UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

December 24, 2009

Mr. D. G. Stoddard, Vice President
Virginia Electric & Power Company
North Anna Nuclear Station Units 1 & 2
P.O. Box 490
Mineral, VA 23117

SUBJECT: NORTH ANNA NUCLEAR STATION - NRC TRIENNIAL FIRE PROTECTION INSPECTION REPORT 05000338/2009008 AND 05000339/2009008

Dear Mr. Stoddard:

On October 2, 2009, the U.S. Nuclear Regulatory Commission (NRC) completed a triennial fire protection inspection at your North Anna Nuclear Station, Units 1 and 2. The enclosed inspection report documents the inspection results which were discussed, on October 2, 2009, with Mr. E. S. Hendrixson and other members of your staff. Following completion of additional review in the Region II office, another exit meeting was held by telephone with Mr. E. S. Hendrixson and other members of your staff on November 12, 2009, to provide an update on changes to the preliminary inspection findings.

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

This report documents two findings of very low safety significance (Green) which were determined to be violations of NRC requirements. However, because of the very low safety significance, and because they were entered into your corrective action program, the NRC is treating these NRC-identified findings as non-cited violation consistent with Section VI.A of the NRC Enforcement Policy. If you contest any non-cited violations in this report, you should provide a written 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, D.C. 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the North Anna Nuclear Station. In addition, if you disagree with the characterization of any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for disagreement, to the Regional Administrator, Region II, and the NRC Resident Inspector at the North Anna Nuclear Station. The information you provide will be considered in accordance with Inspection Manual Chapter 0305, "Operating Reactor Assessment Program."

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of the NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA: Original signed by Paul Fillion for/

Rebecca L. Nease, Chief,
Engineering Branch 2
Division of Reactor Safety

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

Enclosure: NRC Triennial Fire Protection Inspection Report 05000338/2009008 and 05000339/2009008 w/Attachment - Supplemental Information

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Letter to D. G. Stoddard from Rebecca L. Nease signed by Paul Fillion dated December 24, 2009

SUBJECT: NORTH ANNA NUCLEAR STATION - NRC TRIENNIAL FIRE PROTECTION INSPECTION REPORT 05000338/2009008 AND 05000339/2009008

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REGION II

Docket Nos.:	50-338, 50-339
License Nos.:	NPF-4, NPF-7
Report Nos.:	05000338/2009008 and 05000339/2009008
Licensee:	Virginia Electric and Power Company
Facility:	North Anna Nuclear Station, Units 1 & 2
Location:	P.O. Box 490 Mineral, VA 23117
Dates:	September 14 - 18 (Week 1) September 28 – October 2, 2009 (Week 2)
Inspectors:	R. Fanner, Reactor Inspector (Lead Inspector) P. Braxton, Reactor Inspector N. Merriweather, Senior Reactor Inspector R. Rodriguez, Senior Reactor Inspector G. Wiseman, Senior Reactor Inspector
Accompanying Personnel:	L. Castelli, Reactor Inspector (In-Training) J. Montgomery, Reactor Inspector (In-Training)
Approved by:	Rebecca L. Nease, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000338/2009-008, 05000339/2009-008; 09/14-18/2009 and 09/28/2009 - 10/02/2009; North Anna Nuclear Station, Units 1 & 2; Triennial Fire Protection Inspection.

This report covers an announced two-week triennial fire protection inspection (TFPI) by a team of five regional inspectors. Two Green findings, both of which were non-cited violations (NCVs), were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). The cross-cutting aspect, if any, was determined using IMC 0305, "Operating Reactor Assessment Program." 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 4, dated December 2006.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green: The inspectors identified a Green non-cited violation (NCV) of North Anna Nuclear Station Operating License Condition 2. (D), "Fire Protection," in that the licensee failed to adequately address the potential for carbon dioxide (CO_2) over-pressurization within Fire Area (FA) 3-2, the Unit 2 Cable Vault & Tunnel (CV&T). The team determined that adequate CO_2 venting did not exist, resulting in the potential failure of the CO_2 gas boundary. This condition had the effect of allowing gas migration from the CV&T (Zone 2-2) into the CV&T electrical penetration room (Zone 2-4) due to the failure of the door between the two areas to remain closed. The licensee entered and tracked this issue in the corrective action program via Condition Report (CR) 019539, and Apparent Cause Evaluation, ACE000693.

  This finding is a performance deficiency because the licensee did not consider the potential for CO_2 over-pressurization within the Unit 2 CV&T (FA 3-2) according to the applicable industry code of record for the facility. The finding is more than minor because the CO_2 system is required to provide primary suppression coverage for the Cable/Tunnel area of Fire Area 3-2, and the finding is associated with the reactor safety, mitigating systems, cornerstone attribute of protection against external factors, (i.e. fire), and it substantially affects the objective of ensuring reliability and capability of systems that respond to initiating events. The inspectors assessed the finding using Inspection Manual Chapter (IMC) 0609, Appendix F, "Fire Protection Significance Determination Process." The finding was assigned a low degradation rating since the issue screened as very low in the SDP Phase 2 evaluation. This was the case because the only creditable ignition sources in the CV&T are transients which are administratively controlled. Also, the safe shutdown analysis (SSD) already assumes that all cables in the CV&T are damaged; therefore a gas boundary failure within the fire area would affect the fire suppression component of defense-in-depth only and not the capability to safely shutdown. In addition, the CO_2 system was backed up by a manual sprinkler system and a manual deluge system.

The inspectors reviewed guidance contained in IMC 0305 to determine if any cross-cutting aspects existed. The inspectors concluded that because the licensee's failure to address the potential for CO_2 over-pressurization in the Unit 2 CV&T (FA 3-2) resulted from lack of original CO_2 test data and occurred during initial plant start-up, it did not reflect current licensee performance and no cross-cutting aspect was identified. (Section 1R05.03)

- Green: The inspectors identified a Green non-cited violation (NCV) of Technical Specification 5.4.1, Procedures, in that the Unit 1 post-fire safe shutdown (SSD) procedure 1-FCA-3, "Cable Vault and Tunnel Fire", Revision 20, was not consistent with the safe shutdown analysis (SSA) for FA 3-1. Specifically, 1-FCA-3 directed operators to plug a ventilation fan into a receptacle that is powered from an electrical bus that had been previously de-energized in a prior step of the procedure. In another example, 1-FCA-3 did not give operators guidance for swapping the power supply of the auxiliary monitoring panel in the Fuel Handling Building. The licensee entered this issue into their corrective action program, and issued a new revision of 1-FCA-3.

  This finding is more than minor because it is associated with the procedure quality attribute of the Mitigating Systems cornerstone, and it affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The inspectors assessed the finding using Inspection Manual Chapter (IMC) 0609, Appendix F, "Fire Protection Significance Determination Process." The finding was assigned a low degradation rating in Phase 1 because it was determined to be a procedural deficiency that is compensated by operator experience and/or familiarity.

  The inspectors reviewed guidance contained in IMC 0305 to determine if any cross-cutting aspects existed. This finding has a cross-cutting aspect in the resources component of the human performance area [H.2(c)] because the procedure was not complete and up to date in accordance with the SSA. (Section 1R05.06)

B . Licensee Identified Violations

None

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R05 Fire Protection

This inspection report presents the results of a triennial fire protection inspection conducted in accordance with NRC Inspection Procedure (IP) 71111.05T, "Fire Protection (Triennial)." The objective of the inspection was to review the North Anna Nuclear Station (NANS) Units 1 and 2 fire protection program (FPP). The team selected four fire areas (FAs) for review and examined the licensee's implementation of the FPP. The four FAs chosen for review were based on available risk information as analyzed by senior reactor analysts from Region II, previous areas chosen for inspection, data obtained in plant walk-downs regarding potential ignition sources, relational characteristics of combustible material to targets, and location of equipment needed to achieve and maintain safe shutdown (SSD) of the reactor. Section 71111.05-05 of the IP specifies a minimum sample size of three fire areas. Detailed inspection of at least three fire areas fulfills the procedure completion criteria. The four areas chosen were:

1. FA 3-1 CV &T-1, Cable Vault and Tunnel Unit 1
2. FA 5-1 NSR-1, Normal Switchgear Room Unit 1
3. FA 8A-1 TB, Unit 1 Turbine Building General Area
4. FA Z-8C XFMRS, Main and Station Service Transformers

The team evaluated the licensee's FPP against applicable requirements, including North Anna Operating License Condition 2.D for Unit 1 and Unit 2 and documents referenced therein; *Title 10 of the Code of Federal Regulations (10 CFR), Part 50, Appendix R; 10 CFR 50.48*; related NRC safety evaluation reports (SERs); and plant Technical Specifications. The team reviewed related FPP requirements, as described in the Updated Final Safety Analysis Report (UFSAR), Section 9.5.1, "Fire Protection System." The team reviewed other applicable documents including Design Basis Documents for the "Safe Shutdown Analysis (SSA)," the "Fire Protection Program" and the "Appendix R Program." The team evaluated all areas of this inspection, as documented below, against these requirements. Specific licensing basis documents reviewed are listed in the Attachment.

.01 Post-Fire Safe Shutdown From Main Control Room (Normal Shutdown)

a. Inspection Scope

The team reviewed the licensee's fire protection program described in the licensees Updated Final Safety Analysis Report (UFSAR), Section 9.5.1; applicable sections of the licensee's post-fire SSA; plant procedures; simplified flow diagrams; electrical drawings; and other supporting documents. The Reviews were performed to verify that hot and cold shutdown could be achieved and maintained from the main control room (MCR) for

postulated fires in fire areas FAs 5-1, 8A-1, and Z-8C. The inspectors verified that hot and cold shutdown can be achieved and maintained from the control room with or without the availability of offsite power. The team performed plant walkdowns to verify that the plant configuration was consistent with that described in the fire hazards analysis and the SSA. The inspection activities focused on ensuring the adequacy of systems selected for reactivity control, reactor coolant makeup, reactor heat removal, process monitoring instrumentation, and support system functions. The team reviewed the systems and components credited for use during this shutdown method to verify that they would remain free from fire damage.

Operational Implementation

The team reviewed the adequacy of procedures utilized for post-fire SSD and performed a walk through of procedure steps to ensure the implementation and human factors adequacy of the procedures. The team also reviewed selected operator actions to verify that the operators could reasonably be expected to perform the specific actions within the time required to maintain plant parameters within specified limits.

The team reviewed and/or walked down applicable sections of the following procedures for FAs 5-1, 8A-1, and Z-8C:

- 0-FCA-0, “Fire Protection – Operations Response,” Rev. 11
- EPIP-1.01, “Emergency Manager Controlling Procedure,” Rev. 44

b. Findings

No findings of significance

.02 Protection of Safe Shutdown Capabilities

a. Inspection Scope

For each of the selected FAs, the team reviewed the fire suppression system, fire detection system, and fire barriers provided in those areas as well as the location of cables important to SSD to determine whether the SSD capability was protected in accordance with the requirements of 10 CFR 50, Appendix R, and Section III.G. The team performed inspection activity aimed at verifying that cable routing throughout the plant satisfied the physical separation requirements of Section III.G. During plant walk-downs, the team recorded raceway identification codes and the FAs in which those raceways traversed and compared them with the corresponding information in the licensee’s analysis.

b. Findings

No findings of significance were identified

.03 Passive Fire Protection

a. Inspection Scope

The team inspected the material condition and as-built configuration of accessible passive fire barriers surrounding and within the FAs selected for review to evaluate the adequacy of the fire resistance in accordance with the requirements of 10 CFR 50, Appendix R, Section III.G, and Appendix A of BTP APCSB 9.5-1. Fire barriers in use included masonry block walls, poured concrete walls, ceilings, floors, mechanical and electrical penetration seals, doors, fire dampers, and structural steel fire proofing protection. Where applicable, the team examined installed barriers to compare the configuration of the barrier to the rated configuration. The team verified that the as-built barrier configurations met design requirements, license commitments, and standard industry practices. The team verified barrier configurations were either properly evaluated or qualified by appropriate fire endurance tests. For example, fire doors were examined for attributes such as material condition, tightness, proper operation, Underwriter's Laboratories (UL) label on door, method of attachment to the wall, and frame and latch configuration. The team also reviewed construction detail drawings as necessary to augment these inspection activities. In addition, a sample of completed surveillance and maintenance procedures for selected fire doors, fire dampers, and penetration seals were reviewed to ensure that these passive fire barriers were being properly inspected and maintained. Other types of fire barriers were inspected in a similar detail. The inspectors also reviewed the fire loading calculations to verify that the loading used by the licensee was appropriate for determining the fire resistive rating of the fire barriers. Fire model calculations were generated by the team as appropriate using NRC recommended computer codes to evaluate the selected barrier's effectiveness to contain potential fires. The overall criterion applied to this element of the inspection procedure was that the passive fire barriers had the capability to contain fires for one hour or three hours as applicable. The passive fire protection features included in the review are listed in the Attachment.

b. Findings

Introduction: The team identified an unresolved item (URI) involving testing qualification documentation or evaluation for wall and floor fire barrier penetration seal configurations. Insufficient fire qualification test documentation or evaluations were available to qualify certain aluminum conduits that penetrate 3-hour fire rated barriers separating fire areas containing equipment required for safe shutdown. This issue was similar to one identified at Dominion's Surry facility and documented in Section 1R05.02 of NRC Triennial Fire Protection Inspection Report Nos. 05000280,281/2009007(ADAMS Accession No. ML092170680).

Description: During the 2009 NRC Triennial Fire Protection Inspection at Surry Nuclear Station it was identified that sufficient testing qualification or evaluation documentation did not exist to qualify the use of aluminum conduits with silicone foam seals configurations penetrating horizontal or vertical fire rated barriers. Subsequent to the Surry Triennial Fire Protection Inspection completed on June 26, 2009, NANS determined the issue to be applicable to North Anna Nuclear Station. The station staff entered the issue into corrective action program as CR342994 on June 29, 2009, to document the problem and further evaluate the extent of condition. The licensee is

continuing walk downs of rated fire barriers and has established a plan for resolution of the issue.

While inspecting the wall and floor fire barrier penetration seals, the team requested the licensee's documentation for the qualification of penetration seal configurations. The specific seal configuration packages are documented in the attachment section of this report. The team reviewed the penetration seal criteria established in BTP CMEB 9.5-1 which stated that openings through fire barriers which separate fire areas should be sealed or closed to provide a fire resistant rating at least equal to that required of the barrier. While reviewing this information, the team determined the documentation packages requested should have shown information to establish a 3-hour fire rating, since the rated fire barrier walls and floors separating the selected fire areas were required to have a 3-hour rating. In response, the licensee presented Installation Specification NAS-1024 for Silicone Foam in Fire Stops; Technical Report EP-0011; calculations 1250-111-C01, 1250-111-C03, 1250-111-C04; and, Engineering Transmittal ET CEP 00-0025 that included Penetration Seal Configuration Evaluations. The Dominion technical reports, calculations, and test reports applicable to the five basic silicone foam seal configurations were reviewed. The team determined that the NANS testing addressed aluminum cable trays, but not aluminum conduit penetrations through fire barriers. The concern is that aluminum melts at approximately 1220°F, whereas the flame temperature used during fire testing is 1700°F. Testing of penetration assemblies is performed using ASTM-E119. Steel conduit is not a concern, as it has a higher melting point (over 2000°F).

At the time of this report, the team did not have sufficient information to determine that acceptable qualification test results existed for NANS aluminum conduit penetration seal configurations. As a conservative measure, the licensee declared fire barriers with potential aluminum conduit penetrations inoperable, and established applicable compensatory measures in accordance with ET-CEP-09-0010, Rev. 1 for 20 fire areas. The team was aware that the fire barrier penetration seal configurations in question may be qualified by existing nuclear industry penetration seal testing data which the licensee plans to conduct in early 2010. The team determined therefore, there was no immediate safety concern. This issue remains open pending NRC review of the final penetration seal qualification packages and will be identified as unresolved item (URI) 05000338, 339/2009008-01, "Qualification of Fire Barrier Floor/Wall Penetration of Aluminum Conduit Through Sleeve."

.04 Active Fire Suppression

a. Inspection Scope

The team's review of active fire suppression included the fire detection systems, fire protection water supply system, automatic fire suppression systems and manual fire fighting fire hose and standpipe systems. The inspection of fire detection systems included a review and walk-down of the as-built configuration of the systems as compared to the applicable National Fire Protection Association (NFPA) standard. In addition, a sample of completed surveillance and maintenance procedures for selected fire detection systems were reviewed. The team reviewed and walked-down operational aspects of the fire detection systems such as locations of detectors, local annunciation panels and remote alarms to determine the capability to rapidly pinpoint the location of any detected fires.

The team inspected the material condition, operational lineup (i.e. position of valves), design and testing of the fire sprinkler systems in the Unit 1 Cable Vault and Tunnel (FA 3-1). The Control Rod Drive Room portion of FA 3-1 did not have a fixed fire suppression system. The team reviewed licensing documentation, data sheets for sprinklers and engineering evaluations of the sprinkler coverage, and NFPA code deviations to verify that the water-based fire suppression installations met design requirements and license commitments. The locations of accessible sprinkler heads were observed to check for obstructions. The redundancy of fire protection water sources and fire pumps to fulfill their fire protection function to provide adequate flow and pressure to hose stations and suppression systems were reviewed as compared to licensing basis requirements. Additionally, the automatic carbon dioxide (CO_2) fire suppression system within the Unit 1 normal switchgear room (FA 5-1) was reviewed for adequacy of the design and installation. This review included CO_2 fire suppression system controls to assure accessibility and functionality of the system, proper placement of the system nozzles, as well as associated ventilation system fire/ CO_2 isolation dampers. The team also examined licensee design calculations, vendor certifications, and pre-operational test data to verify the required quantity of CO_2 for the area was available.

The team reviewed the manual standpipe and fire hose system to verify adequate design and installation in the selected FAs. During plant tours, team members observed interior fire hose nozzle types, fire brigade nozzles, and the placement of the fire hose stations to verify they were not blocked and were consistent with the fire fighting strategies and FPP documents. The team also examined design calculations, installation specifications, installation drawings, hydraulic calculations, surveillance procedures, and NFPA 14, “Standard for the Installation of Standpipe and Hose Systems-1976 Edition,” to verify that sufficient pressure and flow volume was available to produce electrically safe and effective fire hose operation within the nozzle manufacturer’s specified flow range. Additionally, the team checked a sample of fire hose lengths to confirm they could reach potential fire affected equipment and components within the selected FAs in support of manual fire brigade fire fighting efforts.

Aspects of fire brigade readiness were reviewed, including but not limited to, personal protective and smoke control equipment availability and condition, training, fire drills, daily staffing levels of fire brigade personnel, hose station locations, nozzle types, pre-fire strategies, emergency lighting, and fitness for fire fighting duty of brigade members. In general, the acceptance criteria applied to active fire suppression systems were contained in applicable codes and standards listed in the Attachment as modified by the design basis documents. Documents included in the review are listed in the Attachment.

b. Findings

No findings of significance were identified.

05 Protection from Damage from Fire Protection Activities

a. Inspection Scope

The team evaluated whether automatic fixed CO_2 systems, fixed sprinkler systems or manual fire fighting activities could adversely affect the credited SSD equipment, inhibit access to alternate shutdown equipment, and/or adversely affects the local operator actions required for SSD in the selected fire areas. The team also checked that sprinkler system water would either be contained in the fire affected area or be safely drained off. With regard to the manual fire fighting activities in the selected fire areas, the team considered consequences of a fire hose breaks in areas adjacent to the selected fire areas.

The team addressed the possibility that a fire in one FA could lead to activation of an automatic suppression system in another FA through the migration of smoke or hot gases, and thereby adversely affect SDD. The team reviewed air flow paths out of the selected FAs to verify that inter-area migration of smoke or hot gases would not inhibit necessary operator actions. This portion of the inspection was carried out through a combination of walk-downs, drawing review, and records review.

The team followed up on URI 05000339/2005008-02, Potential for CO_2 Over pressurization of Unit 2 Cable Vault and Tunnel which included a review of the licensee's evaluations and corrective actions.

b. Findings

Failure to Adequately Address the Potential for CO_2 Over-pressurization within the Unit 2 CV&T (FA 3-2) Consistent With the Original CO_2 System Design

Introduction: The team identified a green NCV of North Nuclear Station Operating license condition 2.(D), Fire Protection. The licensee failed to adequately address the potential for CO_2 over-pressurization within the Unit 2 CV&T (FA 3-2) consistent with the original CO_2 system design.

Description: The inspectors documented an initial review of this issue in Section 1R05.03 of NRC Triennial Fire Protection Inspection Report Nos. 05000338/2005008 and 05000339/2005008 (ADAMS Accession No. ML060860343). At the time of the inspection, there were concerns that the CO_2 System discharge settings might result in excessive room pressure during an actual discharge. An Unresolved Item (URI) was opened pending further review and evaluation of additional information to be supplied by the licensee.

Subsequent to the 2005 inspection, the licensee in conjunction with Chemetron Company, who supplied and designed the NANS CO_2 systems, conducted a Low Pressure CO_2 Blower Door Test (Special Test 0-ST-FP-001) on 8/30-31/2007, to determine if the calculated equivalent leakage area from the Unit 2 CV&T was greater than the minimum free venting area required by NFPA 12, Carbon Dioxide Extinguishing Systems. The door fan test measures the size of openings in the pressure boundary enclosure and the pressures that may exist across them. Also, Chemetron developed and ran new computer model hydraulic flow calculations of the NANS existing CO_2 systems based on actual as-built room dimensions, and piping isometric drawings to

determine that the CO_2 tanks contain sufficient quantities of CO_2 for a one-shot discharge in each hazard. The results from the door fan test and hydraulic flow calculations showed that insufficient leakage existed from the Unit 2 CV&T to prevent an over-pressure condition. The Unit 1 CV&T was determined to be adequate. As a result, the licensee documented the issue in Condition Report (CR) 019539 on 9/10/2007; performed an apparent cause evaluation; and, initiated corrective action design change package (DCP-7-155) to replace the existing nozzles in Unit 2 CV&T Zone 2-2 to smaller orifice nozzles. During this inspection, the team reviewed the apparent cause evaluation, blower door test results, flow calculations, and corrective action design change package.

The inspectors reviewed the licensee's apparent cause evaluation, ACE000693, in detail. The licensee's investigation concluded that the apparent cause for the potential over-pressure condition was failure to address the issue within the original CO_2 system design. Two contributing causes were identified: (1) the lack of complete test data and design documentation; and (2) failure to address the impact on the CO_2 systems when modifications are made to the system boundary envelope such as sealing fire barrier penetrations and efforts to reduce control room boundary leakage. The licensee completed the following corrective actions:

1. Develop and perform door fan testing, special test 0-ST-FP-001;
2. Develop new hydraulic flow calculations of the NANS existing CO_2 systems, calculation 131035-Z2-2;
3. Repair boundary wall between the CV&T (Zone 2-2) and CV&T electrical penetration room (Zone 2-4), work order 00790814;
4. Modify the CV&T (Zone 2-2) CO_2 system to replace nozzles, DCP 07-155; and,
5. Revise screening questions within STD-GN-0001 for the Fire Protection Program Checklist to address impacts on area leakage from room's protection by gaseous fire suppression systems.

The inspectors reviewed the licensee's corrective actions for the URI and resolved the open questions concerning it.

Analysis: This finding is a performance deficiency because the licensee did not consider the potential for CO_2 over-pressurization within the Unit 2 CV&T (FA 3-2) according to the applicable industry code of record for the facility. The finding is more than minor because the CO_2 system is required to provide primary suppression coverage for the Cable/Tunnel area of Fire Area 3-2, and the finding is associated with the reactor safety, mitigating systems, cornerstone attribute of protection against external factors, (i.e. fire), and it substantially affects the objective of ensuring reliability and capability of systems that respond to initiating events. The risk significance of the finding was determined using Inspection Manual Chapter 0609, Appendix F, "Fire Protection Significance Determination Process." Pursuant to IMC 0609, Appendix F, the finding category was fixed fire protection systems. The nature of the degradation of the gaseous based suppression system is related to the potential failure of the CO_2 gas boundary and gas migration from the CV&T (Zone 2-2) into the CV&T electrical penetration room (Zone 2-4) due to the failure of the doors between the two areas to remain closed. The safety significance of the over-pressurization within the Unit 2 CV&T breaching the gas boundary screened as very low in the SDP Phase 2 evaluation because the only creditable ignition sources in the CV&T are transients which are administratively

controlled. Also, the safe shutdown analysis (SSD) already assumes that all cables in the CV&T are damaged; therefore a gas boundary failure within the fire area would affect the fire suppression component of defense-in-depth only and not the capability to safely shutdown. In addition, the CO_2 system was backed up by a manual sprinkler system and a manual deluge system.

The inspectors reviewed guidance contained in IMC 0305 to determine if any cross-cutting aspects existed. The inspectors concluded that because the licensee's failure to address the potential for CO_2 over-pressurization in the Unit 2 CV&T (FA 3-2) resulted from lack of original CO_2 test data and occurred during initial plant start-up, it did not reflect current licensee performance and no cross-cutting aspect was identified.

Enforcement: The North Anna Unit 2 Operating License Condition 2.(D), specifies, 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. These documents invoke the requirements of 10 CFR 50, Appendix R, Section III.G, which requires a fixed fire suppression system in the fire area related to the above described finding. Specifically, the SER dated February 1979, section E.5.e states the CO2 systems shall meet the requirements of NFPA 12 for design requirements from over-pressurization. The fixed fire suppression system guidelines as outlined in National Fire Protection Association Standard 12, "Standard on Carbon Dioxide Extinguishing Systems" 1973 edition, Section 26, requires that venting of pressure build-up from the discharge of quantities of carbon dioxide into closed spaces shall be considered.

Contrary to the above, the licensee failed to adequately address the potential for CO_2 over-pressurization within the Unit 2 CV&T (FA 3-2) consistent with the original CO_2 system design. The violation applied to Unit 2 only, and has existed since initial plant start-up. Because the violation is of very low safety significance and has been entered into the licensee's corrective action program as CR-2007-019539, it is being treated as a NCV consistent with Section VI.A.1 of the NRC's Enforcement Policy. This finding is identified as NCV 05000339/2009008-02, Failure to Adequately Address the Potential for CO_2 Over-pressurization within the Unit 2 CV&T (FA 3-2) Consistent with the Original CO_2 System Design. Unresolved Item 05000339/2005008-02 is closed.

.06 Alternative Shutdown Capability

a. Inspection Scope

The team reviewed the safe shutdown systems analysis identified in Chapter 3 of the North Anna Nuclear Station Appendix R Report to ascertain the post-fire operator actions specified by the analysis. The team also reviewed the analysis to identify potential fire-induced cable damage for the areas under review. If any potential areas of concern were identified it was then checked against the safe shutdown procedures (i.e., fire contingency action procedures). Specifically, the inspectors ensured that steps to prevent or mitigate the consequences of fire induced cable damage and any potential spurious operations were listed consistent with the licensee analysis. The review also focused on ensuring that the required functions for post-fire safe shutdown and the corresponding equipment specified as necessary to perform those functions were included in the procedures.

The licensee's current SSA assumed alternative shutdown methods for a severe fire in the Unit 1 cable vault and tunnel. The alternative shutdown strategy credited the use of a remote monitoring panel as well as local operator actions. The process monitoring instruments which were relied on to support safe shutdown were examined to verify that they were either electrically and/or physically independent of the fire area, Unit 1 cable vault and tunnel. The review included a verification that alternative shutdown could be accomplished with or without offsite power.

The team also examined control and instrumentation circuits for selected components. The electrical circuit design for these components were reviewed to determine whether transfer/isolation transfer switches and redundant fuses were provided as necessary to ensure that alternate shutdown systems would be isolated from any damage that may occur, specifically as a result of a main control room fire. The team reviewed completed test records of the routine functional testing performed on the transfer circuits used to transfer electrical controls from the main control room to the auxiliary shutdown panel, motor control center or switchgear as well as the calibration records for process monitoring instruments located on the remote monitoring panel. The test and calibration records were reviewed for selected components to confirm that the components were being maintained in accordance with the surveillance test and preventive maintenance programs.

Operational Implementation

The team reviewed the training lesson plans of licensed and non-licensed operators to verify that the training reinforced the shutdown methodology in the SSA, abnormal procedures, and emergency operating procedures for the selected FAs. The team also conducted interviews, reviewed shift turnover logs and shift manning to verify that personnel required for SSD using alternative shutdown systems and procedures were available onsite, exclusive of those assigned as fire brigade members.

The team performed tabletop reviews of post-fire SSD procedures (i.e., fire contingency action procedures) and also performed a walkthrough of procedure steps to ensure the implementation and human factors adequacy of the procedures. The team checked whether the SSD procedures included steps to prevent or mitigate the consequences of spurious operations. The team walked down the in-plant location of all operator actions specified in the FCA procedures with operations personnel to evaluate the expected ambient conditions, relative difficulty and operator familiarization associated with each operator action. The team reviewed the systems and components credited for use during this shutdown method to verify that they would remain free from fire damage. The team reviewed selected operator actions to verify that the operators could reasonably be expected to perform the specific actions within the time required to maintain plant parameters within specified limits.

Specific time critical actions were evaluated in the following procedures

- 0-FCA-0, Fire Protection – Operations Response, Attachment 2, Rev. 11
- 0-FCA-3, Cable Vault and Tunnel Fire, Rev. 20

b. Findings

Inadequate Procedure for Powering Credited Components for Fire in Cable Vault & Tunnel

Introduction: The inspectors identified a Green NCV of Technical Specification 5.4.1, Procedures, in that the Unit 1 post-fire SSD procedure 1-FCA-3, "Cable Vault and Tunnel Fire", Revision 20, was not consistent with the SSA for FA 3-1. Specifically, 1-FCA-3 directed operators to plug a ventilation fan into a receptacle that is powered from an electrical bus that had been previously de-energized in a prior step of the procedure. In another example, 1-FCA-3 did not give operators guidance for swapping the power supply of the auxiliary monitoring panel in the Fuel Handling Building.

Description: On September 17, 2009, inspectors identified 2 examples in which the North Anna post-fire SSD procedure 1-FCA-3 did not provide adequate instructions for operators to provide power to a ventilation fan and the auxiliary monitoring panel, located in the Fuel Building.

The first instance identified involved manual actions for a ventilation fan located in the Fuel Building. The fan is located at the auxiliary monitoring panel, and is required for the operator's working area to ensure a proper human factors adequacy environment is maintained. This is needed to allow monitoring of critical plant parameters and trends related to SSD, since a fire in the Unit 1 Cable Vault & Tunnel could result in the loss of Unit 1 MCR process monitoring indication. The procedure had an operator close a breaker that is powered from a Unit 1 electrical bus that had been de-energized in a prior attachment in the procedure. As a result, this bus would not be available for use. As of consequence, the next step directed another operator to plug the ventilation fan power cord into a de-energized receptacle. The procedure did not specifically state to use the Unit 2 receptacle, since the Unit 1 receptacle had been de-energized.

In the second instance the inspectors questioned the purpose of the selector switch located at the bottom of the Auxiliary Monitoring Panel. The selector switch was not mentioned in the procedure 1-FCA-3 and therefore had no associated action listed for the operator. It was later confirmed that the selector switch purpose was for swapping the power supply of the auxiliary monitoring panel in the Fuel Handling Building. The procedure sends an operator to the panel to monitor critical plant parameters and trends related to SSD, since a fire in the Unit 1 Cable Vault & Tunnel could result in the loss of Unit 1 MCR process monitoring indication. The licensee SSA credits mitigation of spurious actuations of PORVS, Head Vents, and other events based upon the prompt identification and recognition of the events by the operators. This is one of the primary functions of the licensed operator stationed at the Auxiliary Monitoring Panel. The procedure failed to include a step to swap supply power for the panel to the Unit 2 alternate power supply, using the AC feed selector switch. Without power to the panel, the operator would be unable to monitor plant conditions in the case of a loss of Unit 1 MCR process monitoring indication, as stated in Appendix R Report, Section 4.4.2.7 (Process Monitoring).

Both of these deficiencies are related to the auxiliary monitoring panel. Not having this panel available and operable could adversely affect the plant's ability to achieve SSD following a fire. The licensee initiated CR 348687, which included issuing a new revision of 1-FCA-3. This revision incorporated new guidance to choose the Unit 2 power

receptacle for the ventilation fan, and guidance for swapping the power supply of the auxiliary monitoring panel. The team was provided with a copy of the new revision.

Analysis: The inadequate procedural guidance to provide the auxiliary monitoring panel and Fuel Building ventilation fan with an alternate source of power is considered a performance deficiency. The finding is more than minor because it is associated with the procedure quality attribute of the Mitigating Systems cornerstone, and it affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the procedure deficiencies affect the Human Factors for the actions and ergonomics of the operators since delays and uncertainties would be introduced. The inspectors assessed the finding using IMC 0609, Appendix F, "Fire Protection Significance Determination Process." The finding was assigned a low degradation rating Phase 1 because it was determined to be a procedural deficiency that is compensated by operator experience and/or familiarity. Additionally, this finding has a cross-cutting aspect in the resources component of the human performance area [H.2(c)] because the procedure was not complete and up to date in accordance with the SSA.

Enforcement: Technical Specification 5.4.1 states that written procedures shall be established, implemented, and maintained covering the activities in Appendix A of Regulatory Guide 1.33, Revision 2, dated February 1978. Regulatory Guide 1.33, Appendix A, Section 6.v., requires procedures for combating emergencies, such as plant fires. 1-FCA-3, "Cable Vault and Tunnel Fire," Rev. 20, provided instructions necessary to achieve and maintain post-fire SSD of North Anna Unit 1 in the event SSD could not be performed from the MCR due to a fire in the Unit 1 Cable Vault & Tunnel.

Contrary to the above, the licensee provided operators inadequate procedural instructions for the usage of the auxiliary monitoring panel and the usage of a Fuel Building ventilation fan, as credited in the SSA. This condition has existed since at least April 1, 2008, when Procedure 1-FCA-3, Rev. 20, was issued. Because this finding was of very low safety significance and has been entered into the licensee's corrective action program (CR 348687), this violation is being treated as a NCV, consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000338, Inadequate Procedure for Powering Credited Components for Fire in Cable Vault & Tunnel.

.07 Circuit Analysis

a. Inspection Scope

The team reviewed and verified that the licensee had identified structures, systems, and components (SSCs) important to SSD and that they demonstrated compliance with 10 CFR Part 50.48. This verification also included, for the selected areas, that the licensee had performed a post-fire SSD analysis. The team verified that the licensee's analysis identified and considered process systems and circuits critical for the plant to achieve and maintain hot shutdown in addition to potential flow diversion paths. The team, on a sampling basis, reviewed applicable systems' process and instrumentation diagrams (P&IDs) for flow diversion, loss of coolant, or other scenarios which challenge the plant's ability of maintaining a safe shutdown condition. The team also verified where applicable to ensure the licensee's analysis identified and considered such processes and circuits, and that the analysis showed that hot shorts, and/or shorts to ground would not prevent a SSD condition from being met.

The team reviewed how safe shutdown systems and components would be used to achieve reactor coolant system (RCS) inventory control, core heat removal, RCS pressure control, RCS process monitoring, and ventilation (specifically control room and emergency switchgear room air conditioning) during and following a postulated fire in the fire areas selected for review. System flow diagrams and post-fire operating procedures were reviewed in conjunction with the safe shutdown systems analysis to identify those components credited for SSD. The team reviewed cable routing information for selected components to determine if a fire in the chosen areas would impact them. If there was a potential for components to be impacted by fire, the team performed additional analysis and reviewed credited resolutions. The components that had control cables routed through the selected FAs were examined for potential spurious operation that could either affect system operation or which could affect high/low pressure system interface boundaries. For those components subject to spurious operation the team assessed the adequacy of the licensee's action to resolve the condition. When the licensee's circuit analysis indicated that an operator action would be included in the post-fire operating procedures to mitigate the potential for adverse affects, the team compared the circuit analysis and operating procedures.

The team reviewed the breaker and fuse coordination study documented in Technical Report No. EE-0118, Revision 0, "10 CFR 50 Appendix 'R' Electrical Distribution System Coordination Study North Anna Power Station" to verify that the power supplies necessary to support safe shutdown systems and components would not be loss due to fire damage to associated circuits or that it would have no impact on safe shutdown due to a lack of coordination. The specific components and documents reviewed are listed in the Attachment.

Fire Protection Implementation

The fire protection inspectors coordinated with the electrical inspectors to review components credited for classical fire protection implementation. Specifically, a review was conducted of routing information for credited active fire protection components (i.e., fire detection, electric motor-driven fire pumps, fire protection water distribution system deluge valve controls, and manual fire brigade smoke removal) to determine if a fire in the chosen areas would impact them and the credited defense in depth systems. If there appeared to be a potential for components to be impacted by fire, the team performed additional analysis and reviewed licensee credited resolutions. The circuit analysis review consisted of identifying the impacted cable, determining the purpose of the impacted cable, and verifying the licensee action to resolve the condition. The circuitry associated with the electric motor-driven fire pumps control and automatic functions was reviewed to determine if required the desired start logic would function as designed and would not be vulnerable to fire damage. This portion of the inspection was carried out through document review supplemented by in-plant inspection as appropriate.

b. Findings

No findings of significance were identified.

.08 Communications

a. Inspection Scope

The team inspected the plant communications systems that would be relied upon to support safe shutdown actions, fire event notification, and fire brigade fire fighting activities. The team inspected attributes of the plant communications systems important to post-fire safe shutdown by reviewing shutdown procedures and associated documents (electrical drawings) to verify an adequate method of communications would be available to plant operators during a fire. During this review the team considered the effects of ambient noise levels, clarity of reception, reliability and coverage patterns.

The team inspected the contents of designated emergency storage lockers and reviewed the alternative shutdown procedure to verify that portable radio communications and fixed emergency communications systems are available, operable, and adequate for the performance of designated activities.

The team questioned if a fire in FA 3-1 would result in the loss of radio communications in the FA and in the Auxiliary Building, potentially affecting safe shutdown action. The inquiry resulted in CR 350333-CA147465 being initiated. An in-office review of tests performed on October 28, 2009, from the initiating condition report, was conducted to evaluate the reliability of the radio communications system to support fire event notification and fire brigade fire fighting activities and provide assurance communications would not be degraded.

Fire Protection Implementation

The team inspected the plant communications systems that would be relied upon to support fire event notification, and fire brigade fire fighting activities. The team determined the attributes of the plant communications systems important to post-fire safe shutdown by interviews with staff, determining the availability at designated locations, evaluation of the reliability, verification of maintenance on method credited, and ensurance that batteries maintained a sufficiently charge, good reception in all required areas of the plant, and vulnerability to fire damage etc. The team reviewed selected fire brigade drill summary/critique reports to assess proper operation and effectiveness of the fire brigade command post portable radio communications during fire drills and identify any history of operational or performance problems with radio communications during fire drills. In addition, the team reviewed the radio battery usage ratings for the fire brigade radios stored and maintained on charging stations to verify their availability.

b. Findings

No findings of significance were identified.

.09 Emergency Lighting

a. Inspection Scope

The team inspected the placement and aiming of Emergency Lighting Units (ELUs) installed to provide illumination for operators carrying out the SSD procedures for the selected fire areas. The team reviewed the design, maintenance and testing of ELUs

throughout the plant to confirm they would illuminate for the 8-hour period following the interruption of normal power to the battery chargers. The team performed plant walkdowns with licensee staff of the selected areas to observe if the placement and coverage area of fixed eight-hour battery pack emergency lights provided reasonable assurance of illuminating access and egress pathways and any equipment requiring local operation and/or instrumentation monitoring for post fire safe shutdown. The team also reviewed calculations for the battery power supplies to verify they were rated for at least an eight-hour capacity.

The team verified the emergency lighting system was scoped into the licensee's Maintenance Rule Program. The team reviewed preventive maintenance procedures, maintenance rule evaluations, and completed surveillance tests to ensure adequate maintenance, surveillance testing and periodic battery replacements were in place to ensure reliable operation of the fixed emergency lights. The team reviewed vendor manuals and data sheets to ensure that the emergency lights and batteries were being maintained consistent with the manufacturer's recommendations. The team obtained and reviewed copies of data sheets from recent and past surveillance tests on the ELUs. In cases where an ELU failed the surveillance test, the team followed up to confirm the corrective action and programmatic treatment. Specific documents reviewed by the team are listed in the attachment.

The team also observed whether emergency exit lighting was provided for personnel evacuation pathways to the outside as identified in NFPA 101, Life Safety Code, and the Occupational Safety and Health Administration, Part 1910, Occupational Safety and Health Standards. This review also included examination of whether backup emergency lighting was provided for the primary and secondary fire emergency equipment storage locker locations and dress-out areas in support of fire brigade operations should power fail during a fire emergency.

b. Findings

No findings of significance

10. Cold Shutdown Repairs

a. Inspection Scope

The inspectors verified that the materials necessary to perform cold shutdown repairs was available onsite and properly staged. The team reviewed the need for cold shutdown repairs in relation to the selected fire areas and the licensee's compliance with the requirements of 10 CFR 50, Appendix R. Inspection activities included a review of procedure 0-ECM-0204-01, "Installation of Temporary Residual Heat Removal Motor Feed Cables", Rev. 11, which describe methods for re-energizing a residual heat removal pump in case the feeder cable to the pump is damaged by fire. The procedure was reviewed for completeness and clarity. Documents reviewed by the team are listed in the attachment.

b. Findings

No findings of significance were identified.

11. Compensatory Measures

a. Inspection Scope

The team reviewed the administrative controls for out-of-service, degraded, and/or inoperable, fire protection features (e.g., detection and suppression systems and equipment, passive fire barriers, or pumps, valves or electrical devices providing post-fire safe shutdown functions or capabilities). A sample of records of recent fire protection features impairments were requested and reviewed by the team. The team also reviewed a sample of items listed in Fire Protection Program Health Report (2008Q4) and compared them with the FAs selected for inspection. The team evaluated compensatory measures that had been established for programmatic deficiencies against the approved FPP outlined in VPAP 2401, "Fire Protection Program" and CM-AA-FPA-100, Fire Protection/Appendix R (Fire Safe Shutdown) Program, Rev. 0. The team conducted interviews of on-shift personnel to determine if actions to implement compensatory measures were understood. The team performed independent walkdowns during various stages of the inspection to verify compensatory actions were being implemented successfully.

b. Findings

No findings of significance were identified.

12. Control of Combustibles and Ignition Sources

a. Inspection Scope

For the selected FAs, the team evaluated the fire event history, the potential for fires or explosions, the combustible fire load characteristics, and the potential exposure fire severity. The team reviewed the licensee's transient fire load procedures; selected fire emergency reports; generic fire protection training; and selected portions of the FPP administrative procedures to determine if adequate controls were in place to control the handling of in-situ and transient combustibles in the plant. The team walked down numerous areas in the plant, including the selected plant FAs, to ensure that the licensee had properly evaluated in-situ combustible fire loads, limited transient fire hazards, and maintained general housekeeping consistent with the UFSAR, administrative procedures, and other FPP procedures. There were no hot work activities ongoing within the selected FAs during the inspection so that observation of this activity could not be performed.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems

a. Inspection Scope

The team also reviewed corrective action program documents, including completed corrective actions documented in selected condition reports (CRs) and operating experience program documents, to ascertain whether industry-identified fire protection problems actually or potentially affecting North Anna were appropriately entered into, and resolved by, the corrective action program process. Items included in the operating experience program effectiveness review were NRC Information Notices, industry or vendor-generated reports of defects and non-compliances submitted pursuant to 10 CFR 21 and vendor information letters. The team evaluated the effectiveness of the corrective actions for the identified issues. The documents reviewed are listed in the Attachment.

b. Findings

No findings of significance were identified.

4OA5 Other Activities

.01 (Closed) URI 05000339/2005008-02, Potential for CO_2 Over pressurization of Unit 2 Cable Vault and Tunnel

a. Inspection Scope

The team reviewed the facts of the subject unresolved item (URI) as well as evaluations and corrective actions taken by the licensee.

b. Findings

This issue was discussed in Section 1R05.05.

4OA6 Meetings, Including Exit

On October 2, 2009, the lead inspector presented the preliminary inspection results to Mr. E. S. Hendrixson, Director, Station Safety & Licensing, and other members of the licensee's staff. The license acknowledged the results. A re-exit was held on November 12, 2009, by telephone with Mr. Hendrixson, and other licensee staff, to discuss the final results of the inspection. Proprietary information is not included in this report.

SUPPLEMENTAL INFORMATION

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened		
05000338, 339/2009008-01	URI	Qualification of Fire Barrier Floor/Wall Penetration of Aluminum Conduit Through Sleeve (Section 1R05.03)
Opened/Closed		
05000339/2009008-02	NCV	Failure to Adequately Address the Potential for CO_2 Over-pressurization within the Unit 2 Cable Vault & Tunnel (Section 1R05.05)
05000338/2009008-03	NCV	Inadequate Procedure for Powering Credited Components for Fire in Cable Vault & Tunnel. (Section 1R05.06)
Closed		
05000339/2005008-02	URI	Potential for CO_2 Over-pressurization of Unit 2 Cable Vault & Tunnel (Section 4OA5)

KEY POINTS OF CONTACT

Licensee

R. Anderson	Engineer
H. Anthes	Manager, Maintenance
D. Blakeney	Manager, Nuclear Oversight
M. Bourdeau	Engineer
P. Cameron	Senior Safety Specialist
J. Crossman	Asst. Manager, Operations
B. Dennison	Senior Instructor, Training Operations
E. Hendrixson	Director, Station Safety & Licensing
P. Kemp	Supervisor, Station Licensing
J. Landrum	Engineer
M. Lane	Supervisor, HP Operations
G. Marshall	Manager, Outage & Planning
J. Miller	Engineer
S. Morris	Supervisor, Engineering
O. Robinson	Electrical Engineer
G. Scott	Shift Manager, Operations
J. Scott	Supervisor, Training Operations
B. Sloan	Manager, Engineering Innsbrook
B. Standley	Manager, Engineering
D. Struckmeyer	Supervisor, Engineering
M. Walker	Manager, Engineering
M. Whalen	Station Licensing
J. Zaborowski	Supervisor, Engineering

NRC personnel

J. Reece, Senior Resident Inspector
R. Clagg, Resident Inspector
R. Nease, Branch Chief

LIST OF FIRE BARRIER FEATURES INSPECTED
(Refer Report Section 1RO5.03- Passive Fire Barriers)

Fire Wall Identification	**Description**
Masonry Block Wall,	FA 3-1(Unit 1Cable Vault Room) and FA-3-2 (Unit 2 Cable Vault Room) along column line 8[mark# 01-FP- FBAR254CT01]
Masonry Block Wall,	FA 5-1(Unit 1Normal Switchgear Room) and FA-8A-1

Fire Door Identification	**Description**
Door S-54-5	FA 3-1 (Unit 1Cable Vault Room) to FA-6-1
Door S-54-9	FA-3-2 (Unit 2Cable Vault Room) to FA-6- 2
Door SO7-5	FA 5-1 to FA 8A-1 (Turbine Building)
Door SO7-6	FA 5-1 to FA 8A-1 (Turbine Building)

Fire Damper Identification	**Description**
01-FP-FDMP-1020	FA 5-1 to Duct Space
01-FP-FDMP-1023	FA 5-1 to Duct Space

Fire Barrier Penetration Seal Identification	**Description**
01-FP-FBAR-307AB01-3	FA 5-1 to Auxiliary Building
01-FP-FBAR-307SWGR01-13	FA 5-1 to Turbine Building
01-FP-FBAR-254ESWGR08-BS8	FA 3-1 to FA 6-1(Unit 1Emerg Switchgear Room)
01-FP-FBAR-254CT01-303A-31	FA 3-1 to FA 3- 2(Unit 2 Cable Vault Room)
01-FP-FBAR-254CT01-303A-45	FA 3-1 to FA 3- 2(Unit 2 Cable Vault Room)
01-FP-FBAR-254CT01-303A-49	FA 3-1 to FA 3- 2(Unit 2 Cable Vault Room)
01-FP-FBAR-254CT01-303A-50	FA 3-1 to FA 3- 2(Unit 2 Cable Vault Room)

LIST OF COMPONENTS REVIEWED
(Refer to Report Section 1R05.01 / 1R05.05 / 1R05.07 – Circuit Analysis)

Valves

1-RC-PCV-1455C, Pressurizer Power Operated Relief Valve (PORV)
1-RC-PCV-1456, Pressurizer PORV
1-CH-LCV-1460A, Letdown Isolation Valve
1-RC-SOV-101A-1, Reactor Vessel Head Vent
1-RC-SOV-101B-1, Reactor Vessel Head Vent
1-RC-SOV-102A-1, Pressurizer Vent
1-RC-SOV-102B-1, Pressurizer Vent
1-FW-MOV-100A, AFW Discharge to Steam Generator A
1-FW-MOV-100B, AFW Discharge to Steam Generator B
1-FW-MOV-100C, AFW Discharge to Steam Generator C
1-FW-MOV-100D, Turbine-Driven AFW Pump Discharge to Steam Generator A
1-MS-TV-111A, Steam Supply to AFW Pump Turbine
1-MS-TV-111B, Steam Supply to AFW Pump Turbine
1-MS-TV-101A, Steam Generator A Main Steam Trip Valve
1-MS-TV-101B, Steam Generator B Main Steam Trip Valve
1-MS-TV-101C, Steam Generator C Main Steam Trip Valve

Pump Motors

1-CC-P-1A, Component Cooling Water Pump
1-CC-P-1B, Component Cooling Water Pump
1-CH-P-1A, Charging Pump
1-FP-P-1, Fire Pump
1-FW-P-3A, Motor-Driven AFW Pump
1-FW-P-3B, Motor-Driven AFW Pump
1-RH-P-1A, Residual Heat Removal Pump A
1-RH-P-1B, Residual Heat Removal Pump B
1-SW-P-1A, Service Water Pump
1-SW-P-1B, Service Water Pump

Process Instruments

1-FW-LI-110A, Steam Generator A Wide Range Level
1-FW-LI-110B, Steam Generator B Wide Range Level
1-RC-TI-1410A, Loop 1 Wide Range Cold Leg Temp
1-RC-TI-1420A, Loop 2 Wide Range Cold Leg Temp
59-1-FP-PS-1202, Motor Driven Fire Pump Discharge Header Pressure Switch
59-1-FP-PS-1203, Diesel Driven Fire Pump Discharge Header Pressure Switch

Cable Routing

Offsite Power from Transfer Bus D to Unit 1 Emergency Bus 1J
Offsite Power from Transfer Bus E to Unit 2 Emergency Bus 2H
Offsite Power from Transfer Bus F to Unit 1 Emergency Bus 1H
Offsite Power from Transfer Bus F to Unit 2 Emergency Bus 2J

Cables in Conduit 1CL975NC3 in Rod Drive Room in Unit 1 Cable Vault & Tunnel (CV&T)
Cables in Conduit 1CL975NB1 in Rod Drive Room in Unit 1 CV&T
Cables in Conduit 1CL975NA3 in Rod Drive Room in Unit 1 CV&T
Cables in Conduit 1CL975NB3 in Rod Drive Room in Unit 1 CV&T
Cables in tray 1TC037N
Both Power/Control Cables for 1-FW-MOV-100A
Both Power/control Cables for 1-FW-MOV-100B
Both Power/Control Cables for 1-FW-MOV-100C
Both Power/Control Cables for 1-FW-MOV-100D
Station Blackout System
Control Cables for 1-RC-P-1A, Reactor Coolant Pump 1A
Control Cables for 1-RC-P-1B, Reactor Coolant Pump 1B
Control Cables for 1-RC-P-1C, Reactor Coolant Pump 1C
Power/Control Cables for Emergency Generator 1J
Power/Control Cables for Emergency Generator 2J
Power/Control Cables for Emergency Generator 1H
Power/Control Cables for Emergency Generator 2H

Ventilation

1-HV-AC-01, Control Room AC Unit
1-HV-AC-02, Control Room AC Unit
1-HV-AC-6, Emergency Switchgear Room AC Unit
1-HV-E-4B, Control & Relay Room Chiller
1-HV-E-4C, Control & Relay Room Chiller

LIST OF DOCUMENTS REVIEWED

Procedures

CM-AA-FPA-100, Fire Protection/Appendix R (Fire Safe Shutdown) Program, Rev. 0
CM-AA-FPA-101, Control of Combustible and Flammable Materials, Rev. 0
CM-AA-FPA-102, Fire Protection and Fire Safe Shutdown Review and Preparation Process and Design Change Process, Rev. 0
VPAP-2401, Fire Protection Program, Rev. 29
VPAP-0301, Design Change Process
0-ECM-0204-01, Installation of Temporary Residual Heat Removal Motor Feeder Cables, Rev. 11
0-ECM-2808-02, Trouble-shooting and Repair of Emergency Lights, Rev. 21
0-ECM-2808-02, Trouble-shooting and Repair of Emergency Lights, Rev. 19
0-EPM-2304-02, RHR Appendix R Equipment Inspection, Rev. 10
0-EPM-2808-01, Appendix R Emergency Light Inspection and Testing of Fire Areas 2 (Control Room), 3-1 (U1 Cable Vault and Tunnel), 3-2 (U2 cable Vault and Tunnel), and 50 (Service Bldg Stairwell), Rev 9
0-EPM-2808-01, Appendix R Emergency Light Inspection and Testing of Fire Areas 2 (Control Room), 3-1 (U1 Cable Vault and Tunnel), 3-2 (U2 cable Vault and Tunnel), and 50 (Service Bldg Stairwell), Rev 10
0-EPM-2808-03, Appendix R Emergency Light Inspection and Testing for Fire Area 8 (Unit 1 and 2 Turbine Bldg), Rev. 6
0-EPM-2808-03, Appendix R Emergency Light Inspection and Testing for Fire Area 8 (Unit 1 and 2 Turbine Bldg), Rev. 7
0-EPM-2808-09, Inspection and Testing of Appendix R Emergency Light Chargers, Rev. 17
0-FCA-0, Fire Protection – Operations Response (With Seven Attachments), Rev. 11
0-FPMP-5, Fire Brigade Staging, Unit 1 Mezz Level Storage Lockers, and TSC Response Cabinets Equipment Check, Rev. 5
0-FPMP-10.0, Conduct of Fire Drills, Rev. 1, completed drill of 12-20-05
0-PT-100.6, Fire Protection – Main Fire Loop Flow Test, Rev. 2
0-PT-103.3, Back-Up Repeater Testing for Radio Trunking, Rev. 3
0-PT-105.7, Fire Brigade Ventilation Fans Functional Test, Rev. 2
0-PT-106.3, LP CO_2, System Walter Kidde Heat Detector Operational Test, Rev. 17
0-PT-107.0, Appendix R Locker Inspection, Rev. 5
1-FCA-3, Cable Vault and Tunnel Fire (With Nineteen Attachments), Rev. 20
1-PT-100, Appendix R Equipment And Circuitry Functional Test, Rev. 11
1-PT-104.4, Low-Pressure CO_2, High-Pressure CO_2, and Halon Systems Required Valve Lineup Verification, Rev. 7
1-PT-105.1.1, Fire Protection- Fire Door Inspection-Turbine Building, Control Room and Office Area, Rev. 9
1-PT-105.1.2, Fire Protection- Fire Door Inspection-Service Building, Rev. 10
1-PT-105.1.5, Fire Protection- Fire Damper Inspection, Rev. 8
1-PT-105.1.6, Fire Protection- Fire Damper Functional Operability Test, Rev. 2
1-PT-109, Appendix R Monitoring Instrumentation Channel Check, Rev. 6

Calculations, Evaluations, & Specifications

Apparent Cause Evaluation, ACE000693, Over-pressure Condition May Exist in Unit 2 Cable Vault on CO_2 Discharge, dated 8/25/2008
Calculation EE-0395, Safety-Related 480V Load Center Coordination, Rev. 2

Calculation EE-0806, NANS 4160V and 480V Short-Circuit Analysis, Rev. 0
Calculation ME-0792, Fire Hose Station Design, Rev. 0, dated 02/23/2006
Calculation SM-820, North Anna Extended SG Tube Plugging Auxiliary Feedwater Reanalysis, Loss of Normal Feedwater and Appendix R Cases, Rev. 0
Calculation 1250-111-C01, Impell Corporation, Penetration Seal Configuration Documentation Pkg., 10" DC 3-6548 Silicone Foam/NA & Surry, Rev. 1
Calculation 1250-111-C03, Impell Corporation, Penetration Seal Configuration Documentation Pkg., 10" DC 3-6548 Silicone Foam Blockout/NA & Surry, Rev. 0
Calculation 1250-111-C04, Impell Corporation, Penetration Seal Configuration Documentation Pkg., 12" DC 3-6548 Silicone Foam Blockout/NA & Surry, Rev. 0
Calculation 131035-Z2-2, Low Pressure CO_2 Hydraulic Calculations by Chemetron, Rev. 1
DCP 07-002, Appendix 1-1, Electrical Systems Analysis Checklist (Rev 2) for Replacement of Switchyard 500/36.5 kV Transformers #1 and #2 North Anna Units 1 and 2, Dated 8/26/08
High/Low Pressure Boundaries Units 1 and 2, Rev. 25
NANS Appendix R Report Table 3-1, Safe Shutdown Component Operation Matrix, Rev. 25
NANS Appendix R Report Table 3-3, Potential Spurious Operations Which Could Affect
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11715-FE-90JA-3, Appendix R Block Diagram Main Steam System Sh. 1, Rev. 3
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Instrument Loop Drawing L-FW110A, Feedwater System Steam Generator A Wide Range Level, Approved 6/25/1984
Instrument Loop Drawing L-FW110B, Feedwater System Steam Generator B Wide Range Level, Approved 6/25/1984
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0-PT-1.5.1.4C, Fire Protection System—Fire Barriers, Rev. 8, completed 04/27/2009
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1-EPM-1815-03, Rev. 006, Protective Relay Maintenance For Breaker 15H4 Auxiliary Service Water Pump 1-SW-P-4, Completed 5/30/07
1-EPM-1818-01, Rev. 007, Protective Relay Maintenance For Breaker 15H13, Component Cooling Pump 1-CC-P-1A, Completed 9/5/07
1-EPM-1819-01, Rev. 009, Protective Relay Maintenance For Breaker 15H14, Residual Heat Removal Pump 1-RH-P-1A, Completed 9/5/07
1-PT-36.38, Rev. 003, Operability Testing Of Interlocks From Control Circuits For Breaker 15H6, Charging Pump 1-CH-P-1A, Completed 10/23/08
1-PT-36.36, Rev. 004, Operability Testing Of Interlocks From Control Circuits For Breaker 15H3, Auxiliary Steam Generator Feed Pump 1-FW-P-3A, Completed 3/10/09
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1-PT-214.15, Rev. 10, In-service Inspection (Auxiliary Shutdown Panel Controls Verification), Completed 3/30/09

Work Orders

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0-FS-TB-1, Fire Fighting Preplan for Turbine Building, Rev. 0
1-FS-T-1, Fire Fighting Preplan for Transformers – Unit 1, Rev. 3
1-FS-TO-1, Fire Fighting Preplan for Turbine Oil Room Elevation 254’ – Unit 1, Rev. 3
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NFPA 12, 1973 Edition, Carbon Dioxide Extinguishing Systems
NFPA 13, 1969 Edition, Installation of Sprinkler Systems
NFPA 14, 1974 Edition, Installation of Standpipe and Hose Systems
NFPA 15, 1971 Edition, Water Spray Fixed Systems
NFPA 20, 1972 Edition, Installation of Centrifugal Fire Pumps
NFPA 24, 1969 Edition, Installation of Private Fire Service Mains and Their Appurtenances
NFPA 30, 1977 Edition, Flammable and Combustible Liquids Code
NFPA 50A, 1969 Edition, Gaseous Hydrogen Systems at Consumer Sites
NFPA 72D, 1975 Edition, Installation Maintenance and Use of Protective Signaling Systems
NFPA 80 1970 Edition, Fire Doors and Windows
NUREG-1552, Supplement 1, Fire Barrier Penetration Seals in Nuclear Power Plants, dated January 1999
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Specification NAS 239, Specification for Concrete Masonry, Rev. 2
Specification NAS-264, Specification for Ventilation and Air Conditioning Systems for Secondary Plant, Rev. 3
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Steel Door Institute, SDI 100, Recommended Specifications for Standard Steel Fire Doors and Frames, Revision 11/2003
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Steel Door Institute, SDI 122-07, Installation and Troubleshooting Guide for Standard Steel Doors and Frames, Revision 2007
Underwriters Laboratory Standard 555, Standard for Fire Dampers and Ceiling Dampers, dated May, 14, 1979

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Data Sheet for Bullard Thermal Imager, dated 09/23/2003
Data Sheet for Grinnell Large Orifice Duraspeed Sprinkler, Issue C, dated 9/1/1971
Data Sheet for Simplex 4098-9714 Photoelectric True Alarm Sensors, Rev. M
Data Sheet Model CF6V50 Maintenance Free Rechargeable Batteries
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EE 95-034, Seismic Evaluation and Switch/Jack Installation for Emergency Lighting Units/NANS/ Units 1 & 2, Rev 0, dated 08/23/95
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North Anna Units 1 and 2 – Issuance of Amendments Re: Monitoring Program for Secondary Water Chemistry (TACS Nos. M84455 and M 84456), December 9, 1992
North Anna Unit 1 – Issuance of Amendment Re: One-Time Extension of Surveillance Requirements – Cycle 9 (TAC No. M82984), June 1, 1992
North Anna Unit 1 & 2 – Fire Protection Request for Exemption from a Requirement of Appendix R to 10 CFR Parts 50, Section III.G, February 23, 1984
North Anna Units 1 and 2 – Issuance of Amendments Re: Service Water System (TAC No's: 81864 and 81865), December 13, 1991
North Anna Unit 1 & 2 – Notice of Environmental Assessment and Finding of No Significant Impact Relating to Exemption from the Requirements of Sections III.G and III.J of Appendix R, 10 CFR 50, October 2, 1986
North Anna Unit 1 – Issuance of Amendment No. 1 to Facility Operating License No. NPF-4, January 26, 1970
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North Anna Unit 1 – Issuance of Amendment Re: One-Time Extension of Surveillance Requirements – Cycle 9, June 1, 1992
North Anna UFSAR Chapter 3, Revision 43
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North Anna UFSAR Chapter 9, Section 9.5.2, Communication Systems
SDBD-NANS-FP, Rev. 5, System Design Basis Document for Fire Protection System North Anna Power Station
Technical Report EP-0015, Fire Protection Information to Appendix A to BTP 9-5-1, 1979 FP-SER and National Fire Protection Association (NFPA) Codes, Rev. 0 dated 5/29/2008
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Other Documents

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Conduct of Fire Drills, 0-FPMP-10.0, Summary Reports for Fire Brigade Drills Conducted in 2007 and 2008
Factory Mutual Global, Property Loss Prevention Data Sheets 5-48, Automatic Fire Detection, dated 06/2009
Medical Records for Fire Brigade Members, OPS A Shift, OPS D Shift, and SEC-B Shift
Module NCRODP-06-NA, Fire Protection System, May 2, 2007
Module NCRODP-36-NA, Secondary Plant Ventilation Systems, May 16, 2007
NANS Technical Requirements Manual (TRM) Technical Requirements TR 7.1, 7.2, 7.3, and 7.10, Rev. 62
National Concrete Masonry Association, TEK 7-1C, Fire Resistance of Ratings of Concrete Masonry Assemblies, dated 2009
NRC Regulatory Issue 2005-007, Compensatory Measures to Satisfy the Fire Protection Program Requirements, dated 04/19/2005
NRC Information Notice 97-48, Inadequate or Inappropriate Interim Fire Protection Compensatory Measures, dated 07/09/1997

NUREG-1552, Supp. 1, Fire Barrier Penetration Seals in Nuclear Power Plants, 06/1998
NUREG-1805, Volumes 1 & 2, Fire Dynamics Tools (FDT's) Quantitative Fire Hazard Analysis, dated 12/2004
Underwriters Laboratories (UL) Inc., Fire Resistance Directory, Dow Corning Foam for use in Through-Penetration Fire Stop Devices, XHEZ, System Nos. CAJ-XXXX
Virginia Electric and Power Company North Anna Power Station Units 1 and 2 Individual Plant Examination of Non-Seismic External Events and Fires, June 28, 1994

LIST OF CONDITION REPORTS (CRS) REVIEWED DURING INSPECTION

CR347193, Aluminum conduits in Fire Barrier Penetrations may not have foam seals.
CR332786, Affected Drawings Not Identified in DCP 07-172
CR105502, Cable Route Penetration

LIST OF CRS, CAs, ACEs, or OTHER GENERATED AS A RESULT OF THIS INSPECTION

CR346717, Request WO to remove two sections of diamond deck steel plate in U1 Rod Drive.
CR347193, CA145501, ACE017780, LTR000233, & NNOE000402, Aluminum conduits in Fire Barrier Penetrations may not have foam seals.
CR348499 & CA146359, Incorrect references on drawing 11715-FE-90MA.
CR348623, Defective cooling fans in back-up repeaters 1-CO-COM-9; 1-CO-COM-10; 1-CO-COM-11.
CR348687, During the NRC Triennial Fire Inspection, 2 issues were identified with 1-FCA-3 (U-1 Cable Vault Fire).
CR348690 & CA146552, NRC identified issue from Triennial Fire Inspection – Vital area keys for Aux Bldg (1-FCA-3).
CR349250 & CA146983, Issue identified with 1-FCA-3 during NRC Triennial Fire Protection Inspection – Wheatstone Bridge.
CR349371, CA147046, CA147161, & TE014796, Incorrect statement found in ET-N-09-0090 during 2009 TFPI.
CR349861 & CA147367, Location information on Appendix R Diagram incorrect - Drawing 11715-FE-90HA.
CR349952, CA147395, & CA147507, Verification of correct keys needed in the App R key locker.
CR349987, CA147491, & CA147519, Drawing error found during 2009 TFPI – Drawing 11715-FE-90-FC.
CR350141 & CA147492, Drawing error on 11715-FE-1BA, Mark number incorrectly represented.
CR350163 & CA147498, Enhancement to 0-ECM-0204-01.
CR350230, CA147496, & CA147526, Appendix R emergency lighting in Control Room behind vertical boards.
CR350315, CA147550, & CA147553, NRC TFPI identified minor revision needed to Calc 0653 & ET CEP-00-0039.
CR350333 & CA147565, During NRC TFPI, concern about PMT on radio communication system was identified.
CR350345 & CA147597, Engineering Evaluation for Appendix R lacks sufficient detail and rigor -ET-CEP-00-0018.
CR350346 & CA147596, Additional ET reference needed in 0-GOP-17.0 for RCP seal isolation TCA.
CR350449, Observation made during NRC TFPI concerning transient combustibles.
CR350491, Observation made during NRC TFPI concerning fire drill participation.

CR350492, Observation made during NRC TFPI concerning transient combustibles.
CR350495, Observation made during NRC TFPI concerning fire drill frequency.
CR350498, The NRC TFPI identified that the MCR Chiller exemption needs additional review.
CR350499, Engineering Transmittal N-05-0077 requires revision (TFPI identified).
CR350503, TFPI identified Appendix R report lists incorrect power supply for 2 components.

LIST OF ACRONYMS AND ABBREVIATIONS

AFW	Auxiliary Feedwater
ANSI	American National Standards Institute
APCSB	Auxiliary and Power Conversion Systems Branch
ASSD	Alternate Safe Shutdown
BTP	Branch Technical Position
CAs	Corrective Actions
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
CRs	Condition Reports
ELU	Emergency Lighting Unit
ERFBS	Electrical Raceway Fire Barrier System
ET	Engineering Transmittal
FA	Fire Area
FCA	Fire Contingency Action
FPP	Fire Protection Program
IPEEE	Individual Plant Examination for External Events
IN	Information Notice
IR	Inspection Report
IP	Inspection Procedure
LOSP	Loss of Off Site Power
MCR	Main Control Room
NANS	North Anna Nuclear Station
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
NUREG	An explanatory document published by the NRC
OMA	Operator Manual Action
OSHA	Occupational Safety and Health Administration
PID	Process & Instrumentation Drawing
PORV	Power Operated Relief Valve
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
Rev	Revision
SE	Safety Evaluation
SER	Safety Evaluation Report
SDP	Significance Determination Process
SSA	Safe Shutdown Analysis
SSD	Safe Shutdown
SW	Service Water System
TFPI	Triennial Fire Protection Inspection
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
WO	Work Order