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

Report Nos.: 50-338/85-27 and 50-339/85-27

Licensee: Virginia Electric & 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: October 7 - November 3, 1985

Inspectors: S. Gunther for — Nov 14, 1985
M. W. Branch (SRI) Date Signed

S. Gunther for — Nov 14, 1985
J. G. Luehman (RI) Date Signed

Approved by: S. Gunther for — Nov 14, 1985
S. Elrod, Section Chief Date Signed
Division of Reactor Projects

SUMMARY

Scope: This routine inspection by the resident inspectors involved 175 inspector-hours on-site in the areas of engineered safety features (ESF) walk-down, operational safety verification, monthly maintenance, monthly surveillance, preparations for refueling, design changes and modifications, and Inspection and Enforcement Information Notice follow-up.

Results: One violation was identified - failure to maintain necessary quality records to verify qualification of personnel performing the actions specified in design change procedures (paragraph 7).

REPORT DETAILS

1. Licensee Employees Contacted

E. W. Harrell, Station Manager
D. B. Roth, Quality Control (QC) Manager
G. E. Kane, Assistant Station Manager
E. R. Smith, Assistant Station Manager
R. O. Enfinger, Superintendent, Operations
J. R. Harper, Superintendent, Maintenance
A. H. Stafford, Superintendent, Health Physics
J. A. Stall, Superintendent, Technical Services
J. R. Hayes, Operations Coordinator
D. A. Heacock, Engineering Supervisor
D. E. Thomas, Mechanical Maintenance Supervisor
E. C. Tuttle, Electrical Supervisor
R. A. Bergquist, Instrument Supervisor
F. T. Terminella, Quality Assurance (QA) Supervisor
R. S. Thomas, Engineering Supervisor
G. H. Flowers, Nuclear Specialist
J. H. Leberstein, Licensing Coordinator

Other licensee employees contacted include technicians, operators, mechanics, security force members, and office personnel.

2. Exit Interview

The inspection scope and findings were summarized on November 5, 1985, with selected individuals identified in paragraph 1. The licensee acknowledged the inspectors' findings. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspectors during this inspection.

3. Licensee Action on Previous Inspection Findings

This was not inspected during this reporting period.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Plant Status

Unit 1

The unit operated at or near 100% power during most of the inspection period. On the evening of November 3, 1985, the unit was shut down to commence the cycle five-six refueling outage.

One reactor trip occurred on Unit 1 during the inspection period. The following paragraphs describe the operational transient which resulted in a manual trip of the reactor by the control room operator on October 24, 1985.

- At 3:30 a.m., the 480 volt AC circuit breaker for battery room exhaust fan 1-HV-F-57C failed and caused melting of the vertical bus bars in motor control center (MCC) 1J1-1. This resulted in an electrical trip of the MCC supply breaker, 14J-4, and subsequent loss of power to equipment supplied from the MCC. The equipment that was de-energized included the battery chargers for two of the four instrument buses and the solenoid valves (TV-CC-106A, B, and C) which supply component cooling water (CC) to all three reactor coolant pumps' (RCP) motor oil, stator, and shroud coolers.

- At 3:45 a.m., a power decrease was initiated because of increasing RCP motor bearing temperatures.

- At 3:50 a.m., manual reactor and turbine trips were initiated in preparation for securing the RCPs.

- At 3:52 a.m., all three RCPs were secured and natural circulation was established. The incident was classified as an unusual event (UE) per the site emergency plan and the necessary notifications were initiated.

- At 6:45 a.m., the 1A RCP was restarted after installing a temporary jumper which allowed opening TV-CC-106A, thereby re-establishing CC flow to the RCP motor.

- At 7:54 a.m., repairs to MCC 1J1-1 were completed and at 8:56 a.m. all loads except 1-HV-F-57C were re-energized and returned to normal.

- At 9:02 a.m., the UE was terminated and subsequent notifications were made.

The plant's response to the natural circulation event was as expected; the conditions described in section 9.2.2.5.4 of the Updated Final Safety Analysis Report (UFSAR), which describes a loss of CC to the RCPs, were validated.

Unit 2

The unit was shut down from 100% power on October 11, 1985 because of a failure of the 2H emergency diesel generator (EDG). Following repairs to the EDG the unit was returned to power on October 15, 1985, and operated at or near 100% power for the remainder of the inspection period. Details of the EDG failure are addressed in paragraph 12 of this report.

6. Licensee Event Report (LER) Follow-up

This was not inspected during this reporting period.

7. Follow-up of Previously Identified Items

(Closed) Unresolved Item 338,339/84-38-02; Validity of Quality Records Associated With Design Change Procedures. The conditions discussed in paragraph 10 of Inspection Report 338,339/84-38 have been evaluated by the NRC and appear to violate the requirements of 10 CFR Part 50 Appendix B, Criterion XVII, which requires that sufficient records be maintained to provide information regarding the qualification of personnel performing the actions specified in the procedures.

The inspector's original concern, as discussed in Inspection Report 338,339/84-38, is provided below:

> Section 5.2.2.1 of Administrative Procedure (ADM) 3.1 discusses the control of design change procedures being performed by the Engineering and Construction (E&C) group. Specifically, the ADM states that, "upon completion of each shift, the white working controlled copies are to be returned to the design change log room and those steps completed shall be signed in the master colored controlled copy by the supervisor immediately responsible and knowledgeable of activities completed." The current practice at North Anna is to only keep the master colored controlled copy of the procedure. The working copies are thrown away, thereby destroying the ability to verify personnel qualifications. The following regulatory concerns associated with this practice were discussed with station QA personnel:
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> - Technical Specification (TS) 6.10.2.a requires records and drawing changes reflecting facility design modifications made to systems and equipment described in the Final Safety Analysis Report be retained for the duration of the facility operating license.
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> - Amendment 4 of the Virginia Electric and Power Company (VEPCO) Topical Report, VEP-1, "Quality Assurance Program, Operations Phase", commits VEPCO to collect, store, and maintain QA records in accordance with NRC Regulatory Guide 1.88, Revision 2, 1976, which endorses American National Standards Institute (ANSI) N45.2.9-1974.
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> - Section 3.2 of ANSI N45.2.9-1974, provides instructions on what constitutes a valid QA record.

The inspector reviewed several design change procedures and verified that the record copy of the procedures do not identify the individuals who actually performed the actions; therefore, no traceability of qualifications exists. The design change procedures (DCPs) reviewed, along with the inspector's findings, are listed below:

- DCP-82-14B, Class 1E Transmitter Replacement, required in section 4.2.1.13 as well as in numerous other sections, that Conax seal assemblies be installed using Rosemont and Conax installation

instructions. The working copy and record copy of this procedure were signed by different individuals.

- DCP-83-24, Appendix "R" Emergency Diesel Generator Isolation, required in section 4.11.2 as well as numerous other related sections, that specific safety-related cables be disconnected. The working copy and record copy of this procedure were signed by different individuals.

- DCP-84-15, Outside Recirculation Spray Pump Valve Replacement, North Anna Unit 1, required in section 4.3.5 that certain precise measurements be made. The working copy and record copy of this procedure were signed by different individuals. Another section of this DCP (4.5.16) required a verification that the temperature of the weld returned to within 5-10 degrees Fahrenheit of room temperature using a contact thermometer. Once again, the working copy and record copy of the procedure were signed by different individuals.

The failure to provide traceable records regarding the qualification of individuals actually performing these actions is identified as violation 338,339/85-27-01, and applies to both units.

8. Monthly Maintenance

Station maintenance activities affecting safety-related systems and components were observed/reviewed to ascertain that the activities were conducted in accordance with approved procedures, regulatory guides and industry codes or standards, and in conformance with TS. Specific items observed include the repairs to the 2H EDG discussed in paragraph 12, and repairs to the Unit 1, 1J1-1 MCC discussed in paragraph 5.

No violations or deviations were identified.

9. Monthly Surveillance

The inspectors observed/reviewed TS-required testing and verified that testing was performed in accordance with adequate procedures, that test instrumentation was calibrated, that limiting conditions for operation (LCO) were met and that any deficiencies identified were properly reviewed and resolved.

No violations or deviations were identified.

10. ESF System Walkdown

The following selected ESF systems were verified operable by performing a walkdown of the accessible and essential portions of the systems on October 25, 1985.

- Unit 1 and Unit 2 EDG remote and local breaker alignment.

No violations or deviations were identified.

11. Routine Inspection

The inspectors' observations during the inspection period verified that control room manning requirements were being met. In addition, the inspectors observed shift turnover to verify that continuity of system status was maintained. The inspectors periodically questioned shift personnel relative to their awareness of plant conditions.

Through log review and plant tours, the inspectors verified compliance with selected TSs and LCOs.

During the course of the inspection, observations relative to Protected and Vital Area security were made, including access controls, boundary integrity, search, escort and badging.

On a regular basis, radiation work permits (RWP) were reviewed and specific work activities were monitored to assure they were being conducted per the RWPs. Selected radiation protection instruments were periodically checked, and equipment operability and calibration frequency were verified.

The inspectors kept informed, on a daily basis, of the overall status of both units and of any significant safety matters related to plant operations. Discussions were held with plant management and various members of the operations staff on a regular basis. Selected portions of operating logs and data sheets were reviewed daily.

The inspectors conducted various plant tours and made frequent visits to the Control Room. Observations included the following: witnessing work activities in progress; verifying the status of operating and standby safety systems and equipment; confirming valve positions, instrument and recorder readings, annunciator alarms, and housekeeping.

No violations or deviations were identified.

12. Diesel Generator Failures

Both units at North Anna have experienced numerous internal failures of their EDG engines. The failures can be categorized as either piston/ring failure or cylinder liner scoring/cracking failures. The licensee has attributed past failures to severe TS testing requirements (ie. fast, cold starts and/or fast loading). The term "fast, cold start" refers to the TS requirement to start the EDG from ambient conditions and reach rated voltage and frequency within 10 seconds.

The diesel engines are manufactured by the Fairbanks Morse Engine Division of Colt Industries (model 38TD8-1/8), and use a 12-cylinder, opposed-piston, turbocharged design. These EDGs are rated for continuous duty at 2750 kilowatts (KW), for 2000 hours at 3000 KW, and for 30 minutes at 3300 KW. The diesel manufacturer and the licensee speculated that the most probable cause of piston/liner failures could be attributed to stress-related damage to the wrist pin-to-connecting rod and wrist pin-to-piston insert bushings,

causing piston distortion with ultimate contact between the piston and the cylinder liner. This contact causes excessive heating and continued piston growth until high temperature stress-related piston or liner cracking occurs. This results in pressurization of the crankcase and engine shutdown by the engine protection system. A wrist pin-to-connecting rod bushing on damaged equipment removed from the 2H diesel was measured and found to have elongated by approximately 0.2".

On October 18, 1985, the licensee met with members of the NRC staff which included personnel from NRR, IE, and Region II. The purpose of the meeting was to discuss the details and probable cause of recent engine failures, and the proposed corrective actions to improve reliability. The licensee discussed past engine failures and presented their estimate of the most probable cause; the upcoming complete engine overhaul was also discussed. The licensee committed to complete the engine overhauls prior to returning the units to power following the November 1985 and April 1986 refueling outages for Units 1 and 2, respectively. Additionally, the licensee presented information to justify continued operation of the units until completion of these overhauls; this included past failure analyses and details of previous component replacements.

The diesel generator reliability improvement program was required as part of License Amendment No. 48 of the Unit 2 TS and will be closely followed by the inspectors during the upcoming refueling outages; this is identified as Inspector Follow-up Item (IFI 338, 339/85-27-02).

No violations or deviations were identified.

13. Inspection and Enforcement Information Notice (IEIN) Follow-up

IEIN 85-82, Diesel Generator Differential Protection Relay Not Seismically Qualified, identifies a concern that General Electric (GE) model 12CFD relays, often used for EDG protection against electrical shorts and grounds, are not seismically qualified. The inspectors verified that EDG output breaker protection at North Anna is not being provided by the type relays identified in the IEIN. The protection for both North Anna 1 and 2 is provided by GE model 12HFA and 12CFVB relays which are not addressed in the IEIN.

14. Preparations for Refueling

During the week of October 28, 1985, the inspector reviewed the upcoming refueling outage schedule and discussed major objectives of the outage with the refueling coordinator. The inspector also reviewed several refueling procedures and verified that the licensee had reviewed vendor change recommendations and appropriately modified station implementing procedures.

No violations or deviations were identified.

15. Design Changes and Modifications (37700)

The design change and modification program was reviewed by the inspectors. Specifically, the inspectors selected several design change packages and verified the following:

- that design changes were reviewed and approved in accordance with TS and QA program requirements;
- that design changes were controlled by established plant procedures;
- that design changes were reviewed and approved in accordance with the requirements of 10 CFR 50.59;
- and that operating procedures and drawings were updated in a timely manner to reflect the modification.

Those design changes reviewed are discussed in paragraph 7 of this report.

No violations or deviations, other than that listed in paragraph 7, were identified.