



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

Report Nos.: 50-325/89-06 and 50-324/89-06

Licensee: Carolina Power and Light Company
P. O. Box 1551
Raleigh, NC 27602

Docket Nos.: 50-325 and 50-324

License Nos.: DPR-71 and DPR-62

Facility Name: Brunswick 1 and 2

Inspection Conducted: March 6-10, 1989

Inspector: *S. Tingen*
S. Tingen

4/14/89
Date Signed

Approved by: *G. Belisle*
G. Belisle, Chief
Test Programs Section
Engineering Branch
Division of Reactor Safety

4/17/89
Date Signed

SUMMARY

Scope: This routine, announced inspection was in the areas of IE Bulletin followup and action on previous inspection findings.

Results: A strength was identified which involved licensee root cause determinations of motor operated valve deficiencies, paragraph 2 a. A weakness was identified in the licensee's response to IE Bulletin 88-04, Potential Safety-Related Pump Loss, which involved verification from the pump suppliers that the current miniflow rates are sufficient, paragraph 2.b.

In the areas inspected, violations or deviations were not identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *S. Boyce, Engineer, Technical Support
- *K. Enzor, Regulatory Compliance Director
- *M. Grantham, Engineer, Technical Support
- *J. Harness, General Manager
- M. Haynes, Engineer, Maintenance
- *R. Helme, Manager, Technical Support
- *L. Jones, Director, Quality Assurance/Quality Control
- *T. Jones, Regulatory Compliance
- *J. O'Sullivan, Manager, Training

Other licensee employees contacted during this inspection included craftsmen, engineers, operators, mechanics, technicians, and administrative personnel.

NRC Resident Inspectors

- *P. Madden

*Attended exit interview

2. IE Bulletin Followup (25573) (92703)

- a. (Open) 85-BU-03, T2515/73, Motor Operated Valve Common Mode Failure During Plant Transients Due to Improper Switch Settings. The purpose of Bulletin 85-03 is to require licensees to develop and implement a program to ensure that switch settings for High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) systems motor operated valves (MOV) subject to testing for operational readiness in accordance with 10 CFR 50.55a(g) are properly set, selected, and maintained.

In order to evaluate the licensee's Bulletin 85-03 program the inspector held discussions with appropriate licensee personnel and reviewed the following:

Carolina Power & Light Company (CP&L) letter to the Nuclear Regulatory Commission (NRC), dated May 25, 1988, Brunswick Steam Electric Plants, Units Nos. 1 and 2 Bulletin 85-03 Final Report

Maintenance Instruction (MI)-16-537-M, Limitorque Actuator Motors, Alternating Current (AC) and Direct Current (DC)

Operation Instruction (OI)-13, Valve and Electrical Lineup Administrative Controls

Procedure OCM-MO503, Repair Instructions For Limitorque Motor Operators Model Nos. SMB-00 and SB-00

Maintenance Procedure (MP)-57, Limitorque Valve Actuator Failure Analysis and Trouble-shooting Procedure

Procedure EMP-43, Q-List MOV Settings

MI-16-547C, SMB Limitorque Operator Removal and Installation

Procedure OCM-M001, AC And DC MOV Stroking Procedure

CP&L Brunswick Steam Electric Plant MOV Task Group Final Report, dated December 31, 1988

Maintenance histories dating back to 1987 for all Unit Nos. 1 and 2 Bulletin 85-03 valves

Engineering Evaluation Report 88-422, HPCI/RCIC DC MOV Operability Assessment

In May 1988, CP&L submitted to the NRC a Bulletin 85-03 report stating that all the action items were complete except for the valves identified by Supplement 1 to Bulletin 85-03, which would be completed at a later date. By the following July enough MOV failures had occurred at Brunswick that warranted a major design review of all safety related MOVs. To perform the MOV design review, an MOV Task Group was formed. The MOV Task Group reviewed all aspects of safety-related valves including the actuator and cable sizing to the actuator motor. This review was comprehensive and enveloped the following:

- Thermal binding of valve seats
- Motor shunt winding failures
- Effect of motor starting resistors on valve operation
- Optimum thermal overload protection
- Valve thrust values
- Effect Of increased temperature on actuator motor output
- Cable sizing
- Operation at degraded voltages
- Limit switch settings
- Adequacy of existing station MOV procedures
- Actuator sizing with respect to motor size, spring pack size, and gear ratio.
- MOV function during accident conditions, normal operations, and surveillance testing

Effect of MOV environment on actuator reliability and
 accesability
 MOV inservice testing
 MOV logic
 Pipe support in the areas of MOVs
 MOV Drawings for legibility and correctness
 Adequacy of the orginial Bulletin 85-03 program

The MOV Task Group completed the MOV design review and issued a final report on December 31, 1988. This report contained numerous recommendations. Some recommendations have been completed, others are scheduled to be performed, and some are still being evaluated. Examples of the MOV Task Group recommendations are as follows:

For high system temperature applications, replace flex wedge gate with parallel disc valves in order to alleviate thermal binding.

Install liveload packing on select valves to counter recurring packing leaks.

Remove starting resistors, install surge suppression devices, and modify control logic to eliminate shunt field voltage spikes for all DC MOV motors.

On select MOVs, increase actuator efficiency by converting the operator valve stem mechanical coupling arrangement from a worm/gear stem nut device to a ball screw device.

Design and install overcurrent trip devices on all DC Motors.

After modifications are completed that result in less required actuator torque output, smaller actuator motors will be installed to reduce the DC loading requirement during accident conditions.

Obtain revised valve thrust requirements from vendors.

Revise procedures to recognize new torque switch settings.

The inspector considered that the review performed by the MOV Task force to be thorough. Implementing the numerous task force recommendations will be a major project to manage. The licensee recognized the complexity of implementing the MOV Task Group recommendations and appeared to be taking appropriate actions.

One function of the MOV Task Group was to review the adequacy of the program previously accomplished by the Bulletin 85-03 program. The following are their findings:

The present policy to set MOV limit switches at 4 and 96 percent of valve stem full travel may not be adequate to prevent valve coasting into the backseat.

Thermal overload protection settings need to be revised to recognize latest industry standards.

Update valve thrust values calculated using latest industry standards obtained from the applicable valve vendors.

Increase the number of MOVs to be differential pressure tested.

The inspector reviewed the MOV Task Group Bulletin 85-03 evaluation and noted a potential weakness in that monitoring MOV performance throughout plant life is not formally incorporated into the MOV program. Additionally, the licensee does not have formal guidelines specifying Bulletin 85-03 post maintenance test requirements other than stroke time testing. Review of Bulletin 85-03 valve maintenance histories indicate that valves were being properly retested and routinely monitored for actuator torque output. This potential weakness was discussed with the licensee who stated that actions have been initiated to incorporate these items into their program.

The licensee's procedures provide adequate instructions to set switches and accomplish maintenance. To perform mechanical and electrical maintenance, the licensee developed a number of specialized procedures which is advantageous over having fewer larger procedures that are broad in scope. The most impressive factor of the licensee's Bulletin 85-03 program is the attention given in determining root cause analysis of MOV failures, or deficiencies. During the present Unit 1 refueling outage (RFO), Valve 1-E41-F006, HPCI injection valve, was relocated outside of the main steam isolation valve pit and the valve was replaced with a parallel disc gate valve. After valve replacement, the valve was diagnostically tested with Motor Actuator Characteristics (MAC) equipment. During testing, the valve would cycle but the actuator output torque measured by MAC was excessively high. In order to determine the reason for the excessive actuator torque, Valve Operation and Test System (VOTES) was utilized to measure valve stem thrust. The VOTES diagnostic test results indicated that stem thrust was low. At this time, the licensee did not increase the torque switch setting to increase stem thrust and call the valve operational. The licensee then disassembled the valve actuator and found no discrepancies. After the actuator was reassembled, MAC testing indicated that the actuator output torque was still excessively high. The valve was then cycled at differential pressure to verify operability and the valve did open against a differential pressure; however, the licensee was still not satisfied. Because the actuator torque output was high and the licensee could not determine the cause, the actuator was removed and sent to Limitorque for

testing. Limitorque testing results indicated that the actuator torque output was not high and within specification for a SMB-3 actuator. The problem of the actuator excessively high torque output was then discovered to be in the MAC program software which resulted in an erroneously high output torque reading. The inspector considers this to be an example of the licensee determination to evaluate root cause of MOV deficiencies. The inspector also reviewed several procedures developed by the licensee to determine root cause of MOV failures. OI-13, Valve and Electrical Lineup Administrative Controls Operating instructions, contains a specific section for operators to fill out when any valve failure occurs. The following information is required per OI-13 when a valve failure occurs:

- Procedure step or lineup that was being performed
- Actions performed just prior to lineup in progress
- Valve upstream and downstream pressure and temperature
- Alarm or abnormal indications
- If setting of thermal overload trips were required
- Provide information relating to similar occurrences
- A detailed summary is required

In addition to OI-13, the licensee utilizes MP-57, Limitorque Valve Actuator Failure Analysis and Trouble Shooting Procedure, when MOV failures, occur. MP-57 requires that craftsmen with advanced training accomplish the trouble shooting, that operations and a maintenance engineers are involved, that the MOV be stoked and inspected, and that a final failure analysis report be submitted to upper management for review. Procedures OI-13 and MP-57 recognize an immediate coordinated response is required following an MOV failure in order to adequately determined root cause.

As requested by Action Item e of Bulletin 85-03, the licensee identified the selected safety-related valves, the valves' maximum differential pressures, and the program to assure valve operability in their letters dated May 13, August 29, and October 2, 1986, and March 4, 1987. Review of these responses indicated the need for additional information which was requested in a Region II letter to the licensee dated April 18, 1988.

Review of the licensee's May 25, 1988, response to this request for additional information indicated that the licensee's selection of the applicable safety-related valves to be addressed and the valves' maximum differential pressures meets the requirements of the Bulletin

and except for differential pressure testing, the program to assure valve operability requested by Action Item e of the bulletin is now acceptable. In a telephone conversation between the licensee and Region II NRC staff in November 1988, the licensee approach to differential pressure testing was discussed and as a result Bulletin 85-03 differential pressure testing is being reevaluated by the licensee.

As requested by Action Item e of Supplement 1 to Bulletin 85-03, the licensee's letter dated September 7, 1988, identified the additional valves to be addressed in their program in response to the original bulletin.

Review of this response indicated that the licensee's selection of additional valves to be addressed in their program in response to the original bulletin meets the requirements of Action Item e of the supplement to the bulletin and is acceptable.

The licensee has altered their Bulletin 85-03 action as specified in the May 1988 letter to the NRC. As a result the licensee intends to provide an updated Bulletin 85-03 reply specifying the new direction taken.

- b. (Open) IE Bulletin No. 88-04, Potential Safety-Related Pump Loss, Units 1 and 2.

The inspector reviewed the licensee's letter dated August 5, 1988 and determined that one of the bulletin required actions was not acceptably addressed.

This matter remains open pending verification from applicable pump suppliers that current miniflow rates are sufficient to ensure that there will be no pump damage from low flow operation. The licensee's reasons for not obtaining adequate verification of the current miniflow capacity by the pump manufacturer is based on the Boiling Water Reactor Owner's (BWR) Group response to IE Bulletin 88-04 in that:

BWR operating experience does not indicate any excessive wear to pumps when operating under the current specified flow conditions.

The total expected time in the minimum flow mode over the plant life is low.

Past BWR operating history indicates no occurrences of system unavailability upon demand due to pump wear incurred in minimum flow operation.

Recent inspection of some BWR residual heat removal pumps had indicated no pump impeller damage due to minimum flow that could potentially degrade pump performance over the inspection period.

ASME Boiler and Pressure Vessel Code, Section XI, testing and Technical Specification surveillance requirements will detect changes in pump performances.

BWR safety-related pumps are supplied by different pump vendors. The responses contained in the BWR's Owners Group and the utility's August 4, 1988, letter to the NRC address pumps in general in regards to adequate minimum flow to preclude pump damage at low flow operation but does not address the utility's specific pumps. The inspector discussed this item with the NRR technical contact person listed in the bulletin who agreed with the inspector in that verifying the adequacy of current miniflow capacity by the pump manufacturer is required to meet IE Bulletin 88-04 requirements. This matter is identified as inspector followup item (IFI) 89-06-01.

In the areas inspected, violations or deviations were not identified.

3. Action: On Previous Inspection Findings (92701, 92702)
 - a. (Closed) Unresolved Item 88-11-02, Stroke Times for Backseated Valves. This item involved a note in procedure SP-85-066, Backseating of Valves Using the Motor Operator, that allowed the Manager of Operations or his designee to omit valve stroke time testing after an MOV is backseated. Per the licensee, there are times when stroke time testing is not required after placing an MOV on its backseat and in these cases stroke time testing would not be performed. The inspector reviewed the results of SP-85-066 dating back to 1985 for all valves backseated per the procedure. This review indicated that, in all instances when a valve was placed on its backseat, stroke time testing was subsequently accomplished when required. The inspector's review of the results of backseating MOVs per SP-85-066 indicated that valve stroke times were not being erroneously omitted.
 - b. (Closed) IFI 88-11-09, Stroke Time Testing for Automatic Depressurization System (ADS) Valves. This item involved procedure PT 11.1.2, which implemented ADS stroke time testing, not containing clear instructions pertaining to the acceptance criteria as specified in a relief request to ASME section XI requirements submitted to the NRC for review. The licensee has changed procedure PT 11.1.2 to clearly state the ADS stroke time acceptance criteria in accordance with the relief request. The inspector reviewed the procedure revision and considers it acceptable.
 - c. (Closed) IFI 88-25-01, Management Action to Ensure That Personnel Are Aware of Valve Tapping Policies and Documentation of Valve Failure Policies. This item involved implementing management policies for

operations and maintenance personnel in the areas of tapping on valve solenoids in order to get a valve to stroke test satisfactorily and documenting of initial valve failure when, on subsequent attempts, the valve would operate satisfactorily. In order to ensure licensee personnel were aware of management policies in these areas, Procedures OI-13, Valve and Electrical Lineup Administrative Controls Operating Instructions, and O-MMM-001, Maintenance, Conduct of Operations, were revised. In addition, licensee personnel were verbally instructed on these procedure revisions. The inspector reviewed the procedure revisions and the training lesson plans and considers them acceptable.

- d. (Closed) Licensee Event Report (LER 86-01) Safety Relief Valve Setpoint Drift. During the Unit 2 1985-1986 refueling outage, testing the Unit 2 safety relief valves (SRVs) revealed that 10 of the 11 valves tested exhibited higher than allowed setpoint drift. Target Rock 2-stage SRV setpoint drift was identified as Generic Issue B-55. The BWR Owners Group is directing corrective actions which is being followed by the Office of Nuclear Reactor Regulations.

In the areas inspected, violations or deviations were not identified.

4. Exit Interview

The inspection scope and results were summarized on March 10, 1989, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed below. Dissenting comments were not received from the licensee.

<u>Item No.</u>	<u>Description and Reference</u>
325,324/89-06-01	IFI - Verification of the adequacy of current miniflow capacity by the pump vendor, paragraph 2.b.

Licensee management was informed that three IFIs and one unresolved item discussed in paragraph 3 were considered closed.