



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

Report No: 50-338/89-10 and 50-339/89-10  
 Licensee: Virginia Electric and Power Company  
 5000 Dominion Blvd.  
 Glen Allen, Virginia 23060  
 Docket Nos.: 50-338 and 50-339 License Nos.: NPF-4 and NPF-7  
 Facility Name: North Anna 1 and 2  
 Inspection Conducted: April 3 - April 7, 1989

Inspector: M. McKenzie Thomas 4/17/89  
 M. Thomas, Reactor Inspector Date Signed  
 Inspector: L. S. Mellen 4/17/89  
 L. Mellen, Reactor Inspector Date Signed

Accompanying personnel: F. Jape April 6 - 7, 1989

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 F. Jape, Chief Date Signed  
 Quality Programs Section  
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 Division of Reactor Safety

SUMMARY

Scope: This special, unannounced inspection was conducted in the area of Safety System Outage Modification Inspection (SSOMI) follow-up. The inspection, which was conducted primarily at the Licensee's Corporate Engineering Design Offices, updated the licensee activities concerning four safety-significant items that were addressed in the NRC letter from Gus C. Lainas to W. R. Cartwright dated March 17, 1989 and the Licensee's response dated March 31, 1989.

Results: A brief description of the four safety-significant items and their current dispositions is contained below. The detailed description is contained in paragraph 2.

1. The Service Water System Spray Array and Bypass Valve motor actuators were sized for an incorrect differential pressure rating of 50 psi.

Two of the eight Spray Array MOVs had torque switch settings which were lower than the settings required to open the valves against maximum differential pressure. The torque switch settings have been reset and in their current configuration all of the Spray Array MOVs will allow the motor to develop the required opening torque.

A licensee evaluation of throttling the Spray Array Bypass MOVs indicated the spring packs were not of sufficient size to provide the required closing torque. Administrative controls have been implemented to prevent the MOVs from being throttled in modes 1 - 4 until the spring packs are replaced. This will insure that the Bypass MOVs have sufficient closing torque to operate under design basis conditions.

2. Unjustified assumptions and omissions were detected in setpoint calculations.

The licensee has completed a review of all of the requested set-point calculations. The calculations reviewed had minor mathematical errors and inconsistencies. With the errors corrected there is a demonstrable margin of safety for the setpoints reviewed.

3. Non-class 1E equipment is powered from a vital Class 1E power source without proper isolation.

The specific example cited by the SSOMI team will have isolation cards installed prior to restart of Unit 2 from their current refueling outages. The licensee is in the process of reviewing all DCPs and EWRs being installed during the 1989 refueling outage for each unit that affected the instrumentation system to determine proper isolation and adherence to design requirements. Additionally, the licensee committed during the conference call to review all applicable DCPs and EWRs implemented since procedure NAS 3012 was issued (April 1987). As of the end of this inspection no additional examples of improperly evaluated or unisolated non-safety loads have been discovered. Further discussions will be held between NRC and the licensee to determine the disposition of DCPs and EWRs that were implemented prior to April 1987.

4. DCPs did not prescribe appropriate functional testing requirements.

All DCPs and EWRs that were implemented or were to be implemented during the current refueling outage for Unit 2 were reviewed by the licensee to ensure:

- a. Installed modification operational logic of the circuit is as intended by the design change.
- b. Installed modification does not alter the operational logic of any other system input to the modified circuit.
- c. The modified circuit output operational logic is the same as before unless it was altered by the design change.

The DCPs and EWRs that are to be installed during the current Unit 2 Outage have been reviewed per the Licensee's commitments.

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

P. Boulden, System Engineer  
\*M. Bowling, Assistant Station Manager  
\*R. Calder, Nuclear Engineering Manager  
\*R. Carroll, Project Engineer  
S. Harvey, Supervisor Ad Ops  
\*J. Hegner, Licensing Supervisor  
\*J. Maciejewski, Quality Assurance Manager  
\*W. McBride, Supervisor of Electrical I&C  
\*F. Moore, Vice President, Power Engineering Services  
R. Rasnic, Supervisor Mechanical Engineering  
\*R. Riley, Supervisor Project Engineering  
M. Sartain, Project Engineer  
W. Thomas, Senior Staff Engineer  
\*W. Thompson, Electrical Engineering Manager  
S. Wiser, Senior Staff Engineer

Other licensee employees contacted included engineers, operators, craftsmen, and office personnel.

\*Attended Exit Interview.

Acronyms throughout this report are listed in the last paragraph.

### 2. Follow-up on previously identified items (92700)

The SSOMI team identified a number of items, four of which were addressed as safety-significant matters by the NRC in a letter to Virginia Power on March 17, 1989. The inspectors reviewed the Licensee response dated March 31, 1989. This inspection addresses the items of concern related to the restart of Unit 2 only, for each of the safety-significant matters additional work will be performed by the licensee prior to the restart of Unit 1. The current status of the safety-significant matters is as follows:

Item 1: The Service Water System Spray Array and Bypass Valve motor actuators were sized for an incorrect differential pressure of 50 psi. VEPCO was requested to verify the correct differential pressure for these valves, and make any changes necessary to ensure the actuators would deliver the required torque under all postulated design basis conditions.

The licensee performed an evaluation to determine if the existing Spray Array Valves have sufficient margin to develop the opening torque required to operate under all design basis conditions. The licensee determined that the MOVs had sufficient torque, if the opening torque switch settings were 2.5 or greater. Two of the eight MOVs (SW-122A and SW-222A) previously had a torque

switch setting of 2.0. In this configuration the valves could not have developed the required opening torque. The licensee issued and implemented work orders 089431 and 089432 to adjust the opening torque switch settings for MOVs SW-122A and SW-222A, respectively. The inspectors verified that the torque switch setting have been reset to 2.5, by direct observation of the MOVs in question. The remaining six MOVs had torque switch settings of 2.5 or greater. Based on the inspectors direct observation and the licensees' evaluation, in their current configuration all of the Spray Array MOVs will develop the required opening torque.

The licensee performed an evaluation of the Spray Array Bypass MOVs (SW-123A, SW-123B, SW-223A and SW-223B) and determined that, regardless of the torque switch settings, the spring packs were not of sufficient size to provide the required closing torque during throttled operation; however, operation from either the full open or full closed position was within the bounds of the developed torque. The licensee has begun the spring pack procurement process. There is considerable lead time for the spring pack procurement; however, in the interim the licensee has implemented administrative controls which prohibit throttling the bypass MOVs in Modes 1 through 4. The inspectors verified the administrative controls have been implemented by reviewing the Action Statement Status Log. The implementation of these administrative controls will insure that the Bypass MOVs have sufficient closing torque to operate under design basis conditions until the spring packs are replaced.

The set point documents and the MOV specifications will be revised prior to Unit 2 restart to reflect appropriate design differential pressure and torque switch settings. Additionally the licensee has begun to inspect all of the Service Water MOVs for generic implications of differential pressure and torque switch settings.

The inspectors reviewed design calculations ME-121 and ME-126 as part of the review for this item. Through an administrative error, neither of the calculations had been issued, although they were completed in mid-1987. The licensee investigated this error and found three other calculations that had not been issued. The licensee has corrected this situation by taking appropriate actions to issue these calculations. This administrative error did not effect the conclusions reached on this item.

The licensee is performing a review of similar valves in the Service Water System for generic implications. The scope of the review may be expanded after the Service Water results are analyzed. Additionally, the licensee stated that MOVATS testing has been performed on approximately 90 percent of the safety-related rising stem valves. No problems have been detected relating to undersized operators using either method.

Item 2: Unjustified assumptions and omissions were detected in setpoint calculations and no controlled methodology existed for performing setpoint calculations. VEPCO was requested to review 10 specific examples of setpoint calculations, selected by the SSOMI team, to ensure that proper consideration was given to instrument span, drift value, cable accuracy, and measuring/test equipment accuracy.

To provide assurance that safety system setting limits have not been inadvertently compromised, the licensee reviewed the following set point calculations:

1. Pressurizer Level - EE-0058
2. Pressurizer Pressure
3. RCS Loop Flow - EE-0060
4. High Flux Power Range
5. Over Temperature
6. Over Power
7. Steam Generator Level - EE-0059
8. Steam Delta Pressure - EE-0062
9. Containment Pressure - EE-0052
10. Feed Water Flow

The licensee has completed all of the reviews; although, at the time of this inspection the calculations had not been formally checked, the engineering calculation was provided for those calculations that were completed while the inspectors were at the corporate offices. The remaining calculations were reviewed at the Region II office.

The calculations reviewed had minor mathematical errors and inconsistencies that changed the calculated margin of safety. The basic assumptions for calculation of the margin of safety appeared adequate; however, the licensee had some difficulty in translating these assumptions into useful engineering data. The errors did not reduce the margin of safety below 1.0 percent for any of the calculations and did not require any setpoint changes. The errant calculations were returned to the licensee with an explanation of the inspector's concerns. The licensee reviewed the calculations and corrected the calculations, where appropriate. With the errors corrected, there is a demonstrable margin of safety in the setpoint calculations reviewed.

The inspectors reviewed the preliminary procedure STD-EEN-0304, Calculating Instrumentation Uncertainties by the Square Root of the Squares Method, which will be used to justify the instrumentation uncertainties for instrument setpoint safety margin calculations. The procedure established the methodology for calculation of instrumentation uncertainties and employs the statistical

Square Root of the Sum of the Squares. The procedure had minor discrepancies, which the licensee has corrected. With the errors corrected this method appears to be an adequate method for determining the combination of random independent error components in conjunction with an arithmetic summation of systematic or interactive errors in the setpoint safety margin calculation.

The licensee is reviewing all DCPs and EWRs being implemented during the 1989 refueling outages for both Units 1 and 2. These reviews will be completed prior to the restart of the respective unit.

Item 3: Non-class 1E equipment is powered from a vital Class 1E power source without proper isolation. VEPCO was requested to justify or correct the specific service water instrumentation as well as evaluate other possible instances of improper isolation elsewhere in the facility.

The inspectors reviewed NAS-3012, Criteria Specification for Design and Identification of Electrical Cable Systems, Revision 1. Section G, paragraph 3 which states "Associated Circuit requirements remain until an associated circuit passes through an isolation device or is specifically analyzed or tested demonstrating that the associated circuit cannot degrade the Class 1E circuit to an unacceptable level." The inspectors noted that this procedure was initially issued in April 1987 and as such all modifications implemented after this date were governed by these procedural requirements.

The licensee reviewed NAS-3012 and other commitments and determined that the specific example cited by the SSOMI team required the installation of an isolation card or the justification of the lack of an isolation device. The Licensee has determined that the installation of isolation cards is the preferred option. The isolation cards will be installed prior to the restart from each units current refueling outage. The licensee is in the process of reviewing all DCPs and EWRs installed during the 1989 unit outage that effected the instrumentation system to determine proper isolation and adherence to design requirements. Additionally, the licensee will review all applicable DCPs and EWRs implemented since procedure NAS-3012 was issued (April 1987). As of the end of this inspection no additional examples of improperly evaluated or unisolated non-safety loads have been discovered. Further discussions between the licensee and NRC will determine the disposition of DCPs and EWRs that were implemented prior to April 1987.

Item 4: Design Change Packages (DCPs) did not explicitly prescribe the necessary testing required to demonstrate functionality of the system and affected components following the design change. VEPCO was requested to incorporate the specific post-modification testing requirements into the design change packages or EWRs scheduled to

be installed in this outage, to insure that the modifications being installed during the current outage are functionally tested subsequent to the installation and to insure that the capability of the affected systems to mitigate the design basis accident has not been compromised. Additionally, during the SSOMI inspection, VEPCO committed to update the associated procedures to ensure that the required testing would be accomplished for future modifications.

All DCPs and EWRs that were implemented or will be implemented during the current refueling outage for both Units will be reviewed by the licensee and testing will be completed prior to restart of the respective unit, to ensure:

1. Installed modification operational logic of the circuit is as intended by the design change.
2. Installed modification does not alter the operational logic of any other system input to the modified circuit.
3. The modified circuit output operational logic is the same as before unless it was altered by the design change.

The DCPs and EWRs that are to be installed during the current Unit 2 outage have been reviewed per the licensee's commitments.

The licensee is in the process of revising the procedure that governs the testing and retesting requirements that are specified by the design organization. This change will require the inclusion of post modification testing requirements.

The inspectors discussed the current testing methodology with supervisor of Advisory Operations (Ad Ops) and determined that periodic testing does not necessarily follow modifications that effect safety-related systems. For the specific example cited by the SSOMI team the licensees' current testing methodology requires only a functional test of the modified components and a single point upstream and down stream to be tested. Questions regarding current test methodology will be reviewed during the installation and testing phase of the SSOMI.

### 3. Exit Interview

The inspection scope and findings were summarized on April 7, 1989, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the SSOMI inspection follow-up items. In addition, further discussions were held on April 13, 1989, for Items 1 and 3 during a conference call between the licensee, Region 2 and NRR personnel. During this conference call the licensee described in detail the reviews being performed regarding the generic aspects of Item 1 and provided additional details of their actions regarding Item 3. The licensee committed to submit a report describing the status of each item prior to restart. Dissenting comments were not received from the licensee. Proprietary information is not contained in this report.



The licensee will provide a supplemental response for the items discussed at the exit interview. Proprietary information is not contained in this report.

#### 4. Acronyms and Initialisms

Ad Ops	Advisory Operations
DCP	Design Change Package
EE	Electrical Engineering
EWR	Engineering Work Request
I&C	Instrument and Controls
ME	Mechanical Engineering
MOV	Motor Operated Valve
psi	Pounds per Square Inch
PT	Periodic Test
RCS	Reactor Coolant System
SSOMI	Safety System Outage Maintenance Inspection
SW	Service Water
VEPCO	Virginia Electric and Power Company