency for non-EQ MOVs. This results in many MOVs outside containment receiving the longest period between stem lubrications but having the best assumed stem friction coefficient. FPL had not justified its use of the less conservative 0.15 stem friction coefficient for MOVs at St. Lucie. The assumption of 0.15 as the stem friction coefficient may not be valid unless specific maintenance and lubrication requirements and frequencies are implemented to ensure the continued high efficiency of torque to thrust conversion. FPL will be expected to justify its use of a stem friction coefficient lower than the more typically and conservatively used value of 0.20. This was identified as a concern for further review in the subsequent inspection of GL 89-10 implementation.

The inspectors reviewed FPL's GL 89-10 program description and found no specific guidance on what methodology would be used during the baseline setup of MOV torque switches except to say that diagnostics would be used to set torque switches above the minimum required thrust and below the maximum allowable thrust, as calculated by engineering. No margins were identified to allow for diagnostic equipment inaccuracies. Licensee personnel informed the inspectors that diagnostic equipment inaccuracies will be accounted for by adjusting the required minimum and maximum allowable thrust numbers to obtain an appropriate "window", and then setting the torque switch for the middle of the adjusted thrust band as a "target". Specific margins had not been identified because the licensee had not decided on the diagnostic equipment to be used for the GL 89-10 program (see Section 3.1, "Use of Diagnostics" for further discussion). FPL personnel indicated that the program description and procedures would be revised to document the torque switch setup methodology. The inspectors identified this as a review item for future inspection of GL 89-10 implementation.

FPL uses the open limit switch to control the opening of all GL 89-10 MOVs. The open limit switch is set at approximately 95 percent of the open stroke for gate and globe valves. Torque switch bypass is in effect for the first 20 to 25 percent of the open stroke to prevent high unseating loads from prematurely stopping valve operation. The amount of torque switch bypass in the open direction may be adjusted, on a case-by-case basis, as determined necessary by diagnostic testing. FPL torque seats its GL 89-10 gate and globe MOVs with the exception of one Unit 1 and five Unit 2 MOVs which are limit seated. None of the limit seated MOVs have any ASME Section XI, Category A leakage criteria associated with them. Butterfly valves in St. Lucie's GL program use the close limit switch to control valve seating with the exception of a small number of Unit 2 butterfly valves that are torque seated. This practice is not recommended by the manufacturer (Limitorque) of the actuators (Type HBC) used on the valves. Licensee personnel were unable to explain the reasoning for torque seating these butterfly valves. This issue will be reviewed during future inspections.

The licensee's NRC GL 89-10 Program Description, JPN-PSL-SEMP-91-030, paragraph 3.3.5, identified the methodology used for selecting thermal overload relay heaters and verified that the thermal overload protection bypass philosophy is based on NRC Regulatory Guide 1.106, position C1. The program description further added that Unit 1 licensing predates the Regulatory Guide and makes no commitment to it. It included a listing of GL 89-10 MOVs which indicated the extent to which the Regulatory Guide 1.106 commitment was implemented for Unit 2 and the use of an Engineered Safety Feature Actuation Signal (ESFAS) to bypass the thermal overload relays for Unit 1 MOVs. The inspectors reviewed selected Control Wiring Diagrams for Units 1 and 2 MOVs and verified that the electrical controls implemented logic that was consistent with the description provided in JPN-PSL-SEMP-91-030.

The GL 89-10 Program Description stated that sizing and replacement of thermal overload devices is accomplished in accordance with ANSI/IEEE Standard 741-1990. The inspectors determined that selection of the MOV thermal overload heaters was accomplished via Ebasco Motor Operator Valve Thermal Overload Heater Selection Calculations EC-200 (Unit 1) and EC-185 (Unit 2). These calculations were used in conjunction with "MOV Thermal Overload Heater Selection" procedures BCS-171-191.3000 (Unit 1) and BCS-161-290.3001 (Unit 2). Changeout of the thermal overload relay heaters in the field was accomplished via implementation of Plant Change/Modification (PC/M) 171-191-M, "Replacement of Thermal Overload Heaters for MOV PSL Unit 1", and PC/M 161-290D, "MOV Thermal Overload Devices PSL Unit 2". Based on review of the calculations, procedures, and PC/Ms the inspectors concluded that thermal overload heaters are sized in accordance with accepted industry practice. Additionally, design-basis information used in selection of the heaters was adequately prepared, reviewed, and approved within the ANSI N45.2.11-1974 design controls. The installation scope and special instructions specified in the PC/Ms provided for partial implementation and specified the plant operating modes under which installation could take place.

3.d Design-Basis Differential Pressure and Flow Testing

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

In Section 3.4 of the Program Description FPL indicated its intent to perform in-situ differential pressure testing on MOVs in the GL 89-10 program at or as near as possible to worst-case design-basis conditions. The two-stage approach recommended by GL 89-10 was specified for use where worst-case design-basis testing was not practicable. It stated that, if design-basis conditions could not be fully achieved in testing a valve, diagnostics would be applied to the valve and analytical methods would be used to extrapolate the test results to design-basis conditions. Where in-situ testing was impracticable, the Program Description indicated that plant, test facility, or industry prototype test data would be used and justified.

The Program Description gave no information on how extrapolation would be performed or how prototype test data would be applied. It did not define the method of extrapolating data to design-basis conditions, or the range of an acceptable extrapolation. This was identified by the inspectors for evaluation in subsequent NRC inspection.

The Program Description stated that two exceptions to the GL 89-10 recommendations for testing at worst-case design-basis conditions were under evaluation. The first exception was for MOVs which have a sufficiently low design-basis differential pressure such that the ratio of the thrust required to overcome the differential pressure to the actual thrust delivered by the operator would be very small. The second exception was for MOVs with a high margin between the thrust (or torque, by implication) required at design-basis conditions and the operator available thrust (or torque). These concepts are not consistent with GL 89-10 recommendations and would be considered a deviation from the current FPL commitment, which is to test at design-basis conditions where practicable. The inspectors informed licensee personnel that the NRC should be formally notified of any determination to deviate from their previous commitment, and of the basis, before the deviation was undertaken. Application of the exceptions will be reviewed in relation to the licensee's commitments at future MOV inspections.

The inspectors reviewed the status of the FPL test program. A brief description follows:

Unit 1

The Unit 1 differential pressure testing summary was presented by the licensee as follows:

80 MOVs total for Unit 1 GL 89-10 Program

12 MOVs that cannot be tested due to configuration

27 MOVs that have been analyzed by Bulletin 85-03

5 MOVs that can be tested non-outage

36 MOVs that must be tested in the next two outages

Phase 1 of the design-basis review was reportedly complete for 53 valves. Fifty-three valves was derived from 80 valves total less 27 valves analyzed per Bulletin 85-03. Phase 2 design-basis review and thrust calculations had been completed for 8 MOVs at the time of this inspection. Phase 2 reviews, thrust calculations and baseline diagnostic static testing were reportedly to be completed prior to performance of design differential pressure testing on each valve.

No GL 89-10 tests were performed in the first refueling outage (January 1990) following issuance of GL 89-10. Twenty-eight baseline static diagnostic tests and 12 design-basis differential pressure tests are planned for the October, 1991 Outage. All baseline static diagnostic tests and 24 design-basis differential pressure tests are scheduled to be complete by the end of the April 1993 (third) refueling outage. The above schedule includes the 27 valves analyzed in the 85-03 program.

Unit 2

The Unit 2 differential pressure testing summary was presented by the licensee as follows:

105 MOVs total for Unit 2 GL 89-10 program

12 MOVs tested in previous refueling outage
(this number includes some grouping)

4 valves require static testing
(maximum differential pressure less than 100 psid)

29 MOVs that have been analyzed by Bulletin 85-03

60 MOVs that require testing

In the first refueling outage (September 1990) of the three-refueling outage schedule for GL 89-10 testing, the licensee performed 30 baseline static diagnostic tests and differential pressure tests for 12 valves under the GL 89-10 program. The valves tested were butterfly valves considered by the licensee to fall into the category of MOVs with high margins of available torque relative to required torque to overcome the design-basis differential pressure, as defined in the exceptions to GL 89-10 in the Program Description document.

Of the 12 MOVs referred to above, 6 were tested at as close to design-basis conditions as achievable and the remainder did not receive design-basis testing based on their similarity to the other 6. Diagnostic data was taken on only two of the six tested. While taking credit for untested valves in parallel or like systems was acceptable in the 85-03 program, it is not in accordance with the GL 89-10 recommendation to differential pressure test all valves practicable under worst-case design-basis conditions. Failure to test the valves which are practicable to test is considered a deviation from the licensee's commitment to perform tests in accordance with the GL 89-10 recommendations. The licensee reportedly had already identified this condition and had initiated corrective action.

Bulletin 85-03 Valves

Under NRC Bulletin 85-03 the licensee qualified 27 MOVs on Unit 1 and 29 MOVs on Unit 2 as capable of performing their function at design-basis conditions. Eleven Unit 1 and 12 Unit 2 valves were actually tested. The rest were qualified under the grouping concept allowed in the 85-03 program. No diagnostic test data was obtained in this testing. During the inspection, licensee personnel stated that credit might be taken for the 56 valves qualified under the 85-03 program as design-basis tested in the GL 89-10 program. The valves involved are essentially high differential pressure valves and there is no currently justified method for grouping these valves to limit their testing in accordance with the GL 89-10 program. Also, for some valves which were actually tested at design-basis conditions, no diagnostic data was obtained. The original design-basis differential pressure tests for these valves was performed in 1987. The GL 89-10 recommended reverification period of five years will expire in 1992. With no justified means of reverification at this time and with the reverification time period of 5 years or 3 refueling outages about to expire it did not appear feasible that the licensee could reverify these valves under the GL 89-10 program recommendations. The licensee's actions regarding the testing (initial and reverification) of the Bulletin 85-03 valves to meet GL 89-10 recommendations will be reexamined during NRC inspection of GL 89-10 program implementation.

3.e Periodic Verification of MOV Capability

In recommended action d of the generic letter, the NRC staff requests that licensees prepare or 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 recommends 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 are not representative of the MOV.

FPL personnel indicated that static diagnostic testing would be performed to periodically reverify the design-basis capability of MOVs in their GL program. The use of static testing to verify continued capability of an MOV to operate under worst case differential pressure and flow conditions is not considered adequate at this time because of the uncertain relationship between the performance of an MOV under static conditions and under design-basis conditions. The inspectors expressed concern to the licensee that any method used for periodic verification of MOV capabilities should be technically justified. The verification method used will be reexamined in the subsequent NRC inspection of GL 89-10 program implementation.

To further complicate the above concern, FPL was currently utilizing design-basis testing performed for NRC Bulletin 85-03 to satisfy GL 89-10 testing requirements and licensee personnel indicated that reverification of capabilities of these MOVs was scheduled for 5 years past the last static test. Also, diagnostics were reportedly not used during the 85-03 flow testing. As a result, FPL did not know what thrust was present when each of the Bulletin 85-03 MOVs was stroked. As noted in 3.d above, licensee personnel indicated use of Bulletin 85-03 testing to fulfill GL 89-10 requirements was being reconsidered.

Maintenance activities for MOVs within the scope of Generic Letter 89-10 are described in "Electrical Maintenance Motor Operated Valve Program", dated September 6, 1991. Based on review of this document the program did not provide for the maintenance of thermal overloads. Specifically, requirements for implementing procedure 0940061, "Maintenance of Thermal Overload Devices", had not been included in the program description. Discussions with licensee management revealed that this item had previously been identified by the licensee in their self assessment and listed as item 32 for which corrective actions will be taken. The inspectors reviewed procedure 0940061 and conducted interviews with maintenance engineers to determine the scope of maintenance activities related to thermal overloads. Based on these discussions and reviews the inspectors concluded that procedural controls had been established to ensure adequate maintenance of TOLs. Licensee personnel stated the schedule for preforming this procedure resides in their Preventive Maintenance Scheduler on the Passport Planning System. They indicated that maintenance is performed on approximately 25 percent of TOLs each refueling outage.

The inspectors reviewed the post maintenance test program with licensee personnel. They were informed that diagnostic testing appropriate to specific maintenance activity was not defined but was under development. The MOV

coordinator reportedly reviewed all plant work orders for corrective maintenance and repair and assigned the proper post maintenance testing. The licensee's self assessment audit had identified the need for a post maintenance test guide.

3.f MOV Failures, Corrective Actions, and Trending

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

The inspectors reviewed the following material concerning this subject:

- MP 0940069, Rev. 9, Preventive Maintenance of Non-Environmentally Qualified Limitorque Motor Operated Valve Actuators;
- MP 0940072, Rev. 6, Preventive Maintenance of Environmentally Qualified Limitorque Motor Operated Valve Actuators;
- MP 0940075, Rev. 1, Maintenance and Repair of Limitorque Valve Actuators Type SMB-000;
- MP 0950050, Rev. 0, Post Maintenance Testing of Limitorque Motor Operated Valves;
- MP 0950064, Rev. 0, Maintenance and Repair of Limitorque Valve Actuators Type SMB-0 Through SMB-4; and
- MP 0950065, Rev. 0, Troubleshooting Limitorque Valve Actuators.

The emphasis of this inspection was program review. A program for accomplishing the above reviews, trends, justifications, etc. at the level of detail expected by the NRC was not described in a formal document and had not been developed. The licensee interprets GL 89-10 to address analysis of gross MOV failures only. The GL 89-10 interpretation used by the licensee would not trend positive attributes as is desired by the NRC. Previous gross failures, such as would trigger Nuclear Plant Reliability Data System reports, have been analyzed under existing programs. The lack of program definition regarding documenting and trending MOV degradation and failure information in accordance with GL 89-10 recommendations was identified as a concern that will be reassessed in the subsequent NRC inspection of the licensee's implementation of GL 89-10.

Though a detailed program had not been developed, many elements needed to establish a detailed program existed. The preventive maintenance procedures were quite thorough and required the performer to examine a large number of items, especially during preventive maintenance. In general, numerous observations needed for a detailed program were being made. Though several items were specifically identified for documentation in an attached data sheet, the usual approach was to direct the performer to identify correctable discrepancies in a comment section. All attributes except those specifically discussed would be presumed non-degraded. Considering that completed procedures would be microfilmed and stored in the records vault, this technique would make trending etc. virtually impossible. The troubleshooting procedure had more detailed yes/no type checks in the procedure body but required the performer to document minor repairs in the Journeyman Work Report that accompanies work orders. Again, considering microfilming and storage in the records vault, this technique would make trending, etc. virtually impossible. The MOV coordinator had started a notebook file of MOV gross failures. There were 24 failures identified. 16 of the 24 had data of some kind included in the notebook. MOVATS test data was located in a different set of files. The data collection, file, and review system was non-functional at the level desired by the NRC.

3.g Schedule

In GL 89-10, the staff requested that licensees complete all design-basis reviews, analyses, verifications, tests, and inspections that were initiated in order to satisfy the generic letter recommendations by June 28, 1994, or 3 refueling outages after December 28, 1989, whichever is later. The FPL responses to GL 89-10 indicated that it intended to meet the recommended schedule.

FPL personnel did not provide an overall GL 89-10 program schedule to the inspectors. However, the inspectors did receive schedule information covering most of the individual aspects of the program. An informal schedule document entitled "Generic Letter 89-10 1992 Schedule Milestones" showed completion of design-basis reviews and calculations by mid-1992. The St. Lucie Electrical Maintenance MOV Program indicated that switch settings were being made in accordance with PC/Ms and that all of these PC/Ms would be implemented by the June 1994 schedule specified in the generic letter. The schedule for the testing was less certain. FPL personnel stated that 12 butterfly valves had been subjected to GL 89-10 differential pressure testing at about 80 to 90 percent of design-basis differential pressure during the previous Unit 2 refueling outage. However, as discussed in 3.d above, 6 of these 12 had not actually received the differential pressure testing recommended by GL 89-10 and only 2 had been differential pressure tested with diagnostics. Licensee personnel indicated plans for design-basis diagnostic testing 16 valves in the October 1991, Unit 1 refueling outage, though their evaluation for testing was not fully complete. Diagnostic testing was also said to be planned for another 12 valves under static conditions. The schedule for the outage and for the completion of the remaining diagnostic and other testing was made uncertain by a number of factors. It was the second of the three refueling outages for Unit 1 GL 89-10 testing and no GL 89-10 testing had been

performed in the previous Unit 1 outage. The outage was scheduled to begin within about a month of this inspection and many of the actions required to be accomplished before testing could be undertaken had not been completed. The diagnostic test method and equipment to be used during the outage had not been determined and remained to be contracted, procedural controls and training for use of the diagnostic method had not been approved (see Section 3.1), and preparation of differential pressure test procedures was not complete (see Section 3.d). In the overall schedule the status of the testing of valves previously tested and evaluated under NRC Bulletin 85-03 was an important schedular factor as FPL had not decided whether they would be retested using the additional criteria of GL 89-10. The inspectors indicated particular concern regarding the licensee's ability to meet its commitment to the GL 89-10 schedule.

3.h Overall Administration of MOV Activities

The inspectors found that the overall administration of FPL's GL 89-10 program was described in the Nuclear Engineering's Program Description and in Electrical Maintenance's MOV Program, which have been referred to previously. Generally, the program documents were observed to contain guidance covering most required program activities but lacked detail in the areas of torque switch setting methodologies, MOV failures, corrective actions, and trending.

A multi-disciplinary team had been formed to administer the GL 89-10 program at St. Lucie. This team included members from Production Engineering, Electrical Maintenance, Technical Staff, On-Site Licensing, and Project Engineering. At the plant level, a dedicated MOV Engineer was assigned to coordinate design aspects of the program and a dedicated Electrical Maintenance MOV Coordinator was assigned as the focal point for all in-plant technical issues and implementation of the program. The inspectors conducted several discussions with the MOV Engineer, MOV Coordinator, and other members of the MOV Team, and found them knowledgeable regarding generic letter issues.

3.i MOV Setpoint Control

FPL controlled the setpoints for MOVs using values verified through diagnostic tests. The maximum and minimum torque switch setpoint values were calculated based on maximum and minimum design requirements determined from a design-basis review. The Design Engineering calculations of the torque switch setpoints were issued as drawings and were considered design output documents. The change process was controlled through the Quality Instruction process for control of drawings. Specifically, it was accomplished by the Plant Change/Modification (PC/M) process. The inspectors confirmed that the process included a safety review and an evaluation conducted in accordance with 10CFR50.59 requirements. According to Section 3.3.2 of the licensee's Program Description document, open and close limit switch setpoints were to be based on vendor guidance documented in plant procedures. Bypass limit switch requirement philosophy was described in Section 3.3.3 of the Program Description document. The inspectors determined that the bypass settings were

controlled specified through wiring diagrams, with any necessary changes accomplished using PC/Ms. No concerns were identified by the inspectors in this area.

3.j Training

The inspectors reviewed training procedures, course outlines, toured the training facility, and discussed the training program with licensee personal. The licensee conducts a 32 hour training course titled Maintenance of Motor Operated Valves (MOV) using lesson plan DN #1502200. Upon completion of this lesson plan the trainee completes a written exam and then conducts maintenance on MOVs employing Lab Performance Measure 1521200 (Rev. 1) which is 20 hours in duration. The licensee also conducts an 8 hour training course on the MOVATS 2150 system which is followed by a written exam and a 20 hour lab using PSL Maintenance Procedure No. 0940067 "MOVATS Testing of Motor Operated Valves".

Refresher training is performed and a Job Performance Measure exam is completed prior to each refueling outage. The licensee stated that as information updates become available, they will be incorporated into the training program and future refresher classes.

The MOVATS instructors are plant personnel that attend on-site training at MOVATS and then conduct training courses at the plant site for plant personnel. The licensee indicated they are not a member of a consortium of licensees that audit the MOVATS training program. The methods used by the licensee to ensure the adequacy of this vendor supplied training will be assessed in the NRC inspection of GL 89-10 program implementation.

Uncertainty over the licensee's future diagnostic equipment raised additional training-related concerns. The licensee will have to implement a revised diagnostic curriculum based on the new diagnostic technology which will require additional training in the use of new diagnostic procedures will be required. The inspectors will review FPL's consideration of these concerns during future inspections. With the exception of the above concerns the inspectors did not identify any problems with the training department with regard to course content or licensee personnel.

3.k Industry Experience and Vendor Information

This inspection found FPL using several systems to collect industry experience and vendor information to ensure that operating experience was distributed, communicated, and tracked until resolved. The inspectors reviewed these systems for handling vendor information.

- Under the Feedback of Operating Experience Program (FOP) per Administrative Procedure (AP) 0005724, a corporate level contact screened the INPO information network, incoming NRC documents, and incoming vendor documents. He routed numerous INPO, vendor, and NRC items to the nuclear plants. These were tracked on a corporate data base. AP 0005724, Section 8.6, provided guidance for accepting inputs from individuals personally receiving information from vendors, etc.

- 10CFR Part 21 reports were tracked locally by the QC department under the Corrective Action System per Quality Instruction 16-PR/PSL-1, Rev. 23, Corrective Action, using a database. Completed information packages were stored on microfilm in the QC records vault and were accessed via a database correlating the item number to the microfilm address.

- One of several activities under the Supplier Annual Review program per Quality Instruction 7 QAD 4, Rev. 11, Supplier Annual Review, was the QA department annual telephone survey of suppliers. This survey included identification of supplier QA program changes and of 10CFR Part 21 reports issued. One of the required reviewer activities was to verify that the 10CFR Part 21 information had been transmitted to the plant managers.

The inspectors reviewed the handling of several industry experience items and 10CFR Part 21 reports formally received by the plant, and several industry experience items informally received by plant personnel, as follows:

- NRC IN 90-40, Results of NRC-Sponsored Testing of Motor-Operated Valves, processed as FOP 90-002;

- NRC IN 89-61, Failure of Borg-Warner Gate Valves to Close Against Differential Pressure, processed as FOP 89-117;

- NRC IN 90-72, Testing of Parallel-Disk Gate Valves in Europe, processed as FOP 90-145;

- Limitorque P21 letter dated March 18, 1988, H3BC Cracked Worm Gears, processed under closed CAR 7-9-90 and open tracking CARs 8-8-90 and 8-9-90;

- Limitorque P21 letter dated November 3, 1988, Temperature Effects on RH Insulated DC Motors, processed as CAR 11-4-88;

- Limitorque P21 letters dated September 29, 1989, and October 10, 1989, Fiber Spacers Under Contact Bridges in Cam-Style Torque Switches, processed under CAR 10-9-89 and tracking CAR 12-1-89;

- Limitorque P21 letter dated June 27, 1989, Melamine Torque Switches, processed under CAR 2-3-89;

- Limitorque P21 letter dated March 20, 1990, Motor Pinion Keyway Depth, processed under CAR 3-12-90;

- Limitorque Maintenance Update 88-1 dated August 17, 1988 (informally received), processed as FOP-107;

- Limitorque Maintenance Update 88-2 (informally received), processed as FOP-108;

- Limitorque Maintenance Update 89-1 (informally received), processed as FOP-109;

- Limitorque Maintenance Update 90-1 (informally received), processed as FOP-110; and

- ITI MOVATS Engineering Report ER-5.0, Rev. 1, ITI MOVATS Incorporated Equipment Accuracy Summary (informally received).

The formally-received material was all properly distributed and evaluated. The files contained complete records of the reviews. Some of the material was evaluated as being part of the GL 89-10 effort and assigned to the engineering office, therefore not individually processed. These evaluations were consistent with the scope of GL 89-10. The informally-received material had been in the possession of the MOV Coordinator for some time without being processed under the FOP - 110 program. The MOV Coordinator had only recently learned of the FOP procedure. The need to process the material had not yet been disseminated by the licensee, but had been corrected by the end of this inspection.

During the review, the inspectors found that MOVATS Engineering Report 5.0 was not in the MOVATS technical manual being used by the lectrical shop. Several other Engineering Reports listed in the manual index were also missing from the manual. The manual was not a controlled copy though a copy of this specific manual had been provided to the records vault to be the master copy. FPL personnel contacted MOVATS regarding the missing reports and determined that the reports did not contain information required for their MOV program. FPL personnel indicated that the reports were of technical interest and a copy has been obtained for the manual.

The inspectors stated that FPL needs to ensure that employees are made aware of the importance of submitting materials that may be received informally, then controlling the various copies.

3.1 Use of Diagnostics

St. Lucie had previously been using MOVATS diagnostic equipment to provide a measurement of thrust delivered by motor operators for rising-stem valves. In light of the results of recent industry diagnostic equipment accuracy testing and the concerns over measurement and detection of effects due to rate of loading, it decided to change to new diagnostic equipment designed to provide direct measurement of available thrust. At the time of the inspection, the licensee had not decided on the specific diagnostic system to be utilized for rising-stem valves in their GL 89-10 program.

St. Lucie Unit 1 had an impending outage scheduled for October 1991. The uncertainty related to the status of its diagnostic equipment and insufficient

time to develop internal capabilities forced FPL to request that diagnostic equipment vendors submit proposals for provision of complete diagnostic teams and equipment to support the outage. This request included the requirement that the provider's diagnostic equipment accuracies be stated with supporting documentation, and that the equipment be verified against an acceptable standard developed by the Idaho National Engineering Laboratory.

Concerns were identified by the inspectors regarding the uncertainty of St. Lucie's diagnostic equipment status. The selected diagnostic vendor would be required to supply the diagnostic procedures to be used and, with the Unit 1 outage impending, limited time would be available for FPL to review these procedures and obtain any changes needed to ensure adequate documentation provisions and site procedural controls. In addition, it would be necessary for FPL to develop and provide procedural guidance for torque switch setup to the diagnostic vendor. As noted previously in this report, FPL had not fully developed and documented this methodology. The diagnostic vendor was to provide personnel to perform the necessary diagnostic testing and, while the vendor would supply diagnostic testing personnel qualification documentation, assurance of the adequacy of this documentation would have to be determined by FPL through an audit or survey of the vendor's program.

4. Conclusions

The concerns involved potential deviations from the recommendations of the generic letter, a vendor recommendation that was not being met, and programmatic details that were not sufficiently well defined to assess at this time. A written response is being requested for two concerns which involve potential deviations from the recommendations of the generic letter. One is a concern that the schedule recommended by the generic letter will not be met due to delays resulting from the licensee's recent decision to alter its diagnostic test method because of deficiencies disclosed in the previous method through recent industry testing. The other is that differential pressure and flow testing was being omitted for some valves even though these valves could have been tested and the omission conflicted with a generic letter recommendation to test if practicable.

5. Exit Interview

The inspection scope and all findings were summarized on September 13, 1991, with those persons indicated in Appendix 1. FPL was apprised of the concerns identified during the inspection and listed in the "SUMMARY" at the beginning of this report. No dissenting comments were received from the licensee.

APPENDIX 1

PERSONS CONTACTED

Licensee Employees

*P. Barnes, Production Engineering Group Supervisor - Mechanical/NSSS
*C. Burton, Operations Superintendent
*R. Church, Independent Safety Engineering Group Chairman
*J. Conner, Technical Staff Engineer
*J. Cook, Electrical Maintenance, MOV Coordinator
*L. Croteau, Training
*R. Dawson, Maintenance Superintendent
*W. Dean, Technical Support Supervisor, Electrical Maintenance
*J. Dyer, QC Supervisor
*R. Englmeier, Site Quality Manager
*J. Geiger, Vice President, Nuclear Assurance
*J. Hoffman, Mechanical Engineering Supervisor
*J. Holt, Licensing Engineer
*C. Leppla, I&C Supervisor
*G. Madden, Plant Supervising Engineer, Licensing
*J. Manso, Nuclear Engineering, Principal Engineer
*L. McLaughlin, Plant Licensing Superintendent
*K. Mohindroo, Production Engineering Group Manager
*J. Price, Nuclear Engineering Equipment Support and Inspections
*R. Raldiris, Production Engineering Group Supervisor - Electrical
*T. Roberts, Project Engineering Manager
*L. Rogers, Electrical Maintenance Supervisor
*D. Sager, Site Vice President
*D. Wolf, Site Engineering Supervisor

NRC Personnel

*M. Sinkule, Region II, Projects 2, Branch Chief

*Attended exit interview

APPENDIX 2

ACRONYMS AND INITIALISMS

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulations
EPRI	Electric Power Research Institute
EQ	Equipment Qualification
ESFAS	Engineered Safety Feature Actuation System
FPL	The Florida Power & Light Company
FSAR	Final Safety Analysis Report
GL	[NRC] Generic Letter
IEEE	Institute of Electrical and Electronic Engineers
IN	[NRC] Inspection Report
INPO	Institute for Nuclear Power Operations
MCC	Motor Control Center (electrical distribution)
MOV	Motor Operated Valve
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
P21	Part 21
QA	Quality Assurance
QC	Quality Control
TI	Temporary Instruction
TOL	Thermal Overload