U.S. NUCLEAR REGULATORY COMMISSION

REGION II

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Licensee:	Virginia Electric and Power Company (VEPCO)
Facility:	North Anna Power Station, Units 1 & 2
Location:	1022 Haley Drive Mineral, Virginia 23117
Dates:	December 8, 1996 through January 11, 1997
Inspectors:	R. McWhorter, Senior Resident Inspector R. Gibbs, Resident Inspector P. Byron, Resident Inspector, Surry (Section M1.1) W. Miller, Reactor Inspector (Sections F1 to F8.1)
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ENCLOSURE

EXECUTIVE SUMMARY

North Anna Power Station, Units 1 & 2
NRC Inspection Report Nos. 50-338/96-13, 50-339/96-13

This integrated inspection included aspects of licensee operations, engineering, maintenance, and plant support. The report covers a 5-week period of resident inspection; in addition, it includes the results of an announced inspection by a regional specialist inspector.

Operations

- Daily operations were generally conducted in accordance with regulatory requirements and plant procedures (Section O1.1).
- Operations associated with the Unit 2 startup following a forced outage were well controlled and conservative. Procedural adherence, crew communications, and supervisory oversight were effective (Section O1.2).
- Cold weather protection procedures were properly implemented (Section O1.3).
- A Unit 1 power reduction and swap of Main Feedwater Pumps (MFPs) were carefully controlled and well supervised. A finding that no safety evaluation was completed for a procedure change which affected the MFP recirculation flow lineup will be further reviewed when closing an existing unresolved item on similar issues (Section O1.4).
- The Unit 1 Auxiliary Feedwater System was properly aligned, and components were in good condition. Housekeeping in the Auxiliary Feedwater Pump House was below the standards maintained in more frequently toured areas (Section O2.1).
- Operators carefully planned for possible reactivity effects from maintenance activities on the letdown temperature control valve and properly responded to a small transient which resulted from the maintenance. However, prior to the evolution, operators were not fully aware of the actual mechanism by which the maintenance activity could affect reactivity despite the fact that a similar plant response had been observed at the Surry Power Station in September 1996 (Section O4.1).
- The Oversight organization continued to assess station performance effectively (Section O7.1).

Maintenance

- Service water repair activities were properly performed (Section M1.1).
- A Unit 1 turbine valve freedom test met Technical Specification requirements and was properly performed (Section M1.2).

- Operator and equipment performance was good during a 1J Emergency Diesel Generator surveillance test (Section M1.3).

Engineering

- One Licensee Event Report was closed (Section E8.1).

- A non-cited violation was identified for the Component Cooling Water Surge Tank not being seismically qualified (Section E8.1).

Plant Support

- Chemistry sampling and analyses were carefully controlled, and radiological practices during sampling were effective in preventing the spread of contamination (Section R1.1).

- The transfer of a letdown filter from a filter transport cask to an on site storage container was properly performed, and sound radiation protection practices were followed (Section R1.2).

- The licensee's actions in the resolution of the Thermo-Lag issue were timely and proactive. The only issue outstanding was completion of the NRC review for the use of Thermo-Lag as radiant energy heat shields in the Reactor Buildings (Section F1.1).

- The maintenance records, equipment trending data, and inspection of the fire protection components indicated that there was no maintenance backlog on the fire protection systems. An effective fire barrier penetration seal program had been implemented to inspect penetration seals and to identify and correct deficiencies. The maintenance and performance of the fire protection systems were good (Section F2.1).

- Appropriate surveillances and tests were being performed on the fire protection features and systems. Good evaluations and trending were being provided on the completed test results by the system engineers (Section F2.2).

- The fire protection procedures met the commitments to the NRC and implementation, including housekeeping, was very good. The Technical Requirements Manual was considered a program strength which aided Operations in the identification of fire protection features to achieve and maintain these systems at a high level of operability. However, not incorporating into the station fire protection program procedures a requirement for each fire brigade member to participate in at least two drills per year, as is the current industry practice, was identified as a program weakness (Section F3).

- The fire brigade organization and training met requirements of the site procedures. The fire brigade performance during a simulated fire was good (Section F5).

- The coordination and oversight of the facility's fire protection program were good and met the licensee's commitments to the NRC (Section F6).

- Thorough audits and assessments were made of the facility's fire protection program and appropriate corrective actions were taken to resolve the identified issues (Section F7).

- Previously identified issues involving the evaluation of 3M Appendix R Fire barrier installation were resolved (Section F8.1).

Report Details

Summary of Plant Status

Unit 1 operated the entire inspection period at or near full power.

Unit 2 began the inspection period in cold shutdown for main generator repairs. On December 15, a unit heatup began, but a residual heat removal system valve required repairs, and the unit returned to cold shutdown. On December 19, a unit heatup began again, and the unit reached hot standby on December 21. A reactor startup was performed, and the unit was placed in commercial service also on December 21. The unit reached full power on December 23 and remained at or near full power for the remainder of the inspection period.

I. Operations

O1 Conduct of Operations

O1.1 Daily Plant Status Reviews (71707)

The inspectors conducted frequent control room tours to verify proper staffing, operator attentiveness, and adherence to approved procedures. The inspectors attended daily plant status meetings to maintain awareness of overall facility operations and reviewed operator logs to verify operational safety and compliance with Technical Specifications (TSs). Instrumentation and safety system lineups were periodically reviewed from control room indications to assess operability. Frequent plant tours were conducted to observe equipment status and housekeeping. Deviations Reports (DRs) were reviewed to assure that potential safety concerns were properly reported and resolved. The inspectors found that daily operations were generally conducted in accordance with regulatory requirements and plant procedures.

O1.2 Unit 2 Startup

a. Inspection Scope (71707)

On December 21, the inspectors observed preparations and operations associated with Unit 2 reactor and main turbine startup. The startup followed the completion of a 40-day forced outage to repair damage to the main generator which caused a reactor trip on November 12, 1996. The inspectors evaluated operations against TS requirements and licensee procedures for unit startup.

b. Observations and Findings

The inspectors found that startup activities were performed in accordance with TS requirements and licensee procedures. The approach to reactor criticality and subsequent increase in power were carefully controlled. Throughout each of the evolutions, appropriate supervision was present, operator manipulations were focused, and communications

were formal. When starting up the main turbine, a turbine vibration monitoring panel power supply failure occurred. Crew response to the failure was appropriate, and a conservative decision was made to return the turbine to minimum speed and delay further startup activities until repairs were completed. The inspectors also noted that Operations managers and specialists from the licensee's Oversight group were present to observe and evaluate operations for the startup.

c. Conclusions

Operations associated with the Unit 2 startup following a forced outage were well controlled and conservative. Procedural adherence, crew communications, and supervisory oversight were effective.

O1.3 Cold Weather Protection

a. Inspection Scope (71714)

During the previous inspection period, the inspectors performed initial reviews of the licensee's programs for cold weather protection and their implementation. During this inspection period, the inspectors completed reviews of additional portions of the licensee's cold weather protection program and their implementation as described in licensee procedures 0-GOP-2.9, Heat Trace Breaker Configuration and Status, Revision 1; 0-GOP-4, Cold Weather Operations, Revision 9; and 0-GOP-4.2, Extreme Cold Weather Operations, Revision 4.

b. Observations and Findings

On several occasions during the inspection period, the inspectors performed walkdowns to verify cold weather protection implementation in various buildings and areas, and no discrepancies were identified. On January 7, the inspectors verified that the breakers supplying power to all safety-related Unit 2 Refueling Water Storage Tank (RWST) heat trace circuits were properly aligned. Two Unit 2 heat trace circuits were found to be in an off-normal lineup because of equipment problems, and the inspectors verified that redundant heat tracing was energized. The inspectors also verified that the off-normal alignments were being tracked in abnormal status logs and operator logs. The inspectors verified for selected RWST piping heat trace circuits that the circuits were drawing appropriate amperage to confirm proper operation.

Procedure 2-PT-59.8, Verifying Operability of Freeze Protection on Unit 2 RWST Level Transmitters, Revision 2, completed on July 31, 1996, was reviewed and found to have documented that satisfactory amperage checks were being completed for the Unit 2 RWST level transmitter heat trace circuits. The inspectors also found that both normal and redundant Unit 2 RWST level transmitter circuits were energized simultaneously. The inspectors verified that this arrangement was consistent with 0-GOP-4.2 and was being tracked by abnormal status logs.

c. Conclusions

The inspectors concluded that the licensee's cold weather protection procedures were being properly implemented.

O1.4 Unit 1 Main Feedwater Pump (MFP) Swap

a. Inspection Scope (71707)

On January 3, the inspectors observed operators starting MFP 1-FW-P-1A and securing MFP 1-FW-P-1C. MFP 1-FW-P-1C was planned to be secured because of excessive shaft seal water leakage. The evolution was complicated by the fact that operators suspected that the 1-FW-P-1C recirculation line check valves, 1-FW-290 and 1-FW-291, were leaking. On January 8 and 9, the inspectors reviewed selected plant documents supporting a Procedure Action Request (PAR) to 1-OP-31.1, Main Feedwater System, Revision 21-OT01, which was completed after the evolution.

b. Observations and Findings

The inspectors attended the MFP swap pre-job brief and observed it to be effective. In particular, the contingency action discussions for excessive recirculation line check valve leakage were thorough and informative. The inspectors verified that all personnel involved with the evolution were present at the brief. Prior to the pump swap, reactor power was reduced to 95 percent to reduce feedwater demand as a precaution in the event that MFP recirculation check valve leakage was excessive. The reactor power reduction was carefully performed with appropriate supervision.

During the MFP swap, operators and the inspectors observed dual indication for recirculation header flow control valve, 1-FW-FCV-150C. The status lights indicated that the valve was not fully open as desired, and local operators verified that the valve was near full open. The inspectors observed that the reactor operator appropriately questioned the ability to start a MFP with the valve's fully open limit switch not actuated. Subsequently, research by an extra shift supervisor and the system engineer determined that the pump start permissive was a "not fully closed" permissive on the closed limit switch and that starting a MFP would be unaffected by the open limit switch problem. MFP 1-FW-P-1A was then successfully started, and MFP 1-FW-P-1C was secured.

Following the evolution, leakage through the recirculation check valves created audible flow through MFP 1-FW-P-1C. Isolating the pump for maintenance was considered, but operators desired to leave MFP 1-FW-P-1C available for automatic start until MFP 1-FW-P-1A had operated for a sufficient time period to ensure reliable operation. As a result, operators planned to close MFP recirculation line isolation valve, 1-FW-21, to isolate flow through the leaking check valves. In order to close the valve, a "one time use only" PAR to 1-OP-31.1, was generated

to authorize operators to leave the valve temporarily in the closed position until the reliability run on MFP 1-FW-P-1A was complete. Additionally, control room operators were alerted to this abnormal lineup with a visual cue and an Abnormal Status Log entry. On later dates, the inspectors questioned reactor operators to determine their familiarity with the abnormal condition and found that operator knowledge of the abnormal status condition was good.

The inspectors then reviewed the 10 CFR 50.59 safety evaluation screening criteria for the PAR to 1-OP-31.1 to determine if the screening criteria (Attachment 2 of VPAP-3001, Safety Evaluations, Revision 3) were answered correctly. The inspectors found that question 5B of the screening criteria appeared to be answered incorrectly. Question 5B addressed whether the proposed activity (i.e., temporary procedure change to 1-OP-31.1) altered either temporarily or permanently the information, design, function, ability to function, or method of performing the function of a structure, system or component as described in the Updated Final Safety Analysis Report (UFSAR). Specifically, the change to 1-FW-21 from normally open to closed reflected a change to the main feedwater system as described on a drawing located in Figure 10.4-8 of the UFSAR. Therefore, the inspectors found that question 5B should have been answered "yes", and a safety evaluation in accordance with 10 CFR 50.59 should have been performed. The inspectors reviewed the procedure change and concluded that no unreviewed safety question existed. However, this failure to perform a safety evaluation is a possible non-conformance to the requirements of 10 CFR 50.59. This item will be further reviewed by the inspectors when closing an existing Unresolved Item (URI) on similar issues (50-338, 339/96003-05).

c. Conclusions

A Unit 1 power reduction and swap of MFPs was carefully controlled and well supervised. A finding that no safety evaluation was completed for a procedure change which affected the MFP recirculation flow lineup will be further reviewed when closing an existing URI on similar issues.

O2 Operational Status of Facilities and Equipment

O2.1 Auxiliary Feedwater (AFW) System Walkdown

a. Inspection Scope (71707)

During the week of January 6, the inspectors walked down portions of the Unit 1 AFW System located in the AFW Pump House. The inspectors reviewed valve positions against system design drawings and procedure 1-OP-31.2A, Valve Checkoff - Auxiliary Feedwater, Revision 20. Additionally, the inspectors reviewed overall material conditions of components and housekeeping in the AFW Pump House. Electrical power to critical components was reviewed by verifying the positions of power supply breakers.

b. Observations and Findings

The inspectors found that all valves and breakers were in the correct positions. Pumps, valves and other components were observed to be in good overall condition. Three small leaks, one missing pipe cap, and several other minor discrepancies were noted and reported to Operations supervision for corrective action. Housekeeping in the AFW Pump House was acceptable but below the housekeeping standards maintained in more frequently toured areas. Specifically, in the sumps and pump gland leakoff areas, the continual presence of water had caused the buildup of large amounts of corrosion products and other deposits.

c. Conclusions

The inspectors concluded that the Unit 1 AFW system was properly aligned, and components were in good condition. Housekeeping in the AFW Pump House was below the standards maintained in more frequently toured areas.

04 Operator Knowledge and Performance

04.1 Dilution During Letdown Maintenance

a. Inspection Scope (71707)

On January 3, licensee management discussed with inspectors a small reactivity transient (less than one percent power change) that occurred during letdown line maintenance on January 2. The inspectors reviewed the event to ascertain if maintenance activities were properly controlled and if operators properly responded to the transient.

b. Observations and Findings

The inspectors found that in order to perform maintenance on the Unit 2 letdown non-regenerative heat exchanger component cooling water temperature control valve, 2-CC-TCV-206, operators planned an evolution in which the valve would be placed in the full open position. Fully opening the valve was anticipated to cause letdown and charging temperature to decrease. A formal brief was held among the operating shift to discuss the possible effects of the anticipated change in letdown and charging temperature on reactivity. During the brief, the operators specifically anticipated that the primary effect would be a slight reactivity increase caused by the colder water entering the Reactor Coolant System from the charging system.

The maintenance activity was initiated by fully opening 2-CC-TCV-206, and letdown temperature was observed to decrease from approximately 110°F to approximately 80°F. The operators carefully observed the plant for effects and none were immediately noted. However, approximately ten minutes later, a slight increase in reactor power and Average Temperature (T_{avg}) was observed. Operators promptly inserted control

rods and power and T_{avg} were returned to normal. The maintenance was later completed, and plant conditions were returned to normal. The inspectors reviewed operator responses and concluded that the plant was properly controlled during the transient.

Operations personnel analyzed the event and determined that the reactivity transient was similar to that which would be caused by a dilution of approximately 60 gallons of unborated water. This magnitude was larger than could reasonably be attributable to a change to charging water temperature alone, so the event was further reviewed. Operations personnel then found that the change in letdown temperature had a transient effect upon boron concentration exiting the letdown demineralizer. The mixed bed resin in the demineralizer was found to vary in efficiency with changes in temperature. The 60 gallon equivalent dilution was concluded to have been caused by the effect of the 30°F letdown temperature reduction upon the demineralizer resin. At the lower temperature, the resin became more efficient in ion exchange and removed more ions, such as boron, from the water. This caused the effluent boron concentration to be significantly lower than the inlet concentration until a new equilibrium was established for the lower temperature. After a new equilibrium was reached, the effluent boron concentration returned to a value equal to the inlet concentration. During normal operations with small temperature changes, this effect would not be noticed. However, the 30°F step change in temperature had caused a noticeable effect on plant reactivity. The inspectors reviewed the licensee's conclusions and found that they well explained the plant response observed during the transient.

During a meeting with Oversight personnel on January 8, the inspectors were informed that a similar event occurred at the Surry Power Station on September 14, 1996. At Surry, the corresponding temperature control valve had failed to the 90 percent closed position. Letdown temperature increased 30°F, and power and T_{avg} decreased. Operators responded to restore plant conditions, and DR S-96-2007 was initiated. At North Anna, Operations personnel were not aware of the Surry experience prior to the maintenance. The inspectors discussed these observations with Operations managers who stated that actions were being taken to improve operator knowledge in this area and communications between the North Anna and Surry stations would be improved.

c. Conclusions

The inspectors concluded that operators carefully planned for possible reactivity effects from maintenance activities on the letdown temperature control valve and properly responded to a small transient which resulted from the maintenance. However, prior to the evolution, operators were not fully aware of the actual mechanism by which the maintenance activity could affect reactivity despite the fact that a similar plant response had been observed at the Surry Power Station in September 1996.

O7 Quality Assurance in Operations

O7.1 Oversight Activities Review (40500)

On January 8, the inspectors met with Oversight personnel. Issues discussed included Oversight activities and findings since previous meetings. Copies of recent audits were provided for review. The inspectors found that the Oversight group was identifying and tracking for resolution substantive issues for station performance improvement. The inspectors concluded that the Oversight organization continued to assess station performance effectively.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Service Water (SW) Piping Repairs (62707)

On December 13, the inspectors observed various selected tasks associated with Design Change Package 94-010, Repair/Replacement of Exposed SW Piping To/From Component Cooling Heat Exchangers. The inspectors observed the fitup of a four-inch elbow and the preparation and welding of two sections of four-inch pipe. The inspectors found that housekeeping in each area was good, and both efforts were adequately supported by plant personnel. The inspectors concluded that the SW repair activities were properly performed.

M1.2 Turbine Valve Freedom Test (61726)

On December 27, the inspectors observed operators performing 1-PT-34.3, Turbine Valve Freedom Test, Revision 9-P1. The test was required by TS surveillance requirement 4.7.1.7.2.a to demonstrate the operability of turbine governor and throttle valves. The inspectors observed control room operators reducing unit power for the test and test execution in the control room and at the main turbine. The inspectors found that operators performed all activities carefully and in accordance with procedures. The inspectors verified that equipment performed acceptably during the test and that TS surveillance requirements were met. The inspectors concluded that the Unit 1 turbine valve freedom test met TS requirements and was properly performed.

M1.3 Emergency Diesel Generator (EDG) Fast Start Test (61726)

On January 8, the inspectors observed operators performing 1-PT-82.3B, 1J Diesel Generator Surveillance Test (Simulated Loss of Off-Site Power in Conjunction with an ESF Actuation Signal), Revision 16. The test was required by TS surveillance requirement 4.8.1.1.2.a and 4.8.1.1.2.c to demonstrate the 1J EDG's ability to start and carry electrical loads. The inspectors observed that operators correctly followed procedures, used good self-check techniques, and were appropriately supervised by

senior operators. The inspectors verified that the EDG performance was satisfactory to meet test acceptance criteria and TS requirements. The inspectors concluded that operator and equipment performance was good during the 1J EDG surveillance test.

III. Engineering

E7 Quality Assurance in Engineering Activities

E7.1 Review of UFSAR Commitments

A recent discovery of a licensee operating their facility in a manner contrary to the UFSAR description highlighted the need for a special focused review that compared plant practices, procedures and/or parameters to the UFSAR description. While performing the inspections discussed in this report, the inspectors reviewed the applicable portions of the UFSAR that related to the areas inspected. The following inconsistency was noted between the wording of the UFSAR and the plant practices, procedures and/or parameters observed by the inspectors:

- The licensee did not perform a safety evaluation for a procedure change to align the MFW system differently from the normal alignment shown in USFAR Figure 10.4-8 (Section 01.4).

The above item will be considered when closing URI 50-338, 339/96003-05, Review UFSAR Discrepancies.

E8 Miscellaneous Engineering Issues (92700)

E8.1 (Closed) Licensee Event Report (LER) 50-338, 339/95008: Component Cooling Water Surge Tank Not Seismically Qualified When Tank Level Is Full.

This LER described the licensee's identification on September 26, 1996, that the allowable stress values for the component cooling water surge tank supports would be exceeded during a design basis earthquake if the tank was completely filled. The problem was identified from analyses being performed in follow-up to seismic verifications required as a part of Unresolved Safety Issue A-46 and Individual Plant Examinations for External Events (Seismic) programs. The cause of the problem was determined to be personnel error during the original plant design process. As initial corrective action, the licensee evaluated the tank for continued operability at a reduced water level. Further corrective actions included preparing and installing modifications to strengthen the tank support structure. These modifications were completed in October 1996. Verifications of modification adequacy were performed by the inspectors and discussed in NRC Inspection Report 50-338, 339/96-12. The failure of the system to meet design bases requirements since original construction was a violation of 10 CRF 50 Appendix B, Criterion III, Design Control, requirements. This licensee identified and

corrected violation is being treated as a Non-Cited Violation (NCV) consistent with Section VII.B.1 of the NRC Enforcement Policy (50-338, 339/96013-01).

IV. Plant Support

R1 Radiological Protection and Chemistry Controls

R1.1 Primary System Chemistry Sampling and Analysis

a. Inspection Scope (71750)

The inspectors observed primary system chemistry sampling and analyses to ascertain that sampling was performed in accordance with TS 3.4.7, TS 3.4.8, and plant sampling procedures.

b. Observations and Findings

On December 11, the inspectors observed a full spectrum chemistry sampling of the primary system at the sample sink area. Samples were taken from one reactor coolant system cold leg on both units and from the Unit 2 mixed bed filter. The inspectors observed that procedural compliance was excellent. Additionally, the inspectors noted cautious radiological practices when handling the primary system water inside the sample sink.

The inspectors did, however, observe that the technician manipulated equipment outside the sample sink with potentially contaminated gloves. This was done after rinsing the gloves with pure water and wiping the gloves dry. The inspectors questioned the technician about this practice, and the technician stated that it was an approved practice and was acceptable because of the carefully controlled techniques that had been adopted. Subsequent discussions with health physics supervisors revealed that this was a recently adopted practice to reduce solid radioactive waste by using only one set of rubber gloves. The inspectors subsequently requested a radiological swipe of the equipment handled by the chemistry technician to verify no contamination. The swipe results indicated no spread of contamination from the sample sink to adjacent areas. The inspectors concluded that this was a effective contamination control technique.

On December 18, the inspectors observed chemistry analyses of a different primary water sample for which boron, lithium, and gross activity were analyzed. The inspectors found that the analyses were performed in the required time period for the isotopic analyses, instruments used for the analyses were in calibration, and radiological practices were good.

c. Conclusions

The inspectors concluded that chemistry sampling and analyses met TS requirements and were carefully controlled. Radiological practices during sampling were effective in preventing the spread of contamination.

R1.2 Transfer of Letdown Filter to Onsite Storage Container (71750)

On December 18, the inspectors observed the transfer of a highly radioactive depleted letdown filter from the filter transport cask to the Onsite Storage Container (OSSC) at the Waste Solids Section of the Decontamination Building. Prior to the filter transfer, the inspectors attended the pre-job brief and noted that all personnel involved in the work were present and that the brief was thorough. During the transfer, the inspectors observed that the controlling document was properly followed and that the requirements of the radiation work permit were met. The inspectors concluded that the transfer of the letdown filter from the filter transport cask to the OSSC was properly performed and that sound radiation protection practices were followed.

F1 Control of Fire Protection Activities

F1.1 Resolution of Thermo-Lag Fire Barrier Issue

a. Inspection Scope (64704)

The inspectors reviewed the action taken to resolve the degraded Thermo-Lag fire barrier issues at North Anna and determined if this action was consistent with the NRC requirements.

b. Observations and Findings

In 1991, the NRC found that Thermo-Lag fire barrier material did not perform to the manufacturers specifications. The NRC issued NRC Bulletin 92-01, "Failure of Thermo-Lag 330 Fire Barrier System to Maintain Cabling in Wide Cable Trays and Small Conduits Free from Fire Damage," and requested licensees with Thermo-Lag fire barriers to take the appropriate compensatory measures for the areas where the Thermo-Lag fire barriers were installed. Virginia Power responded to this bulletin by letters dated July 29, 1992, September 30, 1992, April 12, 1993, December 23, 1993, January 27, 1994, December 6, 1994, July 26, 1995, December 15, 1995, and August 8, 1996. The following actions had been taken on this issue:

- Containment:

  The licensee submitted an evaluation to the NRC on December 15, 1995, which provided a justification for the continued use of Thermo-Lag as a radiant energy shield in the reactor buildings and

requested an exemption for the installation of these items in the reactor buildings. This item is presently under review by the NRC.

- Auxiliary Building - Power Supply Cables for Charging Pump 1-CH-P-1C and Component Cooling Water Pump 2-CC-P-1A:

The Thermo-Lag fire barriers initially installed on the armored power supply cables to charging pump 1-CH-P-1C and component cooling water pump 2-CC-P-1A had been removed and replaced with a 1-hour 3M Interam E53A fire barrier. The inspectors reviewed vendor documents, construction documents, fire test data, performed walkdown inspections of the installation and concluded that the installed fire barriers met the vendor's installation requirements. The inspectors also reviewed an evaluation by Underwriter's Laboratories, Inc., dated July 7, 1993, of the vendor's installation design and test data. This evaluation certified that the installation met a 1-hour fire endurance rating and met the separation requirements of 10 CFR 50, Appendix R, Section III.G.2.b. Therefore, this issue for these two installations is resolved.

- Auxiliary Building - 259'-6" Elevation - Temporary Heating, Ventilation and Air Conditioning (HVAC) Flexible Duct Enclosure:

Flexible ducts were provided as an alternate ventilation supply for the charging pump cubicles in the event the normal ventilation system was damaged by a fire. These ducts were to be attached to a supply duct on elevation 259'-6" of the auxiliary building which was connected to back-up ventilation fans installed on the roof of the auxiliary building. These ducts were initially stored within a one-hour Thermo-Lag coated enclosure. These ducts had been relocated from this enclosure and were stored in metal gang boxes located in the fire rated stairway enclosure for the auxiliary building. The Thermo-Lag coating on the HVAC enclosure remained in place but no longer performed a required fire protection function. This issue is resolved.

- Auxiliary Building - Piping Penetrations into Charging Pump Cubicles:

Thermo-Lag was attached to the steel plates of the piping penetrations into the charging pump cubicles on the 244'-6" elevation of the auxiliary building. This Thermo-Lag material was used to enhance the fire protection rating of the fire barriers separating the charging pumps from the auxiliary building. This installation was described in an evaluation and exemption request which the licensee sent to the NRC by letter dated December 11, 1992. This exemption was approved by the NRC in a letter dated

September 12, 1995. The inspectors performed walkdown inspections of these fire barriers and verified that the Thermo-Lag installations remained in place. Therefore, this issue is resolved.

c. Conclusions

The licensee was timely and pro-active in the resolution of the Thermo-Lag issue. Completion of the NRC review for the use of Thermo-Lag as radiant energy heat shields in the Reactor Buildings was the only outstanding Thermo-Lag related issue at North Anna.

F2 Status of Fire Protection Facilities and Equipment

F2.1 Operability of Fire Protection Facilities and Equipment

a. Inspection Scope (64704)

The inspectors reviewed the maintenance history, open maintenance work orders on the fire protection systems, the system engineer's quarterly report data, station DRs and inspected the fire protection systems to determine the performance trends and the material conditions of the plant's fire protection systems, equipment and features.

b. Observations and Findings

As of January 8, 1997, there were a total of 12 fire protection related open work requests. These involved minor corrective maintenance work items which did not affect the operability of the components. Eight of these work requests had been issued since December 1, 1996. Two were issued in November, one in October and one in June 1996. The inspectors concluded that there was no backlog of fire protection maintenance items and that corrective maintenance was performed on degraded fire protection components in a timely manner.

The North Anna System Engineering Quarterly Report for the Third Quarter 1996 indicated that the performance of the fire protection systems was satisfactory except for maintenance problems associated with the 8-hour Appendix R emergency lighting units. The inspectors interviewed the fire protection system engineer and found that the principal problem with these lighting units was a high battery burn out rate due to the loss of electrolyte for batteries installed in warm areas of the plant. To correct this problem, the existing batteries in the lighting units were being replaced with a new type battery that was more suitable for use in a warm location. This project was approximately 68 percent complete and was scheduled to be completed by the summer of 1997. In addition, an enhanced preventive maintenance and test program had been implemented. The installation of the new batteries and the enhanced maintenance should improve the performance of these batteries.

The inspectors reviewed the licensee's self assessment report on the fire protection related DRs written at North Anna. This report indicated that an increased number of fire protection DRs had been written since 1990. This increase was attributed to the lower threshold that the licensee established at which a DR was issued. The assessment identified the type of fire protection components which had multiple DRs issued and areas in which the licensee should review further. For example, the highest number of DRs issued since 1993 were on emergency lighting units and fire barriers. The problems with the emergency lighting units were being resolved by the installation of a new type of battery and battery maintenance was being enhanced. The high number of problems with fire barriers was due to the comprehensive fire barrier inspection program which had recently been initiated. The fire barrier inspection program required the performance of a detailed inspection of 20 percent of the fire barrier penetrations each year. During these inspections, the damming materials installed during the construction phase of the penetration seals were removed, the thickness of the seal was measured, and physical appearance of each seal was evaluated. Removal of this damming material and the subsequent detailed inspection resulted in the identification of a high number of degraded fire barrier penetration seals since 1995. These degraded fire barriers were properly repaired to meet fire protection program requirements. The inspectors considered this program to be very effective.

The inspectors toured the plant and noted that all of the systems inspected were operational and well maintained. However, during the plant tour, one degraded fire barrier assembly was identified in the Unit 2 emergency switchgear room. The licensee promptly initiated the compensatory actions required by the Technical Requirements Manual and issued a work request to perform the required repairs.

During this plant tour, the inspectors also noted that manually activated Halon fire suppression systems were provided for the Unit 1 and Unit 2 emergency switchgear rooms. These areas are required to meet the alternative or dedicated shutdown areas for 10 CFR 50, Appendix R, Section III.G.3. Past NRC practice required either an automatic fire suppression system for these areas or an exemption request with an evaluation which justified the lack of an automatic fire suppression system. The licensee informed the inspectors that this issue was described to the NRC by the licensee's letter dated October 27, 1983. However, it appeared that NRC had not issued a Safety Evaluation to approve this design. This item is identified as an Inspection Follow-up Item (IFI) pending further review by the NRC (50-338, 339/96013-02).

c. Conclusions

The maintenance records, equipment trending data, and inspection of the fire protection components indicated that there was no maintenance backlog on the fire protection systems. An effective fire barrier

penetration seal program had been implemented to inspect penetration seals and to identify and correct deficiencies. The maintenance and performance of the fire protection systems were good.

F2.2 Surveillance of Fire Protection Features and Equipment

a. Inspection Scope (64704)

The inspectors reviewed the following completed surveillance test procedures:

- O-PT-100.2, Fire Protection Pumps-Annual Testing, Revision 6
- O-PT-100.6, Main Fire Loop Flow Test (3-Years), Revision 6

b. Observations and Findings

The completed surveillance tests of the fire protection systems reviewed by the inspectors where appropriately completed and met the acceptance criteria. The test procedures were very good. The data obtained and recorded for each fire pump included multiple points on the pump curve to verify pump performance and each completed test procedure included an evaluation of the test data by the fire protection system engineer. Test results were trended to compare the results of current tests with previous test results.

c. Conclusions

Appropriate surveillances and tests were being performed on the fire protection features and systems and good evaluations and trending were being provided on the completed test results.

F3 Fire Protection Procedures and Documentation

a. Inspection Scope (64704)

Procedure VPAP-2401, Fire Protection Program, Revision 5, and Technical Requirements Manual, Revision 16, were reviewed for compliance with the NRC requirements and guidelines. Plant tours were performed to determine procedure compliance.

b. Observations and Findings

Procedure VPAP-2401 established the administrative guidance used to implement the fire protection program at the two Virginia Power nuclear plants (North Anna and Surry). This procedure contained the requirements for the control of combustibles, ignition sources and fire brigade organization and training. The procedure was satisfactory and met the licensee's commitments to the NRC. However, the procedure did not address the NRC guidelines for the number of fire brigade drills required by each fire brigade member.

Fire brigade drills were performed quarterly for each Operations shift at North Anna as required by VPAP-2401, Section 6.6.12. However, drills were not scheduled to assure that each brigade member participated in at least two drills per year, as provided by the current NRC guidelines of 10 CFR 50, Appendix R, Item L.3, and NUREG 0800, Standard Review Plan, Section 9.5.1, Item C.3.(7).(b). The fire protection industry standard, National Fire Protection Association Standard 600, Industrial Fire Brigade, states that fire brigades members performing fire fighting activities, similar to that performed at nuclear power plants, shall participate in a fire drill at least semi-annually.

The size of the plant's fire brigade averaged approximately 74 members. In 1995, 50 of the 74 members participated in at least one drill and 34 members participated in two or more drills. Approximately 32 percent of the members did not participate in a drill. The drill performance improved during 1996 with 71 members participating in at least one drill and 60 members participating in two or more drills.

Not requiring each fire brigade member to participate in at least two drills per year is identified as a program weakness. The licensee stated that this issue would be reevaluated.

The operability and surveillance requirements for the fire protection systems and components previously located in the TS had been removed from the TS and incorporated into a separate manual entitled the Technical Requirements Manual. The operability requirements for additional fire protection features not previously included in the TS but identified in the UFSAR and other documents, such as emergency lighting, reactor coolant pump oil collection systems, emergency communications equipment, etc., had also been included in the Technical Requirements Manual. The identification and incorporation of the operability requirements for practically all of the fire protection related components at North Anna into a single document was considered an important element for maintaining the operability of the fire protection features. This item is considered a program strength.

The inspectors performed plant tours and noted that the implementation of the site's fire prevention program for the control of ignition sources, transient combustibles, and general housekeeping was very good.

c. Conclusions

The fire protection program implementing procedure met the commitments to the NRC. Incorporating the operability requirements for the fire protection components into the Technical Requirements Manual was considered a program strength which aided Operations in the identification of principal fire protection features and achieving a high level of operability. However, not incorporating into the station fire program procedures a requirement for each fire brigade member to participate in at least two drills per year, as is the current industry practice, was identified as a program weakness.

F5 Fire Protection Staff Training and Qualification

a. Inspection Scope (64704)

The inspectors reviewed the fire brigade organization and training and the site's fire fighting preplans for compliance with the facility's fire protection program and the NRC guidelines and requirements.

b. Observations and Findings

The organization and training requirements for the North Anna plant fire brigade were established by VPAP-2401, Section 6.6. The fire brigade for each shift was composed of a fire brigade leader and two brigade members from Operations and two brigade members from Security. The Operations fire brigade leader and members were normally auxiliary (non-licensed) unit operators. Each fire brigade member was required to receive initial, quarterly and annual fire fighting related training. Each member was also required to satisfactorily complete an annual medical evaluation and certification for participation in fire brigade fire fighting activities. As of the date of this inspection, there were a total of 58 Operations personnel and 20 Security personnel on the plant's fire brigade.

The non-licensed operators utilized as fire brigade leaders were provided with additional training to insure that each leader had sufficient knowledge of plant safety-related systems to understand the effect of fire on safe shutdown capability. In addition, licensed personnel normally respond with the brigade and were available for consultation, if required, in the event of a fire.

The inspectors reviewed the training and medical records for the fire brigade members and verified that the training and medical records were up to date.

On January 8, 1997, the inspectors witnessed a fire brigade drill involving a simulated fire in the Unit 2 normal switchgear room. A fire brigade leader and a total of three members from Operations and two from Security responded to the fire drill in full turnout gear. In addition, a Senior Reactor Operator from Operations and two electrical maintenance personnel responded to the drill. The response by the brigade was timely. The communications and fire fighting tactics demonstrated by the brigade were good. The fire brigade adhered to the guidance of the pre-fire plan for this area during the drill. A drill critique with the drill participants was conducted following the drill. The drill performance was good and the drill objectives were met.

c. Conclusions

The fire brigade organization and training met the requirements in the site procedures. The fire brigade performance during a simulated fire was good.

F6 Fire Protection Organization and Administration

a. Inspection Scope (64704)

The licensee's management and administration of the facility's fire protection program was reviewed for compliance with the commitments to the NRC and to current NRC guidelines.

b. Observations and Findings

The designated onsite manager responsible for the administration and implementation of the fire protection program was delegated to the Supervisor, Administrative Service. The Supervisor, Station Safety and Loss Prevention, reported to the Supervisor, Administrative Services, and was responsible for the station fire protection program and ensuring that the appropriate fire prevention procedures and surveillance tests of the fire protection features were implemented. Coordination of the station's Appendix R requirements was provided by a fire protection system engineer in the Nuclear Engineering group. Engineering support for the design of the fire protection features was provided by the offsite Design Engineering and Support organization.

c. Conclusions

The coordination and oversight of the facility's fire protection program were good and met the licensee's commitments to the NRC.

F7 Quality Assurance (QA) in Fire Protection Activities

a. Inspection Scope (64704)

The following audit and self assessment reports were reviewed:

- Self Assessment — Safety and Loss Prevention Fire Protection Program Self Assessment of December 1996
- QA Audit 93-04 — Biennial Fire Protection and Loss Prevention Audit
- QA Audit 93-10 — Annual Fire Protection and Loss Prevention Audit
- QA Audit 94-10 — Annual/Triennial Fire Protection and Loss Prevention Audit
- QA Audit 95-02 — Annual/Biennial Fire Protection and Loss Prevention Audit
- QA Audit 96-02 — Annual Fire Protection and Loss Prevention Audit
- NML 5/96 Report — Nuclear Mutual Limited (NML) Insurance Inspection Report dated May 31, 1996

- NML 12/96 Report NML Insurance Inspection Report dated December 12, 1996

b. Observations and Findings

The self assessment, QA audits and insurance inspections of the site's fire protection program were comprehensive. A number of findings, observations and issues were identified for resolution to enhance the facility's fire protection program.

The inspectors reviewed the audit findings from each QA report, the recommendations from NML inspection reports and the corrective actions taken on the identified discrepancies. These items had been resolved, except for one item in the December 1996 NML report. NML's letter dated December 12, 1996, identified the apparent need for additional preventive maintenance on the check valves in the discharge piping from the fire pumps. This issue was being evaluated by the licensee to determine the appropriate action required.

c. Conclusions

Thorough audits and assessments were made of the facility's fire protection program and appropriate corrective actions were taken to resolve the identified issues.

F8 Miscellaneous Fire Protection issues

F8.1 (Closed) IFI 50-338, 339/94011-01: Evaluation of 3M Appendix R Fire Barrier Installation.

The inspectors reviewed the actions taken by the licensee on the previously identified concerns related to: incorporation of 3M Interam fire barrier installation documents into station drawings; revision of Procedure 0-PT-108.4, Visual Inspection-Auxiliary Building Fire Retardant Coatings, Cable Tray Fire Stop and Penetration Seals Required by Appendix R, to include the new fire barriers; incorporation of the 3M Interam Fire Barrier vendor manual into the site's vendor manual program; and, controls provided over the vendors/contractors not on the licensee's approved contractors list. A contractor was used to install the 3M fire barrier material who was not on the licensee's list of approved contractors. The inspectors concluded that appropriate action had been taken to resolve each of these issues.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on January 10, 1997. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

W. Anthes, Superintendent, Outage Planning
K. Barnett, Supervisor, Safety and Loss Prevention
L. Edmonds, Supervisor, Administrative Services
B. Foster, Superintendent Station Engineering
E. Grecheck, Assistant Station Manager, Operations and Maintenance
J. Hayes, Superintendent, Operations
D. Heacock, Assistant Station Manager, Nuclear Safety and Licensing
M. Kansler, Vice President, Nuclear Operations
P. Kemp, Supervisor, Licensing
T. Maddy, Superintendent, Security
W. Matthews, Station Manager
M. McCarthy, Director, Nuclear Oversight
D. Roberts, Supervisor, Station Nuclear Safety
H. Royal, Superintendent, Nuclear Training
D. Schappell, Superintendent, Site Services
R. Shears, Superintendent, Maintenance
A. Stafford, Superintendent, Radiological Protection

NRC

G. Belisle, Chief, Reactor Projects Branch 5, Region II
P. Fredrickson, Chief, Special Inspection Branch, Region II
J. Jaudon, Director, Division of Reactor Safety, Region II
E. Merschoff, Acting Deputy Regional Administrator, Region II

INSPECTION PROCEDURES USED

IP 40500: Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems

IP 61726: Surveillance Observations

IP 62707: Maintenance Observations

IP 64704: Fire Protection Program

IP 71707: Plant Operations

IP 71714: Cold Weather Preparations

IP 71750: Plant Support Activities

IP 92700: Onsite Followup of Written Reports of Nonroutine Events at Power Reactor Facilities

ITEMS OPENED, CLOSED AND DISCUSSED

Opened

50-338, 339/96013-01	NCV	Component Cooling Water Surge Tank Not Seismically Qualified (Section E8.1)
50-338, 339/96013-02	IFI	Manual In Lieu of Automatic Fire Suppression System Installed in Units 1 and 2 Emergency Switchgear Rooms (Section F2.1)

Closed

50-338, 339/94011-01	IFI	Evaluation of 3M Appendix R Fire Barrier Installation (Section F8.1)
50-338, 339/96008	LER	Component Cooling Water Surge Tank Not Seismically Qualified When Tank Level Is Full (Section E8.1)
50-338, 339/96013-01	NCV	Component Cooling Water Surge Tank Not Seismically Qualified (Section E8.1)

Discussed

50-338, 339/96003-05	URI	Review UFSAR Discrepancies (Section O1.4)