UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
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ATLANTA, GEORGIA 30303-8931

July 2, 2003

Virginia Electric and Power Company
ATTN: Mr. David A. Christian
Senior Vice President and
Chief Nuclear Officer
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060

SUBJECT: NORTH ANNA POWER STATION - NRC TRIENNIAL FIRE PROTECTION INSPECTION REPORT 50-338/03-06 AND 50-339/03-06

Dear Mr. Christian:

On, May 23, 2003, the Nuclear Regulatory Commission (NRC) completed a triennial fire protection inspection at your North Anna Power Station, Units 1 and 2. An interim exit was held with Mr. D. Heacock, Site Vice President, and other members of your staff on May 23, 2003, to discuss the results of that effort. Following completion of additional review in the Region II office, a final exit was held with Mr. J. Crossman, Supervisor, Station Licensing, and other members of your staff on July 2, 2003. The enclosed report documents our findings from this inspection.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents two findings that have potential safety significance greater than very low significance, however, a safety significance determination has not been completed. These two issues did not present an immediate safety concern.

In addition, the report documents one NRC-identified finding of very low safety significance (Green), which was determined to involve a violation of NRC requirements. However, because of the very low safety significance and because it is entered into your corrective action program, the NRC is treating the finding as a non-cited violation (NCV) consistent with Section VI.A of the NRC Enforcement Policy. If you contest the NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at North Anna Power Station.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publically Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Charles R. Ogle, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos.: 50-338, 50-339
License Nos.: NPF-4, NPF-7

Enclosure: Inspection Report 50-338, 339/03-06
w/Attachment: Supplemental Information

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.:	50-338, 50-339
License Nos.:	NPF-4, NPF-7
Report No.:	50-338/03-06 and 50-339/03-06
Licensee:	Virginia Power and Electric Company (VEPCO)
Facility:	North Anna Power Station
Location:	1022 Haley Drive Mineral, Virginia 23117
Dates:	May 5 - 9, 2003 (Week 1) May 19 - 23, 2003 (Week 2)
Inspectors:	M. Villaran, Consultant, Brookhaven National Laboratory S. Walker, Reactor Inspector G. Wiseman, Fire Protection Inspector (Lead Inspector)
Accompanying Personnel:	N. Staples, Inspector Trainee, Region II
Approved by:	Charles R. Ogle, Chief Engineering Branch 1 Division of Reactor Safety

‘Enclosure

SUMMARY OF FINDINGS

IR 05000338/2003-006, 05000339/2003-006; Virginia Power & Electric Company; 5/05-09/2003 and 5/19-23/2003; North Anna Power Station, Units 1 and 2; Triennial Fire Protection

The report covered a two-week period of inspection by regional inspectors. One Green non-cited violation (NCV) and two unresolved items with potential safety significance greater than Green were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

A. Inspector Identified and Self-Revealing Findings

Cornerstones: Initiating and Mitigating Systems

- TBD. The safe shutdown strategy and related fire response procedures may be inadequate to assure a safe shutdown of the Unit 2 reactor for a fire in Emergency Switchgear and Relay Room (ESGR) No. 2. The licensee's fire response procedures may not preclude plant damage and may prescribe operator actions in the Cable Vault and Tunnel that are not independent from the effects of an ESGR No. 2 fire.

  This finding is unresolved pending completion of a significance determination. The finding is greater than minor because it affects the initiating event and mitigating systems cornerstone objectives. Also, the finding has potential safety significance greater than very low safety significance because in some scenarios, these deficiencies could lead to reactor coolant pump seal package leakage and failure of the specified alternative shutdown strategy. (Section 1R05.05)

- TBD. The shared ventilation system between the Main Control Room (MCR) and the Unit 1 and Unit 2 Emergency Switchgear and Relay Rooms (ESGRs) do not have adequate separation, isolation, or barriers to prevent smoke and toxic gases from being transported to the ESGRs during a fire in the MCR. The alternative shutdown capability for an MCR fire is located at the auxiliary shutdown panels in each unit's ESGR, respectively.

  This finding is unresolved pending completion of a significance determination. The finding is greater than minor because it affects the mitigating systems cornerstone objectives. The finding has potential safety significance greater than very low safety significance because operator inability to safely man the auxiliary shutdown panels could result in failure of the specified alternative shutdown strategy. (Section 1R05.09)

- Green. The fire barrier wrap system installed for 3-hour protection of a MCR exhaust duct routed through the Unit 2 Normal Switchgear Room (NSR) had an indeterminate fire resistance rating instead of the required three hours. The fire barrier wrap system had not been specifically determined through testing nor evaluated as being bounded by the referenced test configuration.

  This was identified as a non-cited violation of 10 CFR 50.48 and License Condition 2.D. This finding is greater than minor because it degraded the ability to meet the mitigating systems cornerstone objective. The finding is considered to have very low safety significance because the fire detection, automatic suppression, and manual suppression for the Unit 2 NSR fire area met the conditions of the licensing basis; a fire damper rated as a 3-hour fire barrier is located in the ventilation duct where it enters the MCR; and no equipment or cable for systems required for safe plant shutdown are located in the fire areas. (Section 1R05.09)

B. Licensee-Identified Violations

None

REPORT DETAILS

1. REACTOR SAFETY
Cornerstones: Initiating Events, Mitigating Systems and Barrier Integrity

1R05 FIRE PROTECTION

The purpose of this inspection was to review the North Anna Power Station (NAPS) fire protection program (FPP) for selected risk-significant fire areas. Emphasis was placed on verification that the post-fire safe shutdown (SSD) capability and the fire protection features provided for ensuring that at least one redundant train of safe shutdown systems is maintained free of fire damage. The inspection was performed in accordance with the Nuclear Regulatory Commission (NRC) Reactor Oversight Program using a risk-informed approach for selecting the fire areas and attributes to be inspected. The team used the licensee's Individual Plant Examination for External Events and in-plant tours to choose three risk-significant fire areas for detailed inspection and review. The three fire areas selected were:

- Fire Area 2 , Main Control Room (MCR); Service Building +276'-9" Level
- Fire Area 5-2, Unit 2 Normal Switchgear Room (NSR); Service Building +307'-3" Level
- Fire Area 6-2, Unit 2 Emergency Switchgear and Relay Room (ESGR) No. 2; Service Building +252'-0' and 254'-0' Levels

For each of the selected fire areas, the team focused the inspection on the fire protection features, and on the systems and equipment necessary for the licensee to achieve and maintain safe shutdown conditions in the event of a fire in those fire areas.

The team evaluated the licensee's FPP against applicable requirements, including Operating License Condition 2.D, Fire Protection; Title 10 of the Code of Federal Regulations, Part 50 (10 CFR 50), Appendix R; 10 CFR 50.48; Appendix A of Branch Technical Position (BTP) Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1; related NRC Safety Evaluation Reports (SERs); the North Anna Updated Final Safety Analysis Report (UFSAR); and plant Technical Specifications (TS). The team evaluated all areas of this inspection, as documented below, against these requirements.

.01 Systems Required To Achieve and Maintain Post-Fire Safe Shutdown

a. Inspection Scope

The team reviewed the licensee's FPP documented in Administrative Procedure VPAP-2401, Fire Protection Program, the NAPS UFSAR, and the NAPS 10 CFR 50 Appendix R Report to determine the systems required to achieve post-fire SSD. The team selected the chemical and volume control (CVCS), auxiliary feedwater, and the MCR and ESGR ventilation systems to review for their support in the fire protection program. The team also reviewed the SSD equipment lists, system flow diagrams, and the fire area hazards analysis (in the Appendix R report) for each of the three selected fire areas to evaluate the completeness and adequacy of the FPP and the systems relied

upon to mitigate fires in the selected fire areas. Specific licensee documents and drawings reviewed during the inspection are listed in the Attachment.

b. Findings

No findings of significance were identified.

.02 Fire Protection of Safe Shutdown Capability

a. Inspection Scope

For the selected fire areas, the team evaluated the frequency of fires or the potential for fires, the separation of systems necessary to achieve safe shutdown, and the separation of electrical components and circuits located within the same fire area to ensure that at least one train of redundant safe shutdown systems remained free of fire damage. The team also inspected the fire protection features to confirm they were installed in accordance with the National Fire Protection Association (NFPA) codes of record to satisfy the separation and design requirements of 10 CFR 50, Appendix R, Section III.G. The team reviewed the following documents, which established the controls and practices to prevent fires and to control combustible fire hazards and ignition sources, to verify that the objectives established by the NRC-approved FPP were satisfied:

- UFSAR, Section 9.10, Fire Protection
- Administrative Procedure VPAP-2401, Fire Protection Program
- Appendix R Report, Chapter 8, North Anna Combustible Loading Analysis
- Loss Prevention Fire Protection Inspection Reports for 2002-2003
- The Approved Combustible Storage Areas List
- Transient Fire Loading Reports for 2002-2003
- Electrical Maintenance Procedure 0-EPM-0302-01, 4160 Volt Type 5HK Breaker and Associated Switchgear Cubical Maintenance

The team toured the selected plant fire areas to observe whether the licensee had properly evaluated in-situ compartment fire loads and limited transient fire hazards in a manner consistent with the fire prevention and combustible hazards control procedures. In addition, the team reviewed fire protection inspection reports, corrective action program (CAP) plant issue (PI) reports resulting from fire, smoke, sparks, arcing, and overheating incidents for the years 2001-2002 to assess the effectiveness of the FPP, and to identify any maintenance or material condition problems related to fire incidents.

The team reviewed drawings for the reactor coolant pump (RCP) oil collection system enclosures and tanks to assess their ability to collect and contain any oil leakage and spray from the oil containing components of the RCPs in accordance with the requirements of BTP APCSB 9.5-1, Appendix A, Position D.2.a. The team also reviewed the RCP operating procedures to confirm that the RCP oil collection system tanks were normally maintained in an empty condition and that guidance was available for the plant operators to identify, and respond to, lubricating oil leaks from an RCP motor.

The team reviewed the fire brigade response procedures, training procedures, and drill program procedures. In addition, the team evaluated fire brigade drill records and critiques for the operating shifts from August 2001- December 2002. The reviews were performed to determine whether fire brigade drills had been conducted in high fire risk plant areas and whether fire brigade personnel qualifications, drill response, and performance met the requirements of the licensee's approved FPP.

The team walked down the fire brigade staging and locker areas in the service and turbine buildings to assess the condition of fire fighting and smoke control equipment. The team examined the fire brigade's personal protective equipment, portable communications equipment, and various other fire brigade equipment to evaluate equipment accessibility, material condition, and operational readiness of equipment. Also, the team observed whether emergency exit lighting was provided for personnel evacuation pathways to the outside exits as identified in NFPA 101, Life Safety Code. This review also included an examination of backup emergency lighting availability on pathways to and within the dress-out and staging areas to support fire brigade operations during a fire-induced power failure. The fire brigade self-contained breathing apparatuses (SCBAs) were examined and assessed for adequacy. Additionally, the availability of supplemental breathing air tanks, and the capability for refill, was evaluated.

Team members walked down the selected fire areas to compare the associated fire fighting pre-fire strategies and drawings with as-built plant conditions. This was done to verify that fire fighting pre-fire strategies and drawings were consistent with the fire protection features and potential fire conditions described in the Appendix R Report. Also, the team reviewed drawings and engineering calculations for fire suppression-caused flooding associated with the ESGR No. 2 (Fire Area 6-2) floor and equipment drain system to verify that those actions required for alternative shutdown (ASD) would not be inhibited by fire suppression activities or leakage from fire suppression systems.

The team reviewed flow diagrams and engineering calculations associated with the 2-II battery room's heating, ventilation, and air conditioning (HVAC) systems. This review was done to verify that systems used to accomplish SSD would not be inhibited by a fire in the battery rooms caused by hydrogen gas buildup due to inoperable ventilation supply and exhaust fans. The team also reviewed design control procedures to verify that plant changes were adequately reviewed for the potential impact on the FPP, SSD equipment, and procedures as required by North Anna Units 1 and 2 Operating License Condition 2.D.

b. Findings

No findings of significance were identified.

.03 Post-Fire Safe Shutdown Circuit Analysis

a. Inspection Scope

The team reviewed how systems would be used to achieve inventory control, reactor coolant pump seal protection, core heat removal and reactor coolant system (RCS) pressure control during and following a postulated fire in the fire areas selected for review. In addition, the team reviewed a sample of the HVAC system for the selected fire areas. Portions of the licensee's Appendix R Report which described the methodology and system flow diagrams were reviewed. Control circuit schematics were analyzed to identify and evaluate cables important to safe shutdown. The team traced the routing of cables through fire areas selected for review by using cable schedule, and conduit and tray drawings. The team walked down these fire areas to compare the actual plant configuration to the layout indicated on the drawings. The team evaluated the above information to determine if the requirements for protection of control and power cables were met. The following motor operated valves (MOVs) and other components were reviewed:

- 2-CH-FCV-2212, Charging Pump Flow Control Valve
- 2-SI-MOV-2867A, Safety Injection (SI) via BIT Valve
- 2-SI-MOV-2867C, SI via BIT Valve
- 2-CH-MOV-2370, RCP Seal Injection Valve
- 2-CH-FCV-2186, RCP Seal Injection Valve
- 2-CH-MOV-2381, RCP Seal Return Valve
- 2-CH-MOV-2286A, Charging Pump Discharge Valve
- 2-CH-MOV-2286C, Charging Pump Discharge Valve
- 2-CH-MOV-2289A, Charging Line Stop Valve
- 2-CH-MOV-2289B, Charging Line Stop Valve
- 2-CH-MOV-2373, Charging Pump Recirc to Seal Water Heat Exchanger Valve
- 2-RC-PCV-2455C, Pressurizer PORV
- 2-RC-PCV-2456, Pressurizer PORV
- 2-RC-MOV-2536, Pressurizer Block Valve
- 2-RC-MOV-2535, Pressurizer Block Valve
- 2-SI-MOV-2869B, SI to RCS Valve
- 2-FW-P-2, Turbine Driven Auxiliary Feedwater (TDAFW) Pump
- 2-FW-MOV-200D, TDAFW MOV to SG 'A' Valve
- 2-MS-TV-211A, Steam Supply to TDAFW Valve
- 2-MS-TV-211B, Steam Supply to TDAFW Valve
- 2-EI-CB-06A & B , Auxiliary Shutdown Panels
- 2-EI-CB-97A & 203 , Auxiliary Monitoring Panels
- HV-160-1 & 2, Ventilation MOV
- HV-161-1 & 2, Ventilation MOV

b. Findings

The MCR and ESGRs are considered separate Appendix R fire areas, and located on separate elevations in the Service Building. The team identified that in some scenarios, the design of the common ventilation system shared between the MCR and the Unit 1 and Unit 2 ESGRs could result in smoke migration issues and habitability concerns for

operators attempting safe shutdown from the respective auxiliary shutdown panels (ASPs). This resulted from the fact that the shared ventilation system between the MCR and the ESGRs did not have adequate physical separation/isolation to prevent smoke and toxic gases from being transported to the ESGRs as a result of a fire in the MCR. Further, the licensee's safe shutdown circuit analysis did not include an evaluation of potential maloperation of the MCR ventilation system, its components, nor its effect on habitability at the ASPs. Specifically, for a significant fire in the MCR, control circuits for fans 1-HV-F-41 & 42 and ventilation MOVs HV-160 & 161 (for both Unit 1 & Unit 2) could be fire damaged, contributing to the smoke migration issues and habitability concerns in the ESGRs. Details related to this finding are located in Section .09 of this report.

No other findings of significance were identified.

.04 Alternative Shutdown Capability

a. Inspection Scope

The team reviewed the licensee's ASD methodology to determine the adequacy of the identified components and systems to achieve and maintain SSD conditions for each fire area selected for review and to verify conformance with applicable requirements as listed in Section .01 above. The NAPS Appendix R Report (Section 4.4) identified twelve fire areas requiring use of an ASD strategy in order to achieve SSD. The team reviewed the licensee's ASD methodology for two of these fire areas. For a significant fire in ESGR No. 2, ASD from the MCR would be used to place the unit in hot shutdown utilizing system cross-connect capability provided from Unit 1, as necessary. For a significant fire in the MCR, ASD from the ASPs would be used to place the unit in hot shutdown. The team specifically reviewed the adequacy of the systems and components [both in the MCR and at the ASPs] selected for reactivity control, reactor coolant makeup, reactor heat removal, process monitoring, and support system functions to achieve and maintain safe shutdown conditions. The methodology was reviewed to verify that safe shutdown could be achieved both with and without a loss of offsite power.

Electrical diagrams of power, control, and instrumentation cables required to support ASD were analyzed for fire induced faults that could defeat operation from the MCR or the ASP. The team reviewed the electrical isolation and protective fusing in the transfer circuits of components (e.g., motor operated valves) required for post-fire SSD at the ASP to verify that the SSD components were physically and electrically separated from the fire area. The team also examined the electrical circuits for a sampling of components operated at the ASP to ensure that a fire in the ESGRs would not adversely affect SSD capability from the MCR.

b. Findings

No findings of significance were identified.

.05 Operational Implementation of Alternative Shutdown Capability

a. Inspection Scope

The team reviewed the following fire procedures implemented during the performance of fire area specific ASD procedures for fires in the MCR and ESGR No. 2.

- 0-FCA-0, Fire Protection - Operations Response, Revision 8
- 0-AP-10, Loss of Electrical Power, Revision 38
- 0-FCA-1, Control Room Fire, Revisions 25 and 26
- 2-FCA-2, Emergency Switchgear Room Fire, Revisions 17 and 18

The team reviewed the operational implementation of the ASD capability for a fire in the MCR and ESGR No. 2 to determine if: (1) the procedures used for ASD were consistent with the Appendix R safe shutdown analysis (SSA) methodology and assumptions; (2) the procedures were written so that the operator actions could be correctly performed within the times assumed in the SSA; (3) the training program for operators included ASD capability; (4) personnel required to achieve and maintain the plant in hot standby from the ASP could be provided from normal onsite staff, exclusive of the fire brigade; and (5) the licensee periodically performed operability testing of the alternative shutdown instrumentation and transfer and control functions.

The team also walked down Fire Contingency Action (FCA) procedures for the MCR (0-FCA-1) and the ESGR No. 2 (2-FCA-2), in combination with the common fire procedures listed above, to evaluate whether these procedures could be performed within the required times given the minimum required operator staffing level, with or without offsite power. Operator and fire brigade staffing was reviewed to establish compliance with TS and conformance with the FPP. The team reviewed reactor operator lesson plans and non-licensed operator training to evaluate the Appendix R training program with respect to SSD and ASD skills, and the requirements identified in the Cross Reference/Performance Links master list. The team discussed the training with operators to ascertain if they were familiar with the actions and the location of significant equipment. In addition, the team reviewed the human factors aspects of ASD; including operator access to remote safe shutdown equipment, and manual actions which could be inhibited by consequences of fire brigade activities or fire suppression system actuation.

b. Findings

Fire Response Procedure for ESGR No. 2 May be Inadequate to Assure Safe Shutdown

Background: Emergency power buses 2H and 2J are located in ESGR No. 2 and provide power to charging pumps 2A, 2B and 2C. Fire damage to these components could result in loss of the RCP seal injection flow and loss of normal charging water flow from the normal Unit 2 source. In addition, loss of RCP thermal barrier cooling could occur as a result of the loss of power supply equipment (located in ESGR No. 2) that provides control power to the RCP thermal barrier component cooling water (CCW) return isolation valves.

Adequate RCP seal cooling can be achieved by maintaining continuous RCP seal injection or maintaining continuous CCW cooling to the RCP thermal barrier heat exchangers. During normal plant operation, both systems would usually be operating. North Anna's strategy for achieving a safe shutdown of the reactor during a fire in alternative shutdown areas stated that the CCW system was not required to achieve hot shutdown, but only required to reach and maintain cold shutdown; therefore, CCW system components or circuits were not protected from fire damage.

Recognizing the above issue, North Anna's Appendix R SSA instead relied upon RCP seal injection flow to assure adequate seal package cooling. The Unit 1 charging system, through an existing cross-connect, is utilized in the licensee's SSA and procedures to provide charging flow and seal injection flow if the Unit 2 charging system were rendered inoperable.

Introduction: A finding was identified in that for a severe fire in ESGR No. 2, the safe shutdown strategy and related fire response procedures may be inadequate to assure a safe shutdown of the Unit 2 reactor. The team had two specific concerns related to this finding:

- For certain fire scenarios in ESGR No. 2, RCP seal injection will be interrupted for a significant period of time. The licensee's Appendix R SSA recognized this condition could occur but failed to identify and analyze the possible adverse impacts of this condition on the RCP seal packages during development of the SSD strategy. For a fire in ESGR No. 2, Fire Procedure 2-FCA-2, Step 7 directs the operator to isolate the RCP seal injection. After charging flow to Unit 2 has been reestablished using the charging cross-tie connection from Unit 1, the procedure directs the operator to reestablish RCP seal injection flow by slowly throttling open the RCP seal injection inlet header isolation valves. The team was concerned that loss of seal injection could result in damage to RCP seal integrity and subsequently to a seal loss-of-coolant accident when seal injection flow is reestablished. Loss of RCP seal injection and recovery thermal shock issues have not been fully bounded by the vendor's RCP seal package analyses.

- The actuation controls and circuits for the Unit 2 Cable Vault and Tunnel (CV&T) CO_2 gaseous fire protection system are located in the ESGR No. 2 and subject to fire damage. Consequently, for certain fire scenarios in the ESGR No. 2, the CO_2 fire protection system actuation controls and circuits located in the room could inadvertently actuate to discharge CO_2 into the Unit 2 CV&T area due a fire-induced electrical hot short circuit condition. However, fire procedure 2-FCA-2 requires an operator to enter and remain in the CV&T cable vault/cable tunnel to open motor control center (MCC) circuit breakers to prevent spurious operation of fire-affected MOV's in the charging and seal injection flow path. Should the CO_2 system inadvertently discharge, procedure implementation for prevention of spurious MOV operation may be significantly delayed.

This is a URI pending completion of the significance determination process (SDP).

Description: The North Anna Appendix R Report SSA identified ESGR No. 2 (Fire Area 6-2) as an alternative shutdown area. For a severe fire in ESGR No. 2, the selected components and systems required to achieve and maintain Unit 2 shutdown will be locally operated and controlled under direction of the shift supervisor from the MCR in accordance with Fire Procedure 2-FCA-2. The alternative shutdown strategy attempts to establish charging flow to the RCS using the Unit 2 charging pumps. If this is unsuccessful (due to fire damage), Step 7 of the procedure directs an operator to initiate procedure Attachment 19 for RCP seal isolation. Until a charging pump is recovered or a charging system cross-connect is established with Unit 1, all Unit 2 RCP seal injection flow would be lost. Based on review and walkdowns of the fire procedure, the team estimated that under ideal conditions about 30 minutes could pass without charging and RCP seal injection before the cross-connect lineup with Unit 1 was established. Without thermal barrier heat exchanger cooling and seal injection, high temperature RCS water would flow up the RCP shaft, past the thermal barrier heat exchanger to the No. 1 seal. A hot seal package could result in pump shaft warping and seal misalignment resulting in significant RCP seal leakage.

In regards to this potential, Westinghouse Direct Work No. DW-94-011 states that:

> "Approximately 13 minutes following the loss of all [RCP] cooling flow, the seal area water temperature will be approaching 550°F. If actions are not taken to initiate a cooldown of the seal package, seal leakage will increase from approximately 3 GPM per pump (normal) to approximately 21 GPM per pump. This seal leakage is based on the expected response of the seals and could increase if one or more seals fail completely open."

Further, this document states that while the RCP vendor's manual identifies limits for reestablishing seal cooling, those limits were "only intended for a loss of seal cooling of short enough duration that the seal package heat up is limited." Recognizing that the effectiveness of establishing CCW to the thermal barrier heat exchanger following an extended loss was unknown and may jeopardize the integrity of the CCW system, the Westinghouse ERG Operations Subcommittee concluded that no attempt should be made to restore seal cooling using the thermal barrier heat exchanger and that seal cooling should be restored by a controlled RCS cooldown. Also, this document states that "the limits on restoring seal injection contained in the RCP vendors manual will still be observed." The team noted that the licensee's fire procedure directed restoration of RCP seal cooling by slowly throttling open the RCP seal injection inlet header isolation valves, however, other RCP vendor's concerns regarding limits for timeliness of reestablishing seal cooling and seal package heat up were not captured in the licensee's fire procedure or Appendix R SSA. Instead the licensee's procedure focuses on maintaining pressurizer level in the indicating range.

The licensee's Appendix R SSA for achieving SSD of the reactor is based on reestablishing charging flow through the cross-connect within 70 minutes after loss of the fire-affected unit's charging pumps [during a severe auxiliary building fire]. This would assure that pressurizer level remained within the indicating range which is a performance requirement of 10 CFR 50, Appendix R, Section III.L.3. However, the analysis did not address the impact of losing RCP seal injection, combined with the loss of thermal barrier heat exchanger cooling, over this time frame.

In addition, for a fire in ESGR No. 2, Attachment 13, Cable Vault Operations, initiated from Steps 27, 30, and 37 of Fire Procedure 2-FCA-2, directs an operator to proceed to the Unit 2 CV&T to manually open 480V circuit breakers at the MCCs in order to remove power from up to 29 fire-affected CVCS and SI system MOVs, thereby preventing spurious valve operations. A note in Attachment 13 directs the operator performing the procedure to remain in the area until released by the Control Room Operator.

However, the team noted that the CO_2 gaseous fire protection system actuation controls and circuits protecting the Unit 2 CV&T area are located in the adjacent ESGR No. 2. In the event of a severe fire in the ESGR No. 2, a fire-induced electrical hot short circuit condition could inadvertently actuate a CO_2 discharge into the Unit 2 CV&T area. The NAPS CO_2 systems are designed in accordance with NFPA standards and require a minimum carbon dioxide concentration of 34 percent. This design gas concentration will not support human life. Upon loss of electric power to the CO_2 storage tank cooling system, the normally energized master system control valve for the CO_2 fire protection system header will pneumatically open. This will cause the system header out to the normally de-energized local Unit 2 CV&T control valve to fill with CO_2. During a severe fire in the ESGR No. 2, a fire-induced electrical hot short circuit condition could inadvertently energize the local Unit 2 CV&T control valve causing a discharge of CO_2 into the Unit 2 CV&T. In addition, fire damage to the CO_2 fire protection system controls and annunciation circuits may result in this discharge occurring immediately without the time delay design feature that allows personnel evacuation. This situation could present a potentially life-threatening habitability concern for an operator entering the Unit 2 CV&T to perform the required SSD actions designated in fire procedure 2-FCA-2, Attachment 13. Because local visual and audible alarms may not actuate, an operator may enter the area after the CO_2 system discharged and become incapacitated. Also, an operator already stationed in the room at the time of an inadvertent actuation may not have sufficient warning to evacuate prior to CO_2 entering the room. The licensee's UFSAR states that SCBAs are available for operators' use; however, the team noted that Fire Procedure 2-FCA-2 did not require the operators to bring SCBA gear to the area, did not provide direction where to obtain SCBA gear, and did not warn the operator of a potential CO_2 hazard. The licensee did not consider this an immediate safety concern because CO_2 flow alarms would alert the MCR of system problems and operator actions in the Unit 2 CV&T could be deferred until a SCBA is obtained or the environment allows entry.

The NAPS SSA did not include an evaluation of potential maloperation of the CO_2 system and its effect on habitability in an area where remote manual safe shutdown activities are required. If it is know that the Unit 2 CV&T CO_2 system has actuated, an operator could obtain SCBA gear and don it prior to entering the area. Despite this, several adverse factors could inhibit an operator's performance under these circumstances: the discharge of the gaseous CO_2 system frequently will result in a fog that limits visibility and decreases the effectiveness of emergency lighting; the operator's field of vision will be restricted by the SCBA gear; radio communications with the control room operator will be hampered; and the time required to perform normally simple activities will be lengthened. None of these obstacles were evaluated in the licensee's SSA. The licensee also stated that performing operator activities while wearing SCBA gear is not a normal part of its operator training program.

Because of the above issues, the team concluded that the licensee's procedures may not preclude plant damage, may prescribe operator actions in the Unit 2 CV&T that are not independent from the effects of an ESGR No. 2 fire and may fail to prevent potential spurious operations. Spurious valve operations in the charging system makeup and seal injection flow paths could impair control of pressurizer level within the indicating band and may result in failure of the specified ASD strategy. In summary, the fire response procedures may not assure a safe shutdown of the reactor. The licensee initiated PI-N-2003-2005 to evaluate the Appendix R shutdown methodology and procedures to address the need to improve consistency for RCP seal package cooling vendor recommendations and initiated PI N-2003-2081 to evaluate the potential of a spurious operation of the CO_2 system interfering with operator actions in the cable vault area.

Analysis: The team determined that this finding was associated with the "protection against external factors" and "procedure quality" attributes. It affected the objective of the initiating events cornerstone to limit the likelihood of events that challenge critical safety functions as well as the mitigating systems cornerstone to ensure the availability, reliability, and capability of systems that respond to initiating events, and is therefore greater than minor. The team determined that the finding had potential safety significance greater than very low safety significance because RCP seal package failure could cause a reactor coolant pump seal loss of coolant accident. Also, the potential for a CO_2 hazard in the Unit 2 CV&T area increased the likelihood that operator actions to mitigate spurious operation of SSD system MOVs may be delayed or not performed and could result in failure of the specified alternative shutdown strategy. However, the finding remains unresolved pending completion the SDP.

Enforcement: 10 CFR 50.48 states, in part, "Each operating nuclear power plant must have a fire protection program that satisfies Criterion 3 of Appendix A to this part." The North Anna Unit 1 Operating License NPF-4 and North Anna Unit 2 Operating License NPF-7, specify, in part, that the licensee implement and maintain in effect all provisions of the approved fire protection program as described in the UFSAR and as approved in the SER dated February 1979.

The licensee's UFSAR commits to 10 CFR 50, Appendix R, Sections III.G and III.L. Section III.G.3 states that alternative shutdown capability should be provided where the protection of systems whose function is required for hot shutdown, does not satisfy the requirements of III.G.2. Section III.L. of Appendix R provides requirements to be met by alternative shutdown methods. Section III.L.2.b states, in part, that "The reactor coolant makeup function shall be capable of maintaining the reactor coolant level...within the level indication in the pressurizer in PWRs." Section III.L.3 specifies that "the alternative shutdown capability shall be independent of the specific fire area(s) and procedures shall be in effect to implement this capability."

Contrary to the above, the alternative shutdown capability specified for a fire in ESGR No. 2 did not meet these requirements and is considered a violation. Specifically, the licensee's procedures may not preclude plant damage; may prescribe operator actions in the Unit 2 CV&T that are not independent from the effects of an ESGR No. 2 fire; and may be inadequate to assure a safe shutdown of the Unit 2 reactor. Pending determination of the safety significance, this finding is identified as URI 50-339/03-06-

001, Fire Response Procedure 2-FCA-2 Not Adequate To Assure Safe Shutdown Of Unit 2.

.06 Communications

a. Inspection Scope

The team reviewed the adequacy of the communication system to support plant personnel in the performance of ASD functions and fire brigade duties. The team verified whether communication function and redundancy requirements were properly evaluated in the licensee's safe shutdown analysis and adequately integrated into the licensee's Appendix R safe shutdown procedures. The team reviewed the adequacy of the radio communication system utilized by the fire brigade and verified that testing of the portable radios ensured two-way communication with the MCR. The team walked down sections of the ASD procedures and inspected selected ASD equipment requiring local manual operator actions in remote areas of the plant to evaluate if adequate communications equipment would be available for the personnel performing the procedures. The team verified the availability and control of keys required to access safe shutdown radios stored in the Appendix R locker. The inspection team visually verified the contents of the Appendix R locker, including the safe shutdown radios and their charging stations. The team also reviewed records from periodic tests of the radio repeater system and from periodic inventory of operator post-fire SSD equipment lockers to assess whether the surveillance test program for the radios was sufficient to assure proper operation during a fire.

b. Findings

No findings of significance were identified.

.07 Emergency Lighting

a. Inspection Scope

The team reviewed the design and operation of, and examined the manufacturer's data sheets for, the direct current (DC) emergency lighting system self-contained, battery powered units. The team checked if these battery power supplies were rated with at least an 8-hour capacity as required by Section III.J of Appendix R. The team inspected area emergency lighting units (ELUs) for operability and checked the aiming of lamp heads to determine if adequate illumination was available to correctly and safely perform local manual operator actions required by the fire procedures. The team also verified that sufficient emergency lighting existed for access and egress pathways used during ASD activities. In some cases, the installed ELUs were tested to demonstrate functionality. The team also reviewed periodic test and maintenance procedures and records to determine if adequate surveillance testing was in place to assure proper operation of the ELUs in the event of a fire at the site.

b. Findings

No findings of significance were identified.

.08 Cold Shutdown Repairs

a. Inspection Scope

The team inspected plant procedures and equipment to ascertain that the licensee had dedicated repair procedures, equipment, and materials to accomplish repairs of damaged components required for cold shutdown, that these components could be made operable, and that cold shutdown could be achieved within 72 hours. The team observed cold shutdown repair equipment and jumper rigs stored in the Appendix R locker (consisting of high pressure tubing, a regulator, and fittings) used to establish local operation of the A and B residual heat removal heat exchanger component cooling outlet isolation valves (2-CC-TV-203A and B), if needed, following a large fire. The team checked that the equipment was appropriately labeled and maintained in good condition.

b. Findings

No findings of significance were identified.

.09 Fire Barriers and Fire Area/Zone/Room Penetration Seals

a. Inspection Scope

The team walked down the selected fire areas to evaluate the adequacy of the fire resistance of barrier enclosure walls, ceilings, floors, and structural steel support fire proofing protection. This evaluation also included fire barrier concrete block walls, penetration seals, fire doors, duct fire wraps, and fire dampers to ensure that at least one train of SSD equipment would be maintained free of fire damage. The team observed the material condition and configuration of the installed fire barrier features. In addition, the team reviewed licensing documentation and engineering evaluations of Generic Letter 86-10 fire barrier features, and NFPA code deviations to verify that the fire barrier installations met design requirements and license commitments. Visual inspections of selected barriers were performed to confirm that the 3-hour rated fire barrier installations were consistent with the tested configurations. The team compared the observed fire barrier penetration seal configurations to the design drawings and tested configurations. The team also compared the penetration seal ratings with the ratings of the barriers in which they were installed.

The team reviewed ASD procedures, selected fire fighting pre-plan strategies, fire damper locations, and HVAC system drawings to verify that access to remote shutdown equipment and operator manual actions would not be inhibited by smoke migration from one area to adjacent plant areas used to accomplish SSD.

b. Findings

1. Failure to Provide Alternative Shutdown Capability that is Physically Independent of the MCR Fire Area

Introduction: A finding was identified in that the shared ventilation system between the MCR (Fire Area 2) and the Unit 1 and Unit 2 ESGRs (Fire Areas 6-1 and 6-2) did not have adequate separation, isolation, or barriers to prevent smoke and toxic gases from being transported to the ESGRs during a fire in the MCR. The alternative shutdown capability for an MCR fire is located in each unit's ESGR, respectively. This is a URI pending completion of the SDP.

Description: The North Anna Appendix R Report identified the MCR fire area as an alternative shutdown area. For a severe fire in the MCR, the operators would abandon the MCR and utilize the Unit 1 and Unit 2 ASPs, located in the Unit 1 and Unit 2 ESGRs respectively, to achieve safe shutdown of the units. The ESGRs share a common ventilation system with the MCR. Fire and smoke dampers, located in the ventilation system ducts, were designed to prevent fire and smoke from spreading from the ESGRs to the MCR. While manual actuation of the Halon system in the ESGR in response to a fire condition would signal these dampers in the ventilation system to close, the team found that there were no smoke or fire detection actuation devices to signal them to shut during a fire in the MCR. In addition, these dampers did not have the capability of being manually actuated. The team was concerned that a large fire in the MCR areas could generate large amounts of heavy black smoke and toxic gases which could migrate through the common ventilation system to the ESGRs. This situation could present a habitability concern for the operators at the Unit 1 and Unit 2 ASPs, while they attempted safe shutdown of their respective units.

Fire contingency action procedure 0-FCA-1, for a MCR fire, did not require the operators to bring SCBA gear to the ESGRs nor are any readily available at the ESGRs. Further, the SSA did not include an evaluation of potential maloperation of the ventilation system, its components, or its effect on habitability at the ASP. As a result, the alternative shutdown capability was not physically independent of the fire area as required by Sections III.G.3 and III.L of Appendix R. The licensee stated that smoke and toxic gases would not migrate through the ventilation system from the MCR to the ESGRs but at the time of the inspection could not provide an adequate analysis to support this position. The licensee initiated PI-N-2003-1585 to evaluate the independence and operability of the ESGR ventilation system during an MCR fire.

Analysis: The team determined that this finding was associated with the "protection against external factors" attribute and affected the objective of the mitigating systems cornerstone to ensure the availability, reliability, and capability of systems that respond to initiating events, and is therefore greater than minor. The team determined the finding had potential safety significance greater than very low, safety significance because operator inability to safely man the ASPs could result in failure of the specified alternative shutdown strategy. However, the finding remains unresolved pending completion of a significance determination.

Enforcement: 10 CFR 50.48 states, in part, "Each operating nuclear power plant must have a fire protection program that satisfies Criterion 3 of Appendix A to this part." The North Anna Unit 1 Operating License NPF-4 and North Anna Unit 2 Operating License

NPF-7, specify, in part, that the licensee implement and maintain in effect all provisions of the approved fire protection program as described in the UFSAR and as approved in the SER dated February 1979.

The licensee's UFSAR commits to 10 CFR 50, Appendix R, Sections III.G and III.L. Section III.G.3 states that alternative shutdown capability should be provided where the protection of systems whose function is required for hot shutdown, does not satisfy the requirements of III.G.2. Section III.L of Appendix R provides requirements to be met by alternative shutdown methods. Section III.L.3 specifies that "the alternative shutdown capability shall be independent of the specific fire area(s) and shall accommodate postfire conditions where offsite power is available and where offsite power is not available for 72 hours."

Contrary to the above, the alternative shutdown capability specified for a fire in the MCR did not meet this requirement and is considered a violation. Pending determination of the safety significance, this finding is identified as URI 50-338, 339/03-06-002, Alternate Shutdown Panel Ventilation System Not Independent from Impacts of a Main Control Room Fire.

2. Failure to Demonstrate the Rating of 3-Hour Fire Barrier Wrap

Introduction: A Green non-cited violation (NCV) was identified for failure to ensure that the fire barrier wrap system installed for 3-hour protection of a MCR exhaust duct routed through the Unit 2 Normal Switchgear Room (NSR) was a 3-hour fire rated barrier. The Underwriters Laboratories (UL) fire resistance test, as referenced in the NAPS Appendix R Report, indicated that the 3-hour fire resistance rating for the fire barrier wrap system supported the acceptability of the wrap for protection of a structural steel column assembly only. The fire resistance rating of the fire barrier wrap system installed for protection of the exhaust duct in the Unit 2 NSR had not been specifically determined through testing nor evaluated as being bounded by the referenced test configuration.

Description: The Unit 2 NSR (fire area 5-2) and the Unit 2 cable tray room (fire area 4-2) have the MCR exhaust duct [nominally 18"x18"] passing through both rooms without a 3-hour rated fire damper installed between the two areas. In lieu of a rated fire damper, the licensee implemented a plant modification in 1992 (DCP 92-258), to wrap the outside of the duct in the Unit 2 NSR with a fire barrier wrap system [4" thick mineral wool batts] intended to meet the commitment for 3-hour separation between the two fire areas. This separation was originally required based on a NAPS commitment to comply with the separation requirements of BTP APCSB 9.5-1. The installation design of the fire barrier wrap system was based on a UL listed fire barrier wrap system referenced in the NAPS Appendix R Report, Section 2.3, Miscellaneous Passive Fire Protection Items, Table 2-3, Note 8.

The team reviewed the licensee's design modification package number 92-258 and the UL fire resistance test report for the fire barrier wrap system. The review indicated that the fire barrier wrap design was based on a UL fire test which qualified the fire barrier wrap system for 3-hour protection of a minimum size W10X49 steel column. Neither the design modification package nor the referenced qualification fire test report addressed the acceptance of using this fire barrier wrap system design for protection of 18"x18" 22-

gauge steel duct. The licensee stated that the fire wrap on the duct was acceptable but at the time of the inspection could not provide an engineering analysis to support this position. The team could not determine whether the testing was adequate to qualify the fire barrier wrap system as a 3-hour fire-rated barrier (the as-installed duct configuration has significantly less thermal mass than the tested steel column). Because the duct fire barrier wrap design was not bounded by the tested configuration, the team considered the fire rating to be indeterminate instead of three hours as originally designed. The licensee initiated PI-N-2003-2094 to perform an evaluation of the installed fire barrier wrap system.

Analysis: The team determined that this finding was associated with the "protection against external factors" attribute and affected the objective of the mitigating systems cornerstone to ensure the availability, reliability, and capability of systems that respond to initiating events, and is therefore greater than minor. The finding was considered to have very low safety significance (Green) because the fire detection, automatic suppression, and manual suppression met the conditions of the licensing basis for the Unit 2 NSR fire area, a fire damper rated as a 3-hour fire barrier is located in the ventilation duct where it enters the MCR; and neither the Unit 2 NSR nor the Unit 2 cable tray room contain equipment or cable of systems required for SSD.

Enforcement: 10 CFR 50.48 states, in part, "Each operating nuclear power plant must have a fire protection program that satisfies Criterion 3 of Appendix A to this part." The North Anna Unit 1 Operating License NPF-4 and North Anna Unit 2 Operating License NPF-7, specify, in part, that the licensee implement and maintain in effect all provisions of the approved fire protection program as described in the UFSAR and as approved in the SER dated February 1979.

Section 9.5.1.2.4.2 of the NAPS UFSAR states that the licensee committed to provide 3-hour rated fire area boundaries as described in the Appendix R Report, Chapter 2. NAPS Appendix R Report, Chapter 2, Section 2.3 and Table 2-3 states that the licensee committed to provide 3-hour fire resistance rated fire barrier wrap system. The qualification fire test report for the UL fire barrier wrap system supported the acceptability of the use of the fire barrier wrap system for 3-hour rated protection of a minimum size W10X49 steel column. The qualification fire test report for the fire barrier wrap system did not support or bound the acceptance of using this design for 3-hour rated protection of a 18"x18" 22-gauge steel duct. Also, the licensee did not have an engineering analysis to support the qualification of the installed fire barrier wrap configuration for 3-hour fire barrier protection of a 18"x18" duct. The failure to ensure that the fire barrier wrap system installed for 3-hour protection of a MCR exhaust duct routed through the Unit 2 Normal Switchgear Room (NSR) was a 3-hour fire rated barrier was considered to be a violation of 10 CFR 50.48 and License Condition 2.D. Because the failure to ensure that this fire protection feature was a 3-hour fire rated barrier is of very low safety significance and has been entered into the licensee's CAP, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC's Enforcement Policy: NCV 50-339/03-06-003, Failure to Demonstrate the Fire Resistance Rating of 3-Hour Duct Wrap.

.10 Fire Protection Systems, Features, and Equipment

a. Inspection Scope

The team reviewed flow diagrams, cable routing information, and valve lineup procedures associated with the motor-driven and diesel-driven fire pumps and the fire protection water supply system. The team evaluated the common fire protection water delivery and supply components to determine if they could be damaged or inhibited by fire-induced failures of electrical power supplies or control circuits. Using plant operating procedures, the team walked down the fire pumps and fire protection water supply system to observe the system material condition, consistency of the as-built configuration with engineering drawings, and to determine correct system controls and lineup. The team reviewed the general status of the fire protection suppression systems through review of fire protection inspection reports and quarterly engineering FPP performance reports for the years 2001-2002. In addition, the team reviewed test procedures and periodic test results for the fire pumps to assess whether the surveillance test program was sufficient to verify proper operation of the fire protection water supply system in accordance with the program acceptance criteria delineated in the Technical Requirements Manual (TRM).

The team examined the adequacy of installed fire protection features in accordance with the separation and design requirements in Appendix R, Sections III.G.1 and III.G.3. The team walked down accessible portions of the fire detection and alarm systems in the selected fire areas to evaluate the engineering design and operation of the installed configurations. The team also reviewed engineering drawings for fire detector spacing and locations in Fire Areas 5-2 and 6-2. The team reviewed an independent fire protection consultant's technical evaluation of the detector locations for the installed detection system to verify compliance with the licensee's Appendix R Report and NFPA 72E, Standard on Automatic Fire Detectors, 1984 Edition. The team reviewed the adequacy of the design, installation, and operation of the manual suppression standpipe and fire hose system for the service building complex. The team reviewed the adequacy of the design and installation of the manual Halon fire suppression systems for the ESGR No. 2. This review included Halon fire suppression system controls to assure accessibility and functionality of the system, as well as associated ventilation system fire/Halon isolation dampers. The team also examined licensee design calculations, vendor certifications, and pre-operational test data to verify the required quantity of Halon for the area was available. Additionally, the team reviewed engineering drawings, schematics, flow diagrams, and evaluations associated with the area floor drain system to determine whether systems and operator actions required for ASD would be inhibited by potential leakage from manual Halon or fire hose station suppression activities.

The team reviewed a sample of manual fire hose lengths to determine whether they could reach the SSD equipment. Additionally, the team observed placement of the fire hoses and extinguishers to assess consistency with the fire fighting strategies.

b. Findings

No findings of significance were identified.

.11 Compensatory Measures

a. Inspection Scope

The team reviewed the TRM and applicable sections of the fire protection program administrative procedure regarding administrative controls to identify the need for and to implement compensatory measures for out-of-service, degraded, or inoperable fire protection or post-fire safe shutdown equipment, features, and systems. The team reviewed licensee reports for the fire protection status of Unit 1, Unit 2 and of shared structures, systems, and components. The review was performed to verify that the risk associated with removing fire protection and/or post-fire systems or components, was properly assessed and implemented in accordance with the approved fire protection program. The team also reviewed CAP PI reports generated over the last 18 months for fire protection features that were out of service for long periods of time. The review was conducted to assess the licensee's effectiveness in returning equipment to service in a reasonable period of time.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems

a. Inspection Scope

Corrective action program PIs resulting from fire, smoke, sparks, arcing, and equipment overheating incidents for the last 18 months were reviewed to assess the effectiveness of the fire prevention program and to identify any maintenance or material condition problems related to fire incidents. The inspectors also reviewed other CAP documents, including completed corrective actions documented in PIs, and operating experience program (OEP) documents to verify that industry-identified fire protection problems potentially or actually affecting North Anna were appropriately entered into and resolved by the CAP process. Items included in the OEP effectiveness review were NRC Information Notices, industry or vendor-generated reports of defects and noncompliance under 10 CFR Part 21, and vendor information letters.

b. Findings

No findings of significance were identified.

4OA6 Meetings, Including Exit

The team presented the interim inspection results to Mr. D. Heacock, Site Vice President, and other members of your staff at the conclusion of the inspection on May 23, 2003. A final exit meeting was held via telephone with Mr. J. Crossman, Supervisor, Station Licensing, and other members of your staff on July 2, 2003, to present the final results of the inspection. The licensee acknowledged the findings presented. Proprietary information is not included in the inspection report.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel:

K. Barnette, Supervisor, Site Industrial Safety/Fire Protection
M. Bourdeau, Fire Protection Systems Engineer
T. Carlisle, Appendix R Engineer, Nuclear Engineering
J. Crossman, Supervisor, Nuclear Engineering, Station Licensing
D. Heacock, Site Vice President
L. Lane, Director, Station Nuclear Safety and Licensing
H. Le, Supervisor, Corporate Programs
J. Leberstien, Supervisor Licensing
L. Martin, Supervisor, Nuclear Engineering, Auxiliary Systems

NRC personnel:

M. Morgan, Senior Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-339/03-06-001	URI	Fire Response Procedure 2-FCA-2 Not Adequate To Assure Safe Shutdown Of Unit 2. (Section 1R05.05)
50-338, 339/03-06-002	URI	Alternate Shutdown Panel Ventilation System Not Independent from Impacts of a Main Control Room Fire (Section 1R05.09)
50-339/03-06-003	NCV	Failure to Demonstrate the Fire Resistance Rating of 3-Hour Duct Wrap (Section 1R05.09)

Closed

50-339/03-06-003	NCV	Failure to Demonstrate the Fire Resistance Rating of 3-Hour Duct Wrap (Section 1R05.09)

Discussed

None

LIST OF DOCUMENTS REVIEWED

Section 1R05: Fire Protection

Procedures:

0-AP-10, Loss of Electrical Power, Rev. 38
0-EPM-0302-01, 4160 Volt Type 5HK Breaker and Associated Switchgear Cubical Maintenance, Rev. 27
0-FCA-0, Fire Protection-Operations Response, Rev. 8
0-FCA-1, Control Room Fire, Revs. 25 and 26
2-FCA-2, Emergency Switchgear Room Fire, (Unit 2), Revs. 17 and 18

0-ECM-204-01, Installation of Temporary Residual Heat Removal Motor Feeder Cables, Rev. 9
0-EPM-2304-02, RHR Appendix R Equipment Inspection, Rev. 6
0-EPM-2808-05, Appendix R Emergency Light Inspection and Testing of Fire Area 11 (Unit 1 and 2 Aux Bldg and Fuel Bldg), Rev. 7
0-EPM-2808-09, Inspection and Testing of Appendix R Emergency Light Chargers, Rev. 11
0-EPM-2808-14, Discharge Testing of Appendix R Emergency Lighting Fire Area 11, Rev. 4
2-EPM-2808-02, Discharge Testing of Appendix R Emergency Lighting Fire Areas 9A-2, 14A-2, 14B-2 and 17-2, Rev. 3
2-EPM-2808-03, Appendix R Emergency Light Inspection and Testing of Fire Area 6-2 (Unit 2 Emergency Switchgear), Rev. 5
2-FPMP-2.1, Fire Extinguisher Inspection-Control Room, Rev. 4
2-FPMP-2.2, Hose Rack and fire Extinguisher Inspection, Rev. 6
0-FPMP-3, SCBA Operability Test, Rev. 1
0-FPMP-5, Fire Brigade Staging and Unit 1 Mezzanine Level Storage Lockers Equipment Check, Rev. 1
1-FS-CR-1, Loss Prevention Fire Strategy, Control Room, Units 1 & 2, Rev. 1
1-FS-CT-1, Loss Prevention Fire Strategy, Cable Tray Spreading and Battery Room, Units 1 & 2, Rev. 1
1-FS-S-4, Loss Prevention Fire Strategy, Unit 1 and 2 Normal Switchgear Rooms, Rev. 3
1-FS-CR-4, Loss Prevention Fire Strategy, Units 1 & 2 Normal Switchgear Rooms, Rev. 3
2-FS-S-2, Loss Prevention Fire Strategy, Unit 2 Cable Vault and Tunnel and Rod Drive, Rev. 6
2-FS-S-3, Loss Prevention Fire Strategy, Unit 2 Emergency Switchgear Instrument Rack and Air Conditioning Rooms, Rev. 5
0-MCM-1205-02, Repair of Non-Pressure-Boundary Appendix R and Non-Appendix R Fire Doors, Rev. 10
1-OP-1B, Section 5.5.4, RCP Oil Collection System, Rev. 30
0-PT-100.2, Fire Protection Pumps-Annual Testing, Rev. 14
0-PT-100.5, Fire Pump Diesel Inspection, Rev. 0
0-PT-103.3, Back-Up Repeater Testing for Radio Trunking, Rev. 3
0-PT-105.2.1, Hose Station Inspection, Rev. 4
0-PT-107.0, Appendix R Locker Inspection, Rev. 2
1-PT-100, Appendix R Equipment and Circuitry Functional Test (U1), Rev. 9
1-PT-109, Appendix R Monitoring Instrumentation Channel Check(U1), Rev. 5
2-PT-100, Appendix R Equipment and Circuitry Functional Test (U2), Rev. 9
2-PT-107.7, Emergency Switchgear Room Halon System Functional Test, Rev. 5

2-PT-108.7, Visual Inspection Ventilation Duct Fire Retardant Wrap in Unit 2 Air Conditioning Chiller Room and In Unit 2 Normal SWGR Room as Required by Appendix R, Rev. 0
VPAP-0301, Design Change Process, Rev. 16
VPAP-0312, Seismic Housekeeping and Temporary Structures and Trailers Inside the Protected Area, Rev. 1
VPAP-0903, Control of Welding, Rev. 5
VPAP-2401, Fire Protection Program, Rev.19

Design Criteria and Standards:

STD-EEN-002, Design Standard for Cable, Rev. 5
STD-EEN-0305, Fire Protection Systems, Rev. 2
STD-GN-0003, Attachment 3, Non-Safety Related QA Category with Special Quality/Regulatory Requirements, Rev. 14

Calculations and Evaluations:

Calc EE-0009, Hydrogen Generation for Exide 26N23 Battery in Battery Rooms, Rev. 1
Engineering Transmittal CEE 95-032, Plenum Cable Fire Protection Acceptability NAPS, Rev. 0
Engineering Transmittal CEP-00-0009, Evaluation of Smoke Detector Design Criteria-Emergency Switchgear Rooms, Rev. 0
Engineering Transmittal CEP-00-0010, Evaluation of Smoke Detector Locations-Safe Shutdown Areas, Rev. 0
Engineering Transmittal CEP-00-0020, Evaluation of Fire Dampers Lacking a UL Label in the Emergency Switchgear Room, Rev. 0
Engineering Transmittal CEP 00-09-0039, Maintenance of Pressurizer Level During Appendix R Fires - North Anna Power Station, Units 1 & 2 and Surry 1&2, Rev.1
Engineering Transmittal CEP 00-0043, Availability of MOVs for Local Operation NAPS, Rev. 0
Engineering Transmittal CEP 01-0003, Operator Response Times for Appendix R - North Anna Power Station, Unit 1 and 2, Rev. 0
Safety Evaluation 89-SE-ot-068, UFSAR Change Notification FN-87-52, dated October 11, 1989
Technical Report EE-0072, Standardized Fire Watch Guidance, North Anna and Surry Power Stations, Rev. 0
Technical Report EE-0110, Appendix R Emergency Light Description North Anna Power Station, Rev. 0
Technical Report EP-0017, Combustible Loading Analysis: NAPS Units 1 & 2, Rev. 2
Technical Report NE-1184, Review of Operator Response Time Data for Key Operator Actions Assumed in the Safety Analyses - North Anna Power Station, Units 1 and 2, Rev. 0
Technical Report NE-1200, Key Operator Actions Assumed in the Safety Analyses - North Anna Power Station, Units 1 and 2, and Surry Power Station Units 1 and 2, Rev. 3
Calculation EE-0027, Emergency Diesel Generator Loading Sequencing, Rev. 1

Drawings:

11715-FAR-206 series, Equipment Location-Appendix R, Service Building, Rev. 14
11715-FB-101 series, Valve Operating Diagram, Yard Water & Fire Protection, Rev. 15

11715-FB-104B, Low Pressure Carbon Dioxide System Flow Diagram, Rev. 2
11715-FB-104D, Emergency Switchgear Room Halon 1301 System Flow Diagram, Rev. 0
11715-FE-3QA, Wiring Diagram, Auxiliary Monitoring Panel 1-EI-CB-203, sh. 1, Rev. 0
11715-FE-3QH, Wiring Diagram, Auxiliary Monitoring Panel 1-EI-CB-203, sh. 2, Rev. 0
11715-FE-51H, Emergency Switchgear Rooms Fire Protection, Rev. 11
11715-FE-51K, Switchgear Room Fire Protection, Rev. 11
11715-FS-5A, Roof and Floor Framing-Service Building, Rev. 15
12050-DAR-095C, Appendix R Flowpath - Chemical & Volume Control System, sh. 1, Rev. 5
12050-DAR-096A, Appendix R Flowpath - Chemical & Volume Control System, sh. 3, Rev. 0
12050-DAR-095B, Appendix R Flowpath - Chemical & Volume Control System, sh. 2, Rev. 3
12050-DAR-095C, Appendix R Flowpath - Chemical & Volume Control System, sh. 2, Rev. 4
12050-DAR-095B, Appendix R Flowpath - Chemical & Volume Control System, sh. 1, Rev. 7
12050-DAR-074A, Appendix R Flowpath - Feedwater System, sh. 3, Rev. 1
12050-DAR-074A, Appendix R Flowpath - Feedwater System, sh. 1, Rev. 7
12050-ESK-6DP, Elementary Diagram 480 V Circuits, MOV (2536), sh. 38, Rev. 18
12050-ESK-6NR, Elementary Diagram, Solenoid Oper. Valves (2456 & 2455C), sh. 1, Rev. 20
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License Basis Documents

NAPS Appendix R Report, Rev. 21
NAPS Post Fire Safe Shutdown SE Submittal, dated 6/82
NAPS Fire Protection Systems Review Submittal, dated 4/77
NAPS UFSAR , Section 8.3, Onsite Power Systems, Rev. 38
SER Regarding Fire Protection Program, dated 02/79
SER Regarding Sections III.G.3 & III.L of Appendix R to 10CFR50 Concerning Alternate Safe Shutdown Capability In Event of Fire. Facilities In Compliance With Requirements, dated 11/82
SER Regarding Appendix R to 10CFR50 Items III.G.3 & III.L Supporting Utility Proposal for Alternate Safe Shutdown Capability In Event of Fire, dated 11/82

Applicable Codes and Standards:

IEEE 383, Standard for Type Test of Class 1E Electrical Cables, Field Splices and Connections for Nuclear Power Generating Stations, dated 1974
NFPA 10, Portable Fire Extinguishers, 1970 Edition
NFPA 12, Carbon Dioxide Extinguishing Systems, 1973 Edition
NFPA 12A, Halon 1301 Extinguishing Systems, 1980 Edition
NFPA 13, Standard for the Installation of Sprinkler Systems, 1971 Edition.
NFPA 14, Standard for the Installation of Standpipe and Hose Systems, 1974 Edition.
NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection, 1971 Edition.
NFPA 20, Standard for the Installation of Centrifugal Fire Pumps, 1972 Edition.
NFPA 72D, Standard for the Installation, Maintenance, and Use of Proprietary Protection Signaling Systems, 1975 Edition.
NFPA 80, Standard on Fire Doors and Windows, 1970 Edition.
NFPA 90A, Standard on Air Conditioning and Ventilating Systems, 1981 Edition
NUREG-1552, Supplement 1, Fire Barrier Penetration Seals in Nuclear Power Plants, dated January 1999
Underwriters Laboratories, Fire Resistance Directory, January 1998
UL 910, Test for Flame Propagation and Smoke Density Values for Electrical and Optical Fiber Cables Used in Spaces Transporting Environmental Air, dated 2/95
OSHA Standard 29 CFR 1910, Occupational Safety and Health Standards

PI Reports, Audits, and Self Assessments Reviewed:

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PI N-2000-1593-R3, Use of Non-Appendix R Equipment
PI N-2002-3049, Fire Door 2-BLD-STR-S94-5 Does Not Comply With Original Design Standard

Self-Assessment CEN 03-01,"Fire Protection/Appendix R Program - North Anna Power Station, dated 4/29/03

Other Documents Reviewed:

Appendix R Report, Chapter 8, North Anna Combustible Loading Analysis, Rev 19
Approved Combustible Storage Areas List, dated October 25, 2002
Basic Fire Training Manual, FIRE0011, Rev. 1
Consumer Product Safety Commission (CPSC) Recall Alert, Invensys Building Systems Recall of Siebe Actuators in Building Fire/Smoke Dampers, dated October 2, 2002
Cross Reference/Performance Links, Miscellaneous Data/Appendix-R Task, OPS NA Appendix R tasks listing, dated 5/8/03
Design Change Package 84-26, Addition of Emergency Lighting, North Anna Units 1 and 2, dated 7/11/84
Design Change Package 92-258, Installation of Fire Retardant Wrap to Control Room Exhaust Fan Duct / NAPS, dated 9/18/92
Dominion Resources Services, Basic Fire Training Instructor Guide, dated October 4, 2001
Exide Document Number L100 989 5M, Model L-100, undated
Exide Document Number B 200 989 5M, Model B-200, undated
Exide Document Number 7932-6-77, Exide Emergency Lighting Systems, dated 6/1/77
Exide Document Number F100, Series F100, F100RT, dated 5/1/92
Fire Brigade Drill Logs for operating shifts for the period August 2001- December 2002
Fire Protection Inspection Reports (Form 721859) for the period 2001-2002
Fire Protection Systems Review for North Anna Power Station, dated April 1, 1977
Grinnell Fire Protection Systems Company, Halon 1301 Fire Suppression System Concentration Test, No. 23.3552934-S1, Unit 2 ESGR, dated October 6, 1984
Lesson Plan for Safe Shutdown Training, Non-Licensed Operator Program, dated 5/10/01
Lesson Plan for Fire Contingency Action Procedures (97), Reactor Operator Program," Rev. 4
NRC Information Notice 2002-24, Potential Problems with Heat Collectors on Fire Protection Sprinklers
NRC Information Notice 2002-27, Recent Fires at Commercial Nuclear Power Plants in the United States
Quarterly Engineering Fire Protection Health Reports, for the period 2001-2002
NAPS Response to Request for Additional Information- IPEEE, Attachment 1, dated 8/6/99
NAPS Fire Endurance Test on Cable Penetration Fire-Stop Systems Utilizing Dow Corning Q3-6548 Silicone RTV Foam, dated 2/15/77
Product Update S-012-1, "High Temperature O-Rings to Survive Loss of All Seal Cooling, Westinghouse Electric Corp., November 1991
The Fire Fighter and Electrical Equipment - A Guide to Self Protection, University of Michigan Firemanship Training Program, dated May 1993

Technical Manuals/Vendor Information

Product Data Sheet, The McCabe Resettable Link, PHL Inc., dated May 20, 2003
Product Data Sheet, Model 5650F Fire Damper, PrefCo Products Inc., dated June 1999
Vendor Technical Manual 59-S980-0002, Dry-Type Low Voltage General Purpose Transformers, Rev. 1

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N-2003-1585, Concerns Regarding Whether a MCR Fire Would Affect Habitability of the ESGR
–2003-2005 Concerns Regarding the Appendix R Shutdown Methodology and Procedures to Address the Need to Improve Consistency With RCP Seal Cooling Vendor Recommendations
N-2003-2079, Concerns Regarding UFSAR Section 9.5.1.4 to Clarify Combustible Loading and Evaluation of Postulated Fires
N-2003-2081 Concerns Regarding the Potential of a Spurious Operation of CO_2 Within the Cable Vault to Interfere with Operator Actions.
N-2003-2088, Enhancements Identified for Appendix R RHR Repair Procedure 0-ECM-0204-01
N-2003-2094, Concerns Regarding MCR Ventilation Exhaust Duct Wrap Fire Rating
N-2003-2096, Concerns Regarding UFSAR Section 8.3.1.1.2.6 to Clarify Cable Fire Propagation Testing

LIST OF ACRONYMS

APCSB	Auxiliary and Power Conversion Systems Branch
ASD	Alternative Shutdown
ASP	Auxiliary Shutdown Panel
BTP	Branch Technical Position
CAP	Corrective Action Program
CCW	Component Cooling Water
CFR	*Code of Federal Regulations*
CO_2	Carbon Dioxide
CVCS	Chemical and Volume Control System
DC	Direct Current
ELU	Emergency Lighting Unit
ESGR	Emergency Switchgear and Relay Room
FCA	Fire Contingency Action
FPP	Fire Protection Program
GPM	Gallons Per Minute
HVAC	Heating, Ventilation and Air Conditioning
NAPS	North Anna Power Station
NCV	Non-cited Violation
NFPA	National Fire Protection Association
NRC	U.S. Nuclear Regulatory Commission
MCR	Main Control Room
MOV	Motor Operated Valve
OEP	Operating Experience Program
PORV	Power Operated Relief Valve
PI	Plant Issue
PWR	Pressurized Water Reactor
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
SCBA	Self-contained Breathing Apparatus
SDP	Significance Determination Process
SER	Safety Evaluation Report
SG	Steam Generator
SI	Safety Injection
SLOCA	Reactor Coolant Pump Seal Loss of Coolant Accident
SSA	Safe Shutdown Analysis
SSD	Safe Shutdown
TDAFW	Turbine Driven Auxiliary Feedwater
TRM	Technical Requirements Manual
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
UL	Underwriters Laboratories
URI	Unresolved Item