



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

Report Nos.: 50-338/88-08 and 50-339/88-08

Licensee: Virginia Electric and Power Company
 Richmond, VA 23261

Docket Nos.: 50-338 and 50-339

License Nos.: NPF-4 and NPF-7

Facility Name: North Anna 1 and 2

Inspection Conducted: April 4-8, 1988

Inspector: *for Frank Jape* 4/28/88
 G. Tingen Date Signed

Approved by: *Frank Jape* 4/28/88
 F. Jape, Section Chief Date Signed
 Test Programs Section
 Division of Reactor Safety

SUMMARY

Scope: This routine, announced inspection was in the areas of complex surveillances and IE Bulletin followup.

Results: No violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *P. Bouden, Plant Engineer
- *R. Driscoll, Manager, Quality Control
- *L. Edmonds, Superintendent, Nuclear Training
- *R. Einfinger, Superintendent, Operations
- *R. Garver, Reactor Engineer
- *S. Hamill, Supervisor, Inservice Inspection
- *E. Hendrixson, Engineering Supervisor (Acting)
- *M. Kansler, Superintendent, Maintenance
- *J. Leberstein, Licensing Engineer
- *D. Ruth, Nuclear Specialist

Other licensee employees contacted included engineers, technicians, and office personnel.

NRC Resident Inspectors

- *J. Caldwell
- L. King

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on April 8, 1988, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

Inspector Followup Item 338, 339/88-08-1, Effect of steam versus hotwater as system medium on pressurizer safety valve set point pressure.

The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspector during this inspection.

3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. I. E. Bulletin Followup (25581) (92703) (25573)

- a. (Closed) 338, 339/86-BU-02, I. E. Bulletin 86-02, "Static "0" Ring Differential Pressure Switches."

This bulletin involved the installation of Static "0" Ring Model 102 and 103 differential pressure switches as electrical equipment important to safety. The licensee responded to the NRC in a letter dated July 25, 1986, that they have not purchased or installed the subject switches at North Anna. This item is closed.

- b. (Closed) 338, 339/86-BU-03, I. E. Bulletin 86-03, "Potential Failure of Multiple ECCS Pumps Due to the Single Failure of Air-Operated Valve in Minimum Flow Recirculation Line."

The licensee reviewed IEB 86-03 and identified in Virginia Power Company Letter Number 86-67713, dated January 15, 1987, that the specific concern of Bulletin 86-03 is not applicable because the Safety Injection (SI) pumps minimum flow recirculation valves are motor operated. Motor operated valves fail as-is where as air operated valves fail shut., However, licensee investigation of this bulletin raised a concern regarding the possible failure of the SI pumps motor operated recirculation valve to reopen upon demand after having been shut in accordance with procedures. Further analysis by the licensee has shown that this concern can be addressed through appropriate revisions to the applicable Emergency Operating Procedures (EOPs).

Each individual SI pump recirculation line contains its own isolation motor operated valve and downstream of this isolation valve all three SI pump recirculation lines combine into a single recirculation line that contains an additional motor operated valve. If the motor operated valve in the common recirculation line was unable to be opened during a small rupture loss of coolant accident, failure of the SI pumps would result. To prevent failure of this valve to open the licensee has developed a policy to always operate the individual SI pump recirculation valve and to maintain the common recirculation line valve open at all times. The following procedures were reviewed by the inspector and were found to contain appropriate revisions to address operation of the desired valves.

- 2-EP-0, Revision 1.02, "Reactor Trip or Safety Injection"
- 2-EP-1, Revision 1.02, "Loss of Reactor or Secondary Coolant"
- 1-EP-3, Revision 1.03, "Steam Generator Tube Rupture"

In addition the inspector noted that the SI pump combined recirculation motor operated valve is included in the licensee I. E. Bulletin 85-03 program. Bulletin 85-03 requires additional actions be taken to ensure motor operated valve reliability. This item is closed.

- c. (Closed) 338, 339/85-BU-03 and 338, 339/T2515/73, I. E. Bulletin 85-03, "Motor Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings"

The purpose of this bulletin is to require the licensee to develop and implement a program to ensure that switch settings for High Pressure Coolant Injection and Emergency Feed Water System Motor Operated Valves (MOVs) subject to testing for operational readiness in accordance with 10 CFR 50.55a(g) are properly set, selected and maintained. Action Item b of the bulletin requires that correct switch settings be established; Item c requires differential pressure testing or alternate methods to demonstrate operability with the settings from Item b; Item d requires plant procedures to assure the maintenance of correct switch settings throughout plant life. Implementation of these requirements has involved the use of diagnostic test equipment, Motor Operated Valve Analysis Test System (MOVATS), by trained licensee personnel. North Anna valves covered by this bulletin are limitorque-operated Model Numbers SB00, SMB,00 and SMB000, rising stem gate and globe valves. There are 25 bulletin valves identified for each unit. The following switches are utilized in North Anna bulletin MOVs:

- Thermal Overload Relay
- Open Torque Switch
- Close Torque Switch
- Geared Limit Switches
 - Open Limit
 - Open Indication
 - Open Torque Switch Bypass
 - Close Limit
 - Close Indication
 - Close Torque Switch Bypass

In Virginia Electric and Power Company Letter 86-275A, dated January 4, 1988, the logic for the MOV switch setting is discussed and will not be repeated in this report. Action Items a and b of the bulletin require written reports regarding the bulletin program be submitted to the NRC. The licensee has completed these items and the reports are currently under NRR review. At the inspection exit meeting the licensee was informed that although Region II has closed Bulletin 85-03 additional information may be requested as a result of ongoing NRR review of the licensee bulletin responses.

In order to evaluate the North Anna Bulletin 85-03 program the inspector reviewed the following procedures:

MEMP-C-MOV-1, Revision No. 4, Mechanical - Electrical Procedure for Inspection and Repair of Safety-Related Limitorque Valve Control Type SMB-000, SMB-00, and SB-00.

EMP-SP-MOV-3.2, Electrical Maintenance Procedure for Post Maintenance Testing of Motor-Operated Valves Using MOVATS Motor Load Unit

EMP-C-MOV-1, Electrical Maintenance Procedure for Troubleshooting and Repair of Limitorque Motor Operated Valves

EMP-P-MOV-3, Electrical Maintenance Procedure Predictive Analysis of Motor Operated Valves

EMP-SP-MOV-3.1, Electrical Maintenance Procedure for Post-Maintenance Testing and Adjustments of Motor Operated Valves Using MOVATS 2150

1-ST-73, Differential Pressure Test of Motor Operated Valves

EWR 87-202A, Motor Operated Valves Thermal Overload Calibration Checks.

These procedures provided clear instructions on how to obtain specific values for switch settings. Applicable procedures specified that torque switches are required to be set with the Belleville spring in the relaxed condition. Following limit switch adjustment the valves were checked for back seating by opening the valve electrically and then placing the valve in manual and counting the handwheel turns it takes to place the valve on its back seat. All bulletin valve thermal overload protection devices were calibration checked in order to assure premature thermal overload tripping will not prevent valves from performing their functions. Geared limit switches were set based on number of valves handwheel turns. Bulletin 85-03 discusses problems associated with this method; however, since the valves were MOVATS tested following switch setting in order to verify correct switch setting the inspector consider this method acceptable.

During MOVATS testing of bulletin valves discrepancies were encountered. Examples are operators were found to be experiencing thrust in the close direction well in excess of operator rating, the desired thrust band could not be obtained, and target thrust bands were required to be changed based on differential pressure testing. The inspector reviewed Engineering Work Request 87-022, 87-1205, 87-404, and 87-120F in order to verify that these problems encountered during MOVATS testing were being resolved by engineering personnel.

The purpose of Bulletin 85-03 is to ensure that MOVs operate during normal and abnormal events. MOV operation at a degraded voltage is an abnormal event. North Anna safety-related MOVs are required to develop adequate thrust to open or close at 80% rated nominal Voltage. At North Anna two methods are utilized in order to

determine that thrust output at degraded voltage. The first method relies on vendor provided information that specifies the thrust that will be developed at 80% nominal voltage and is based on the voltage squared relationship. The second method to determine actuator thrust at degraded voltage is based on the following formula:

$$T_a = CF (T_m), \text{ where,}$$

$$T_a = \text{thrust available at 80\% nominal voltage}$$

$$CF = 1/ [V_m/368]^2$$

$$V_m = \text{Voltage measured at locked rotor voltage}$$

$$T_m = \text{Thrust measure at locked rotor}$$

North Anna Bulletin valve actuators contain AC motors and are significantly oversized which enhances valve operability at reduced voltages.

For each bulletin valve the licensee has assembled a final data package containing the as-found and as-left MOVATS results. The inspector selected a sample of 10% of the bulletin valves final data packages and verified that the as-left thrust valves were within the licensee specified tolerances. The data packages for Valves 2-CH-MOV-2115C, 2-C11-MOV-2269B, 1FW-MOV-100B, 1CH-MOV-1275B and 1CH-MOV-1115B were reviewed by the inspector.

The inspector reviewed the following IE Information Notices in order to verify incorporation into the licensee MOV bulletin program.

IE Information Notice 86-71 - Recent Identified Problems with Limitorque Motor Operators

IE Information Notice 85-22 - Failure of Limitorque Motor Operated Valves Resulting from Incorrect Installation of Pinion Gear

IE Information Notice 86-34 - Improper Assembly, Material Selection, and Test of Valves and Their Actuators

The only discrepancy noted was that the IE Information Notices 86-34 guidelines for attaching the actuator to the valve body did not appear to be fully incorporated into bulletin procedures. IE Information Notice 86-34 stated that the valve should be in the mid position while torquing the fasteners that secure the actuator to the valve body, and also referenced vendor torque values for the fasteners. The licensee procedure that installed the actuator to the valve body, MEMP-C-MOV-1, did not specifically place the valve in the mid position nor specify torque values when installing the valve actuator to the valve body. This was discussed with the licensee who in turn is going to reopen IE Information Notice 86-34 and take any corrective action deemed necessary.

Results of this inspection indicate proper implementation of Bulletin 85-03 by the licensee. In addition the licensee has made internal commitments that exceed Bulletin 85-03 requirements. The ASME code requires that valves be stroke time tested following packing adjustment; however, while the stroke time test may be successful, the real problem would not be encountered until the valve is required to operate under design conditions. An increase resistance due to tightened packing in addition to normal valve resistance may exceed the capability of the operator which would result in the valve failing to operate. The licensee has recognized this situation and has internally committed to perform MOVATS motor load unit testing following MOV packing adjustment. The licensee has also internally committed to expand Bulletin 85-03 to all safety related valves. This item is closed.

No deviations or violations were identified.

6. Main Steam Safety Valve and Pressurizer Safety Valve

Surveillances - Units 1 and 2 (61701)

The inspector reviewed the set point test results obtained from North Anna Units 1 and 2 Main Steam Safety Valves (MSSVs) and Pressurizer Safety Valves dating from November 1979 to September 1987. North Anna Technical Specifications (TSs) specify at a 1% set point tolerance for these safety valves, any set point obtained outside this tolerance is considered as "set point drift" and a test failure.

The inspector reviewed the following Licensee Event Reports (LERs) that document previous North Anna MSSV and Pressurizer Safety Valve set point drift occurrences:

<u>Unit</u>	<u>Ler #</u>	<u>Date</u>	<u>#Set Point Drift Failures</u>
1	79-155/03L-0	12/17	2 Pressurizer Safety Valves
1	80-009/03L-0	2/80	6 MSSVs
1	81-040/03L-0	3/81	2 Pressurizer Safety Valves
2	82-014/03L-0	8/82	1 Pressurizer Safety Valve
2	83-027/03L-0	4/83	6 MSSVs
2	86-001-01	2/86	8 MSSVs
1	87-008-00	5/87	1 Pressurizer Safety Valve
1	87-009-00	5/87	12 MSSVs
2	87-008-00	9/87	3 Pressurizer Safety Valves
2	87-009-00	9/87	11 MSSVs

The cause of safety valve failures in these LERs was not identified. The following additional safety valve failures have occurred due to a set point drift: (These failures are in addition to the failures reported in the previously listed LERs).

<u>Unit</u>	<u>Date</u>	<u>#Set point Drift Failures</u>
1	11/82	1 MSSV
2	9/84	1 Pressurizer Safety Valve
2	9/84	14 MSSVs
1	11/85	5 MSSVs
2	3/86	2 Pressurizer Safety Valves

North Anna TSs invoke Section XI of the ASME Boiler and Pressure Code which requires that the Pressurizer Safety Valves and MSSVs be tested in intervals that result in each valve being tested at least once over a five year period. If failures occur when testing the test frequency must be increased. Due to the set point drift problems North Anna is currently removing all MSSVs and Pressurizer Safety Valves each refueling and sending them to WYLE Laboratories for set point and seat leakage testing. The inspector noted that the most recent results of Unit 2 WYLE test results indicate a large number of safety valves with seat leakage.

The inspector questioned the licensee's corrective action concerning the safety valve drift problems. The only corrective action disclosed to the inspector by the licensee was to investigate increasing the TS set point tolerance range. If increasing the set point tolerance range can be justified the licensee will submit a TS Amendment. Review of the most recent WYLE test results indicates a significant number of safety valves set point drift to exceed three percent. Also this corrective action does not address valve seat leakage.

Upstream of North Anna Pressurizer Safety Valves is a hot loop seal, this loop seal is maintained full of coolant and temperature is maintained with strip heaters. Per the licensee the reason for heating the coolant in the loop seal is to prevent water hammer in the safety valve downstream piping. When a safety valve opens, the heated water in the loop seal will flash to steam. WYLE Laboratories lift set points tests the safety valves with steam. Per another Region II utilities study on safety valve set points the use of steam versus water as the system medium effects the safety valve set point. According to the study a safety valve set point test utilizing hot water as the system medium results in a higher set point than when utilizing steam as the system medium. This is identified as Inspector Followup Item 338, 339/88-08-01, Effect of Steam Versus Hot Water As System Medium on Pressurizer Safety Valve Set Point Pressure.

No deviations or violations were identified.