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

December 18, 2001

EA-00-022
EA-01-310

Carolina Power & Light Company
ATTN: Mr. James Scarola
Vice President - Harris Plant
Shearon Harris Nuclear Power Plant
P. O. Box 165, Mail Code: Zone 1
New Hill, NC 27562-0165

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT - NRC INSPECTION REPORT 50-400/00-09; PRELIMINARY WHITE FINDING

Dear Mr. Scarola:

On December 12, 2001, the NRC completed an open item inspection for your Harris facility. The enclosed report documents the inspection findings, which were discussed on December 12, 2001 with Mr. J. Scarola, Harris Plant Vice President and other members of your staff.

This inspection was an in-office examination of two unresolved items (URIs) which were identified in NRC Inspection Report 50-400/99-13 (ADAMS Accession Number ML003685341) forwarded to you on February 3, 2000. The two URIs were: URI 50-400/99-13-01, Adequacy of Thermo-Lag Fire Barrier to Meet Plant Licensing Basis Requirements, and URI 50-400/99-13-02, Adequacy of the 10 CFR 50.59 for Changes Made to the UFSAR to Revise the Fire Rating of Selected Thermo-Lag Fire Barriers. These issues were unresolved pending NRC review of the adequacy of the protection provided by the Thermo-Lag fire barrier assembly and the acceptability of your technical evaluations used to justify revising the fire resistance rating of the Thermo-Lag fire barrier.

Based on the results of this inspection, the inspectors identified a finding involving the Thermo-Lag fire barrier assembly between the B Train Switchgear Room/Auxiliary Control Panel Room and the A Train Cable Spreading Room (URI 50-400/99-13-01). Based on your Thermo-Lag barrier fire resistance tests conducted in 1994 and 1995, this barrier did not have the required three-hour fire resistance rating. This inspection finding was assessed using the applicable significance determination process (SDP) and preliminarily determined to be White (i.e., an issue with low to moderate increased importance to safety, which may require additional NRC inspections.) This issue was also determined to be an apparent violation of NRC requirements. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions - May 1, 2000" (Enforcement Policy), NUREG - 1600, this apparent violation is being considered for escalated enforcement action because it is associated with a White finding.

Before the NRC makes a final decision on this matter, we are providing you an opportunity to request a regulatory conference where you would be able to provide your perspectives on the significance of the finding, the bases for your position, and whether you agree with the apparent violation. If you choose to request a regulatory conference, we encourage you to submit your evaluation and any differences with the NRC's evaluation at least one week prior to the conference in an effort to make the conference more efficient and effective. If a regulatory conference is held, it will be open for public observation. The NRC will also issue a press release to announce the regulatory conference.

The inspectors identified another finding involving your determination, through an engineering analysis and changes made to the fire protection program, that the degraded Thermo-Lag barrier discussed above was acceptable (URI 50-400/99-13-02.) This finding was not evaluated under the SDP but was documented because, by accepting the degraded fire barrier, you adversely affected the ability to achieve and maintain safe shutdown. Such changes require NRC approval. This finding has been determined to be an apparent violation of NRC requirements. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions - May 1, 2000" (Enforcement Policy), NUREG - 1600, this apparent violation is being considered for escalated enforcement action because it appears to have impacted the NRC's ability to perform its regulatory function.

The circumstances surrounding this apparent violation, including the changes made to the fire protection program, the significance of the issue, and the need for lasting and effective corrective action, were discussed with members of your staff at the inspection exit meeting on December 12, 2001. As a result, it may not be necessary to conduct a predecisional enforcement conference in order to enable the NRC to make an enforcement decision.

Before the NRC makes its enforcement decision, we are providing you an opportunity to either (1) respond to the apparent violation involving the changes made to the fire protection program addressed in this inspection report within 30 days of the date of this letter or (2) request a predecisional enforcement conference. If an enforcement conference is held, it will be open for public observation. The NRC will also issue a press release to announce the conference.

If you choose to respond in writing, your response should be clearly marked as a "Response to An Apparent Violation in Inspection Report No. 50-400/00-09" and should include for the apparent violation: (1) the reason for the apparent violation, or, if contested, the basis for disputing the apparent violation, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response should be submitted under oath or affirmation and may reference or include previously docketed correspondence, if the correspondence adequately addresses the required response. If an adequate response is not received within the time specified or an extension of time has not been granted by the NRC, the NRC will proceed with its enforcement decision or schedule a predecisional enforcement conference.

Please contact Mr. Charles R. Ogle at (404) 562-4605 within seven days of the date of this letter to notify the NRC of your intentions regarding the regulatory conference for the preliminary White finding, and your intentions regarding a predecisional enforcement conference for the second apparent violation. If we have not heard from you within 10 days, we will continue with our significance determination and associated enforcement processes on these findings and you will be advised by separate correspondence of the results of our deliberations on this matter. If you desire both a regulatory conference and a predecisional enforcement conference, the NRC will attempt to schedule them on the same day.

Since the NRC has not made a final determination in this matter, no Notices of Violation are being issued for the inspection findings at this time. In addition, please be advised that the number and characterization of the apparent violations described in the referenced inspection report may change as a result of further NRC review.

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 Publicly Available Records (PARS) component of NRC's Document system (ADAMS). ADAMS is accessible from the NRC web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

If you have any questions regarding this letter, please contact me at 404-562-4600.

Sincerely,

/RA/

Charles A. Casto, Director
Division of Reactor Safety

Docket No.: 50-400
License No.: NPF-63

Enclosure: Inspection Report 50-400/00-09
w/Attachment

cc w/encl:
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DATE	12/6/2001	12/13/2001	12/11/2001	12/6/2001	12/11/2001	12/18/2001	12/18/2001
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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.:	50-400
License No.:	NPF-63
Report No.:	50-400/00-09
Licensee:	Carolina Power & Light (CP&L) Company
Facility:	Shearon Harris Nuclear Power Plant, Unit 1
Location:	5413 Shearon Harris Road New Hill, NC 27562
Dates:	August 17, 2000 - December 12, 2001
Inspectors:	G. Wiseman, Senior Reactor Inspector (Lead Inspector) W. Rogers, Senior Reactor Analyst
Approved by:	C. Casto, Director Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000400-00-09, on 08/17/2000 -10/01/2001, Carolina Power & Light Company , Shearon Harris, Unit 1, Region-based follow up inspection of fire protection Unresolved Items 50-400/99-13-01 and 50-400/99-13-02.

This in-office review was conducted by a regional fire protection inspector and senior reactor analyst. The inspectors identified one preliminary White finding with an apparent violation. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609 “Significance Determination Process” (SDP). The NRC also identified an additional apparent violation which was dispositioned outside the SDP. Findings for which the SDP does not apply are indicated by “no color” or by the severity level of the applicable violation. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at http://nrr10.nrc.gov /NRR/ OVERSIGHT/index.html.

A. Inspector Identified Findings

Cornerstone: Mitigating Systems

- Preliminary White. The inspectors identified an apparent violation of the fire protection program required by 10 CFR 50.48 and License Condition 2.F, in that the Thermo-Lag fire barrier assembly which serves as the fire area separation barrier between Fire Area 1-A-SWGR-B [B Train Switchgear Room/Auxiliary Control Panel Room] and Fire Area 1-A-CSR-A [A Train Cable Spreading Room] has an indeterminate fire resistance rating instead of the required three hours.

  This degraded condition increased plant risk because, if a severe fire occurred in Fire Area 1-A-SWGR-B and breached the Thermo-Lag fire barrier, both trains of post-fire safe shutdown capability could be damaged or lost due to the same fire. (Section 1R05)

- Apparent Violation. The inspectors identified an apparent violation of License Condition 2.F, for accepting through analysis a degraded Thermo-Lag fire barrier assembly between the B Train Switchgear Room/Auxiliary Control Panel Room and the A Train Cable Spreading Room. This change adversely affected the ability to achieve and maintain safe shutdown in the event of a fire and, as such, required NRC approval. This issue was not assessed in accordance with the SDP but instead was assessed in accordance with guidance in Sections IV.A.1 through IV.A.4 and Section IV.B of the NRC’s Enforcement Policy.

  The issue was significant because the licensee’s change process for the fire protection program allowed this degraded condition to be accepted without NRC approval. (Section 1R05)

Report Details

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems

1R05 FIRE PROTECTION

(Closed) Unresolved Item 50-400/99-13-01: Adequacy of Thermo-Lag Fire Barrier to Meet Plant Licensing Basis Requirements

The licensee's approved fire protection program referenced in the Updated Final Safety Analysis Report (UFSAR) and Safety Evaluation Reports (SERs) required the fire area separation barriers to have a minimum fire resistance rating of three hours such that both redundant divisions or trains of safety-related systems are not subject to damage from a single fire. The licensee conducted Thermo-Lag barrier fire resistance tests in 1994 and 1995. The results of this testing were indeterminate to confirm the fire resistance capability of the barrier, based on standard fire test exposure. At one hour and 48 minutes the average allowable temperature rise limit of 250 Fahrenheit (°F) was exceeded. The Thermo-Lag fire barrier assembly which served as part of the fire area separation barrier between Fire Area 1-A-SWGR-B, the B Train Switchgear Room/Auxiliary Control Panel (ACP) Room, and Fire Area 1-A-CSR-A, the A Train Cable Spreading Room (CSR) failed to qualify as a 3-hour rated fire barrier enclosure.

The degraded fire barrier assembly fire resistance capability was less than the requirements established in the approved fire protection program. The 1-A-SWGR-B area had a detection system using ionization smoke detectors. No additional fire mitigating features, such as automatic suppression system coverage as required by Standard Review Plan, NUREG-0800, Section 9.5.1, Subsection 5, General Plant Guidelines, Safe Shutdown Capability, Position C.5.b.1, were provided for Fire Area 1-A-SWGR-B including the ACP room.

Both the B Train Switchgear Room/ACP Room and the A Train CSR contained severe in-situ fire combustible loadings adjacent to the Thermo-Lag fire barrier that exceeded 240,000 British Thermal Units (BTUs) per square foot. Should a severe fire in Fire Area 1-A-SWGR-B, occur that was of significant intensity and duration to breach the Thermo-Lag fire barrier assembly, certain redundant A train cables and their associated functions of safe shutdown systems (263 electrical cables) could be damaged or lost due to the same fire which failed the B train safe shutdown equipment and cables. The licensee had performed technical evaluations to justify the acceptability of the Thermo-Lag fire barrier in lieu of the fire resistance test results. This item was unresolved pending NRC review of the adequacy of the protection provided by the Thermo-Lag fire barrier assembly.

Region II requested the Office of Nuclear Reactor Regulation (NRR) to evaluate this issue in two Task Interface Agreements (TIAs),TIA 99-028 , ADAMS Accession Number ML003671052, dated November 23, 1999 and TIA 2000-16 ADAMS Accession No. ML003754169, dated September 25, 2000. NRR completed its review of the TIAs and documented their responses by memorandums dated August 1, 2000 (TIA 99-028, ADAMS Accession No. ML003736721), October 24, 2000 (TIA 2000-16, ADAMS

Accession No. ML003763138), and February 26, 2001 (TIA 2000-16 Supplemental, ADAMS Accession No. ML010570084). Additionally, the NRC technical staff met with CP&L on March 21, 2001, to discuss the technical elements of their fire tests and safety evaluations for these fire barriers (Meeting Summary, ADAMS Accession Nos. ML010930511, ML010930521, and ML010930544).

In response to a conference call with the NRC on May 10, 2001, the licensee submitted a letter dated August 21, 2001, Serial HNP-01-123 (ADAMS Accession No. ML012390055), which provided a technical evaluation that concluded the existing fire barrier assembly, when considering an air gap of one inch between the fire barrier and a cable tray, meets the intent of the 3-hour fire barrier design requirement. The NRC staff reviewed this submittal, but did not agree that this arrangement satisfied the design requirement for a 3-hour rated fire barrier assembly.

The results of the inspectors' review were as follows:

- 10 CFR 50.48 required that all operating nuclear power plants have a fire protection program that satisfies Criterion 3 of Appendix A to 10 CFR Part 50.

- Harris Operating License NFP-63, Condition 2.F, "Fire Protection Program," specified, in part, that Carolina Power and Light (CP&L) implement and maintain in effect all provisions of the approved fire protection program as described in the UFSAR for the facility as amended and as approved in the SER dated November 1983 (and Supplements 1 through 4), and the Safety Evaluation dated January 12, 1987.

- Harris UFSAR Section 9.5.1.2.2, "Barriers and Access," stated that fire barriers with a minimum fire resistance rating of three hours were provided such that both redundant divisions or trains of safety-related systems were not subject to damage from a single fire to the extent possible in accordance with NRC position C.5.b.(2) of BTP Chemical Engineering Branch (CMEB) 9.5-1 (NUREG-0800), July 1981.

- Harris UFSAR Section 9.5.1.2.2 and Section 9.5.1.4 of the SER dated November 1983, identified the Thermo-Lag fire barrier assembly between the B Train Switchgear Room/ACP Room and the A Train CSR as a 3-hour rated fire barrier.

The Thermo-Lag fire barrier wall assembly, designed and installed during initial plant construction, which served as the fire area separation barrier between the B Train Switchgear Room/ACP Room and the A Train CSR, had an indeterminate fire resistance rating instead of three hours as originally designed. The fire resistance rating of three hours was referenced in the Harris UFSAR and the NRC SERs that established the approved fire protection program. This condition was identified during the licensee's independent laboratory testing conducted in 1994 and 1995 in response to the identified issues in NRC Bulletin 92-01, "Failure of Thermo-Lag 330 Fire Barrier Systems to Maintain Cabling in Wide Cable Trays and Small Conduits Free From Fire Damage."

The NRC concluded that this finding represented a failure to implement and maintain NRC approved fire protection program safe shutdown system separation requirements for the Thermo-Lag fire barrier assembly. The Thermo-Lag fire barrier assembly which serves as the fire area separation barrier between Fire Area 1-A-SWGR-B and Fire Area 1-A-CSR-A has an indeterminate fire resistance rating instead of the required three hours established in the approved fire protection program. This unresolved item is considered an Apparent Violation (AV) of the fire protection program required by 10 CFR 50.48 and NRC Operating License NPF-63, Condition 2.F and is identified as AV 50-400/00-09-01, Failure to Maintain the Fire Area Separation Barrier Between the B Train Switchgear Room/Auxiliary Control Panel Room and the A Train Cable Spreading Room as a 3-hour Rated Barrier. This finding is preliminarily characterized as a White finding in accordance with the Fire Protection Significance Determination Process (SDP). The problem was entered into the licensee's corrective action program as NCR 00009049 (Closed) and NTM 00022745 (Open). The licensee has implemented compensatory measures in the areas affected by the degraded fire barrier.

Risk Determination

This issue affected the mitigation cornerstone due to the degradation of a fire protection defense-in-depth element, therefore it was assessed in accordance with the NRC Reactor Oversight Process's SDP as described in NRC Inspection Manual Chapter 0609, Appendix F (MC 0609 App. F). The assessment included a SDP Phase I screening, a Phase II evaluation, and a Phase III risk evaluation. The evaluations were performed by the Lead Inspector and a Region II Senior Reactor Analyst and considered the following:

Performance Deficiency - The Thermo-Lag fire barrier between the B Train Switchgear Room/ACP Room and the A Train CSR had an indeterminate fire resistance rating instead of three hours. This condition existed for greater than 30 days without compensatory measures. The performance deficiency is associated with Fire Area 1-A-SWGR-B. Fire Area 1-A-SWGR-B contains the B Train Switchgear Room and the ACP Room, therefore, safe shutdown of the plant for a fire in this area would be achieved from the main control room since the ACP is located in the fire affected area.

Fire Barrier - The Thermo-Lag fire barrier between the B Train Switchgear Room/ACP Room and the A Train CSR had an indeterminate rating but was assumed at one hour and 48 minutes based on licensee's test data. The area had no automatic suppression system. Due to its reduced fire resistance capacity, the barrier was assigned moderate degradation.

Fire Detection and Automatic Fire Suppression - Fire Area 1-A-SWGR-B area had a detection system using ionization smoke detectors. The 1-A-SWGR-B area had no fixed automatic suppression system.

Fire Scenario - Fire Area 1-A-SWGR-B contained a severe fire combustible loading adjacent to the Thermo-Lag fire barrier assembly that exceeded 240,000 BTUs per square foot. The primary combustibles in the B Train Switchgear Room and ACP Room are electrical cables located above numerous potential ignition sources. Fire Area 1-A-

SWGR-B area had a detection system. The 1-A-SWGR-B area had no fixed automatic suppression system. Without prompt automatic fire suppression, hazardous conditions during a fire are expected to occur in a relatively short period of time. The as-constructed fire barrier had an indeterminate rating. A severe fire in Fire Area 1-A-SWGR-B would challenge the Thermo-Lag fire barrier between the B Train Switchgear Room/ ACP area and the A Train CSR area containing Train A cables. This severe fire could cause failure of the barrier and result in damage to 263 electrical cables. Some of the cables affected functions necessary to mitigate core damage. Equipment affected included the following: motor driven auxiliary feedwater (AFW) train A, the turbine driven AFW train, the A and C steam generator power operated relief valves (PORVs), A train switchgear room ventilation chilled water, boric acid transfer pump 1A and, the A train containment H_2 analyzer. Also, a large number of valve/ventilation damper position indications and process parameter indications would be lost including pressurizer level, steam generator (SG) narrow range level and reactor coolant system (RCS) hot leg temperature. A fire beginning in the A Train CSR and challenging the Thermo-Lag wall was not evaluated under SDP Phase 2.

<u>Manual Fire Fighting Effectiveness</u> - The B Train Switchgear Room/ACP Room area had a detection system using ionization smoke detectors. The detection system would provide fire alarm conditions in the Main Control Room (MCR) to notify the fire brigade for fire-fighting response. Based on several condition reports written concerning fire brigade performance, adequacy and use of fire pre-plans, and observations by NRC inspectors of fire brigade drills, fire brigade manual fire suppression was assigned moderate degradation.

The inspectors used the qualitative assessment guidance and degradation categorization criteria established in Attachment 2 of Inspection Manual Chapter 0609, Appendix F in assigning this rating. As documented in NRC Inspection Report 50-400/99-13, the inspectors observed during the review of selected Harris Nuclear Assessment Section (HNAS) assessment reports that a number of issues had been identified concerning fire brigade drill performance deficiencies and the quality and use of pre-fire plans. Licensee audit H-FP-97-01 dated January 29, 1997, stated in part that, “There is a need for more aggressive training/drill schedule for fire brigade members. Performance of the fire brigade during recent drills has demonstrated deficiencies which could reduce their effectiveness in a real fire emergency.” Another licensee audit H-FP-98-01 dated January 29, 1998, stated in part that, “Fire pre-plans relied upon by the fire brigade to aid in fire fighting and in protecting safe shutdown equipment are not being maintained current and are cumbersome to use.” This weakness was upgraded to an issue in audit H-FP-98-02, dated January 29, 1999. The reason for the upgrade was the failure of the fire brigade to use fire pre-plans during a December 1998 fire drill and the lack of sufficient action in revising the fire pre-plans.

Also, during an unannounced fire brigade drill observed by NRC, and conducted on November 3, 1999, in the B Train Switchgear Room/ACP Room (Fire Area 1-A-SWGR-B), a fire fighting pre-fire plan, FPP-012-02-RAB, area of improvement was identified. The fire preplan drawing did not identify the availability of fire hose stations in the turbine building to stage for use when accessing the switchgear rooms. NRC Inspection Report

50-400/99-05 documented that no fire drills were scheduled in the switchgear rooms, and no fire drill had been conducted in these areas for at least seven years.

Fire Ignition Frequency - The inspectors review of the Harris Individual Plant Evaluation of External Events (IPEEE) identified the ignition frequencies for the specific fire area, zone, or room of concern (see IPEEE pages 4-28 through 4-33). These frequencies are summarized below:

6.2E-3/yr. The ignition frequency for fixed fire sources that could propagate into a fire that would challenge the Thermo-Lag wall.

6.3E-7/yr. The ignition frequency for transient combustible induced fires. This assumed a survey for transient combustibles in the B Train Switchgear Room twice daily. Derived from ➜1.41E-4 (Probability transient combustibles ignite) * 4.5E-3 (Probability of the presence of transient combustibles) = 6.3E-7/yr.

1.3E-7/yr. The ignition frequency for welding & cutting induced fires. Derived from ➜1.3E-5 Ignition Source Data Sheet (ISDS) * 1E-2 (ISDS weighting factor)

6.2E-3/yr. Total Ignition Frequency < generic switchgear room ignition frequency

Fire Mitigation Frequency (FMF)

FMF = IF + FB + MS + AS + CC (when appropriate)

where, IF = Fire Ignition Frequency
= -2.2 (log of 6.2E-3)

FB = Fire Barrier
= -1.25, (for moderate degradation, three hour rated fire barrier with an assumed fire resistance of between one hour and two hours)

AS = Automatic Suppression/Detection
= 0, (for no automatic suppression in the fire area)

MS = Manual Fire Fighting Effectiveness
= -0.5, (for moderate degradation, for non-control room fire area, based upon NRC observation of fire brigade drills and degraded fire brigade performance documented in condition reports and licensee's fire protection program audits)

CC = Dependencies/Common Cause Contribution
= 0, (for no conditional dependancy adjustments for this concern)

FMF = (-2.2) + (-1.25) + (0) + (-0.5) + (0) = -3.95

Based on the length of time the condition existed (greater than 30 days) and the fire mitigation frequency of 1 per 10^3 to 10^4 years, the estimated likelihood for the initiating event occurrence during the degraded time period was rated D.

The inspection finding was assessed using the reactor trip (TRANSIENT) and Loss of Offsite Power (LOOP) initiating event SDP worksheets. For the TRANSIENT case the assessment assumed that the resulting reactor trip is successful (due to the fire) and initially makes the reactor sub-critical. There are multiple reasons to assume the reactor trip was successful including: de-energizing power to the B side reactor trip breakers, loss of main feedwater (FW), closure of the main steam isolation valves (MSIVs), loss of power to two reactor coolant pumps, etc. For the TRANSIENT worksheet it was assumed that all B train power was unavailable and that a LOOP did not ensue.

It was uncertain whether the A train portion of the fast bus transfer circuit would work following the reactor trip. Therefore, the LOOP worksheet was completed. For the LOOP worksheet a fire in SWGR RM B causes an incomplete transfer of offsite power between the unit auxiliary transformer (UAT) and the station auxiliary transformer (SAT). This would result in a loss of power to all alternating current (AC) powered equipment (safety related and non-safety related), except those safety related components powered by Emergency Diesel Generator (EDG) 1A-SA. Also, all train B direct current (DC) powered equipment would lose power. For this analysis this was assumed to be a non-recoverable LOOP.

For the TRANSIENT case, no spurious actuations were assumed and credit was given for operator action recovery of high pressure recirculation, auxiliary feedwater, high pressure injection, and feed and bleed. The TRANSIENT case resulted in multiple (>2) GREEN findings adjacent to WHITE. This would yield a WHITE finding.

For the LOOP case, no spurious actuations were assumed and credit was given for operator action recovery for high pressure recirculation, auxiliary feedwater, and high pressure injection. Emergency AC Power (EAC) operator recovery was not credited. The LOOP cases resulted in two independent WHITE findings and multiple (>2) GREEN findings adjacent to WHITE. This would yield a WHITE finding in the Phase II SDP.

Manual Chapter 0609 Appendix F, “Fire Protection Significance Determination Process,” states that for those cases where Phase II method determines that the inspection findings have potential risk significance, a more refined Phase III risk evaluation can be performed.

Therefore, this performance deficiency was evaluated under a Phase III risk evaluation. This evaluation is summarized in the attachment to this report. In terms of equipment lost and LOSP considerations, the Phase III risk evaluation is consistent with the Phase II analysis. The main difference between the Phase III risk evaluation and the Phase II review is in the derivation of the fire frequencies which will cause loss of fire confinement (challenges Thermo-Lag fire barrier). The Phase III risk evaluation determined that the change in core damage frequency (CDF) due to the performance deficiency is 1E-6. Based on this information, the inspectors concluded that this issue was within the increased regulatory response band (WHITE).

(Closed) Unresolved Item 50-400/99-13-02: Adequacy of the 10 CFR 50.59 for Changes Made to the UFSAR to Revise the Fire Rating of Selected Thermo-Lag Fire Barriers

The licensee's approved fire protection program referenced in the Updated Final Safety Analysis Report (UFSAR) and Safety Evaluation Reports (SERs) required the plant's fire area separation barriers to have a minimum fire resistance rating of three hours such that both redundant divisions or trains of safety-related systems are not subject to damage from a single fire. On August 18, 1997, in 10 CFR 50.59 Safety Evaluation 97-255 for ESR 95-00620 the licensee changed the approved fire protection program by accepting the condition of a degraded Thermo-Lag fire area separation barrier between the B Train Switchgear Room/ACP Room and the A Train CSR. To justify the acceptability of the Thermo-Lag fire barrier in lieu of the fire resistance test results, the licensee performed, in addition to Safety Evaluation 97-255, an additional technical evaluation, HNP-M/MECH-1065, which was transmitted to the NRC in a letter dated August 21, 2001. These evaluations were performed to support the position that the fire barrier configurations meet the intent of the 3-hour fire barrier design requirements. These evaluations concluded that the protection provided by the Thermo-Lag fire barrier will ensure the plant's ability to achieve and maintain safe shutdown conditions under postulated fire scenarios.

During this inspection period, the inspectors consulted through TIA memorandums dated August 1, 2000 (TIA 99-028, ADAMS Accession No. ML003736721); October 24, 2000 (TIA 2000-16, ADAMS Accession No. ML003763138); and, February 26, 2001 (TIA 2000-16 Supplemental, ADAMS Accession No. ML010570084) with the fire protection technical staff in the NRC's Office of Nuclear Reactor Regulation. Subsequently, the NRC technical staff met with CP&L on March 21, 2001, to discuss the technical elements of their fire tests and safety evaluations for these fire barriers (Meeting Summary, ADAMS Accession Nos. ML010930511, ML010930521, and ML010930544). Additionally, in response to a conference call with the NRC on May 10, 2001, the licensee submitted a letter dated August 21, 2001, Serial HNP-01-123, (ADAMS Accession No. ML012390055) which provided a technical evaluation that concluded that the existing fire barrier assembly, when considering an air gap of one inch between the fire barrier surface and a cable tray, meets the intent of the 3-hour fire barrier design requirement. This was based on the licensee's fire test data and analysis of an anticipated temperature increase of the surface of a cable tray located with a minimum one inch air gap between the unexposed surface of the fire barrier and the side rail of a cable tray.

Based on the above documentation, the NRC staff concluded: (1) The licensee had not clearly demonstrated that the as-installed Thermo-Lag fire barriers were adequate to withstand the hazards associated with the area(s) to protect important equipment from fire damage; (2) The 1-hour Thermo-Lag fire barrier assembly fire tests satisfied the acceptance criteria specified in Supplement 1 to Generic Letter (GL) 86-10 for a wall assembly to achieve a 1-hour fire resistance rating to meet NRC fire protection requirements; (3) The 3-hour Thermo-Lag fire barrier assembly fire tests did not satisfy the acceptance criteria specified in Supplement 1 to GL 86-10 to achieve a three-hour fire resistance rating, and therefore should not be used as the basis for determining the adequacy of the fire barriers for satisfying NRC fire protection requirements; (4) The licensee's technical evaluations did not provide the NRC staff with an adequate technical basis on which to conclude that the existing fire barrier assembly, when considering an air gap of one inch between the fire barrier and a cable tray, meets the intent of the 3-hour fire barrier design requirement since the evaluation approach was not in accordance with the established test protocol and acceptance criteria for fire barriers as specified in National Fire Protection Association (NFPA) 251, Standard Methods of Fire Tests of Building Construction, and modified by the NRC staff in Supplement 1 to GL 86-10; and, (5) The licensee's technical evaluations did not provide the staff with an adequate technical basis on which to conclude that the change to the approved fire protection program (current licensing basis of a 3-hour rating to a rating that was "adequate" for the hazard) would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire as required by the plant's fire protection license condition.

License Condition 2.F to the Shearon Harris Operating License NPF-63 states, in part, "The licensee may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire."

On August 18, 1997, in Safety Evaluation 97-255, the licensee made changes to the approved fire protection program without prior Commission approval, that adversely affected the ability to achieve and maintain safe shutdown in the event of a fire. Specifically, in Safety Evaluation 97-255, the licensee accepted the condition of a degraded Thermo-Lag fire barrier assembly between the B Train Switchgear Room/ACP Room and the A Train CSR in lieu of the intended 3-hour fire rating. The 1-A-SWGR-B area had a detection system using ionization smoke detectors. No additional fire mitigating features such as an automatic suppression system as required by Standard Review Plan, NUREG-0800, Section 9.5.1, General Plant Guidelines, Safe Shutdown Capability, Position C.5.b.1 were provided for the fire area considered.

The change adversely affected the ability to achieve and maintain safe shutdown in the event of a fire, in that, the licensee went from full compliance with the fire protection safe shutdown system separation criteria to less than full compliance which increased the likelihood that both redundant divisions or trains of safety-related systems could be damaged by a single fire. Therefore, this change to the fire protection program could adversely affect the ability to achieve and maintain safe shutdown in the event of a fire and prior NRC approval was required. Failure to obtain NRC approval prior to implementing this change constitutes an apparent violation of License Condition 2.F. This apparent violation was not evaluated under the SDP because it appeared to have impacted the NRC's ability for oversight of licensed activities and, as such, was evaluated in accordance with guidance in Sections IV.A.1 through IV.A.4 and Section IV.B of the NRC's Enforcement Policy. This apparent violation is identified as AV 50-400/00-09-02, Failure to Obtain NRC Approval Prior to Implementing a Change to the Approved Fire Protection Program.

4. OTHER ACTIVITIES

4OA5 Management Meetings

.1 Exit Meeting Summary

The inspection results were presented by telephone to Mr. J. Scarola, Harris Site Vice President and other members of licensee management at the conclusion of the inspection on December 12, 2001. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

D. Alexander, Nuclear Assessment Manager
C. Burton, Site Operations Director,
J. Caves, Licensing Supervisor
R. Field, Regulatory Affairs Manager
W. Gregory, Operations Fire Protection Program Analyst
S. Hardy, Harris Engineering Support Services Principal Analyst
S. Laur, PSA Supervisor
D. McAfee, Fire Protection Program Manager
E. McCartney, Technical Services Superintendent
J. Scarola, Harris Plant Vice President
M. Wallace, Harris Senior Analyst - Licensing

NRC

J. Brady, Senior Resident Inspector, Harris
C. Payne, Team Leader, Engineering Branch 1, Division of Reactor Safety

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-400/00-09-01	AV	Failure to Maintain the Fire Area Separation Barrier Between The B Train Switchgear Room/Auxiliary Control Panel Room and the A Train Cable Spreading Room as a 3-hour Rated Barrier (Section 1R05)
50-400/00-09-02	AV	Failure to Obtain NRC Approval Prior to Implementing a Change to the Approved Fire Protection Program (Section 1R05)

Previous Items Closed

50-400/99-13-01	URI	Adequacy of Thermo-Lag Fire Barrier to Meet Plant Licensing Basis Requirements (Section 1R05)
50-400/99-13-02	URI	Adequacy of the 10 CFR50.59 for Changes Made to the UFSAR to Revise the Fire Rating of Selected Thermo-Lag Fire Barriers (Section 1R05)

SIGNIFICANCE DETERMINATION PROCESS PHASE III EVALUATION

Performance Deficiency The Thermo-Lag fire barrier between the B Train Switchgear Room/Auxiliary Control Panel (ACP) Room and the A Train Cable Spreading Room (CSR) had an indeterminate fire resistance rating instead of three hours. This Thermo-Lag fire barrier wall assembly was installed during initial plant construction. Therefore, this condition existed for greater than one year without compensatory measures.

Overview of Analysis The risk significance of this performance deficiency is determined by establishing the ignition frequency of a fire that would challenge the fire barrier. Then, the conditional core damage probability (CCDP), assuming the barrier was breached and the cables/functions on the other side of the wall failed, will be established versus the barrier is not breached. The product of the ignition frequency and the CCDP is the core damage frequency (CDF). The difference between the CDF assuming a degraded barrier and assuming the barrier did not fail will be the change in the CDF. Based upon the change in CDF a color consistent with NRC Inspection Manual Chapter 0609 will be recommended.

Determination of Fire Ignition Frequency with a Degraded Thermo-Lag Barrier

The licensee's Individual Plant External Event Evaluation (IPEEE) Ignition Source Data Sheet established the compartment fire frequency as 1.26E-2 per year. The three dominant ignition sources and their frequencies of occurrence were:

Electrical cabinets @	7.50E-3/yr
Transformers @	3.29E-3/yr
Battery chargers @	1.00E-3/yr

The other ignition sources are at least a magnitude less likely to occur and are omitted from further evaluation. The licensee's IPEEE did not consider battery chargers capable of developing into compartment fires that would challenge the Thermo-Lag barrier. This ignition source is omitted from further evaluation. Also, all cabinet or transformer fires are not capable of developing into full compartment fires that would challenge the Thermo-Lag barrier. To address this situation a severity factor (a fractional value between 0 and 1) is used to estimate the percentage of fires that could become full compartment fires. In the absence of plant-specific information, the severity factors for the electrical cabinets, and transformers were based on the Electric Power Research Institute Fire Probabilistic Risk Assessment Implementation Guide (FPRAIG), December 1995 (Section D.3). The FPRAIG severity factors ranged from 0.08 to 0.2, and engineering judgment was used to determine these severity factors. These severity factors account for prompt detection and fire suppression or control using local fire extinguishers by operators investigating the scene. Applying the severity factors from the FPRAIG, the portion of the dominant fires that could cause compartment loss is:

Electrical cabinets @	7.50E-3/yr * .12 =	9.00E-4/yr
Transformers @	3.29E-3/yr * .10 =	3.29E-4/yr
Total		1.23E-3/yr

The Thermo-Lag wall in its degraded condition would afford some protection of the cables/functions on the other side of the wall. Therefore, the 1.23E-3 ignition frequency is modified to account for the degradation. A factor of -1.25 for a moderately degraded fire barrier is selected from Table 5.1 "Quantification of Degradation Ratings of the Individual Defense In Depth Elements," of Manual Chapter 0609, Appendix F. This -1.25 penalty is transferred into a failure probability of .056.

1.23E-3/yr * 10exp(-1.25) = 1.23E-3/yr * .056 = 6.89E-5/yr

Therefore, 6.89E-5/yr is established as the ignition frequency of compartment fires challenging the functions protected by the degraded Thermo-Lag wall.

Determination of Fire Ignition Frequency without a Degraded Thermo-Lag Barrier

The ignition frequency for just a compartment fire without a degraded Thermo-Lag wall would be:

1.23E-3/yr * 10exp(-3) = 1.23E-3/yr * .001 = 1.23E-6/yr

A factor of -3 for a fire barrier in its normal operating state is applied from Table 5.1 "Quantification of Degradation Ratings of the Individual DID Elements," of Manual Chapter 0609, Appendix F. This -3 is transferred into a failure probability of .001 and applied to the ignition frequency.

Conditional Core Damage Probability (CCDP) Development A severe fire could cause the barrier to fail resulting in damage to 263 electrical cables. Some of the cables affect functions necessary to mitigate core damage. Given that the fire fails all the Train B equipment (loss of the B Train Switchgear Room) and fails the Thermo-Lag wall, a CCDP can be developed using a specially developed event tree with the results presented in a tabular form worksheet (similar to Phase II worksheets). The assumptions used to establish the functions affected, the possibility that spurious actuations could have a significant impact on the functions involved and the possibility of recovering lost functions will be determined. (The same nomenclature used in Phase II worksheets will be used for the critical functions involved in the possible dominant accident sequences)

Assumptions Used in Determining the Affected Functions

1. Due to the lack of a credible fire initiator in the CSR (only cables are in the room), a fire beginning in the A Division CSR and challenging the Thermo-Lag wall is not being evaluated.

2. The resulting reactor trip is successful (due to the fire) and initially makes the reactor sub-critical. There are multiple reasons for the trip including de-energizing power to the B side reactor trip breakers, loss of Main Feedwater, closure of the Main Steam Isolation Valves (MSIVs) and, loss of power to two Reactor Coolant Pumps (RCPs).

3. It is uncertain whether the A Division portion of the fast bus transfer circuit works following the reactor trip. Therefore, a specially developed event tree and worksheet (Division B Fire & Possible LOSP), taking into account the time dependency associated with the Thermo-Lag wall failing at approximately two hours after fire initiation will be developed.

   a. When loss of offsite power (LOSP) is considered it is because a fire in Switchgear Room B (SWGR RM B) causes an incomplete transfer of offsite power between the Unit Auxiliary Transformer and the Station Auxiliary Transformer. This results in a loss of power to all alternating current (AC) powered equipment (safety related and non-safety related), except those safety related components powered by emergency diesel generator (EDG) 1B-SA. Also, all Train B direct current (DC) powered equipment loses power. Based upon a review by the NRC's Senior Resident Inspector, offsite power recovery is credible and will be included in the modified worksheet.

   b. When a fire in SWGR RM B does not result in LOSP, it will cause a reactor trip & a loss of power to nonsafety-related 6.9 kilovolt (KV) Buses 1B, 1C, & 1E; 6.9 KV safety-related Bus 1B-SB (normal & emergency power sources) and all buses/motor control centers fed from 1B-SB, 1B, 1C & 1E. Also, all Train B DC powered equipment eventually loses power.

4. Whether the fire causes a LOSP or not, is immaterial for a number of functions. The loss of the safety related B power (AC & DC) division and the balance of plant cables within SWGR RM B causes a failure of Main Feedwater to all three steam generators (SGs) when their respective Feed Water Isolation Valves, Flow Control Valves (FCVs) and bypass valves' B side solenoids de-energize, thereby closing the valves. Therefore, the power conversion system (PCS) function is lost and not recoverable. The loss of power to the B side MSIV solenoids causes the MSIVs on all SGs to close. Therefore, only the atmospheric dump valves (ADVs) for SGs A & C (ADV to SG B loses power) of the condensate (CD) function would be available. The breakers powering the B train Low Pressure Safety Injection (LPSI) pump, B train charging/safety injection pump (CSIP), B train emergency diesel generator (EDG) output breaker and B train motor driven auxiliary feedwater (MDAFW) pump are in SWGR RM B (along with these trains' valves & interlocks). The breakers for critical train B support system component cooling water (CCW), chilled water, EDG ventilation and emergency service water (ESW) prime movers (pumps or fans) are contained in SWGR RM B. Therefore, all of these trains fail and can not be recovered. The turbine driven AFW train is lost through the loss of DC power to the control system. Also, the FCVs for the turbine driven AFW pump fail open to all three SGs and the steam supply to the turbine from SG C stays closed. Two of the three reactor coolant system (RCS) power operated relief valve (PORV) block valves fail "as is" which is normally open at this facility and power to one of the three RCS PORVs fail close.

   The trains (associated with the Special Event Tree Risk Determination Worksheet) lost exclusively due to a fire in SWGR RM B are:

⇨ B Train MDAFW pump, suction valves from Condensate Storage Tank & ESW, discharge valves to SGs [AFW]

⇨ B Train CSIPs, suction valves from the Volume Control Tank, LPSI pump and Refueling Water Storage Tank & discharge valves to the reactor vessel [Early Injection High Pressure (EIHP), High Pressure Recirculation (HPR)]

⇨ B Train LPSI pumps, suction & discharge valves from the Refueling Water Storage Tank and the containment sump [support train to HPR]

⇨ B Train CCW [a support train to HPR]

⇨ B Train ESW [a support train to HPR, EIHP, AFW]

⇨ Turbine Driven AFW [AFW]

⇨ B Train EDG [Emergency Alternating Current (EAC)]

Therefore, these functions are assumed to always be failed on specially developed event tree and worksheet (Division B Fire & Possible LOSP).

5. With alarm/confirmation of an evolving fire in SWGR RM B, Abnormal Operating Procedure (AOP) - 36 will be entered and executed as written. Operator errors possible due to the process variable indications that operators routinely rely upon that fail while using AOP-36 are not being evaluated. Therefore, following the reactor trip, the primary side of the plant responds consistently with natural circulation conditions. CSIP A provides RCS inventory control since there is no stuck open RCS PORV or RCP seal Loss of Coolant Accident (RCP thermal barrier cooling via CCW train A and seal injection via A CSIP is available). Any additional reactivity controls are provided by train A Boron Injection or gravity flow Emergency Boration. Secondary side heat removal is via the A MDAFW train with secondary system pressure control via the A & C ADVs or the safety relief valves on all three steam loops.

6. Spurious actuations, exclusively due to the fire in SWGR RM B, are possible. Since AOP- 36 specifically directs operator actions inside and outside the control room to recover from these spurious actuations, prevention of the spurious actuation from affecting operator response or recovery from spurious actuations is reasonable. Therefore, due to prescribed procedure actions or operator recovery capabilities, a penalty for spurious actuations is not applied.

7. At one hour and 48 minutes after the reactor trip the Thermo-Lag wall fails allowing the fire in the B SWGR RM to damage **all** the cables in the CSR adjacent to the ACP RM (part of the A Division cables). The Division A cables damaged in the CSR adjacent to the ACP Rm that affect a significance determination process (SDP) function (core damage mitigation function) are stated below along with the affected SDP function:

- ⇨ cables 11481B, 11834C, 11921N, 11944H, 11945F, 11946F, 11957A, 11957G, 12092A - Train A MDAFW [AFW]

- ⇨ cables 12092A, 11975P, 11975H, 11957G - Turbine Driven AFW [AFW]

- ⇨ cables 11254C, 11254N, 11256C, 11834C - SG PORVs [ADV portion of CD]

- ⇨ cables 12629P, 13030A - Train A CSIP, EDG A, LPSI A, ESW A, CCW A & AFW due to loss of support system function - heat ventilation & air conditioning for SWGR RM A [DIV PWR]

8. The only heating ventilation and air conditioning systems needed to support equipment functions are the ventilation systems associated with the Charging Pump Rooms (Reference IPE submittal page 3-13), the EDG Rooms (Reference IPE submittal page 3-13) and SWGR RM A. Needing SWGR RM A ventilation is due to the additional heat input from the SWGR RM B fire.

9. The composite loss of SDP functions due to fire in SWGR RM B and the CSR are:

   - ⇨ AFW
   - ⇨ PCS
   - ⇨ EIHP
   - ⇨ HPR
   - ⇨ EAC
   - ⇨ DIV PWR

   These are the functions assumed to fail when evaluating the risk significance of the performance deficiency when using the specially developed event tree and worksheet (Division B Fire & Possible LOSP). Also, these are the functions to be evaluated to determine whether recovery credit can be applied.

10. Once the Division A CSR cables fail, all core cooling methods will eventually be lost, unless operators take recovery actions.

11. Only in a very limited sense (subjectively under recovery considerations) are the collective process variable indication failures being considered. Without extensive analysis, it is beyond the risk evaluator’s capability to ascertain an operating crew’s response to such failures. The licensee indicated that success paths exist to derive the actual condition of the plant. Examples include loss of all Pressurizer level, wide range B SG pressure, and hot leg RCS temperature. It is assumed that those success paths are universally understood by operators and would be used [acts of commission are not considered] .

12. The Thermo-Lag fire barrier between the B Train Switchgear Room/ACP Room and the A Train CSR had an indeterminate fire resistance rating but was assumed at one hour and 48 minutes based on licensee’s test data.

Recovery Considerations

1. With the damage to the cables in the A CSR the instructions of AOP-36 will not provide enough direction to mitigate the event. Given the extensive operator training on Emergency Operating Procedures (EOPs), it is assumed that the licensed operators will decide to transition to the EOPs for loss of heat sink once AFW fails. The applicable EOP directs recovery of AFW until certain criteria is met to initiate feed & bleed (F&B). Instrument failures could result in operators determining that the F&B criteria is immediately met at the onset of damage to the Division A CSR cables. However, once F&B is initiated the EOP directs recovery of AFW. Therefore, no matter which way operators decide, the EOP will direct AFW recovery and F&B.

2. AFW - There are substantial distractions to choosing to recover any train of AFW versus initiating once thru cooling. However, there is procedure direction and adequate time available (estimation around two hours - one hour to figure out how to recover and to perform the actions) to recover a train and still prevent core uncovery. Determining how to recover the MDAFW pump would be moderately complex requiring some thought and co-ordination. The physical effort of recovery will involve taking control of the FCV(s), re-establishing power to the MDAFW and transferring the suction source to ESW. Once in operation the correct indications would need to be viewed to keep the train in service. Also, as part of the actions of AOP-36 (prior to Thermo-Lag wall failure) all engineered safety features are disabled. Therefore, secondary side heat removal is totally based upon operator actions. Licensed operators are routinely trained to evaluate unexpected situations and would have a high degree of training in recognizing the success path. Also, there is some direction in the EOPs, Alarm Response Procedures and Operating Procedures that would help diagnose the situation. Execution of such a recovery effort would be within operator capabilities. Consequently, recovery is assumed for AFW as RECOVERY OF FAILED TRAIN.

3. PCS - Hi Hi SG signal precludes recovery

4. DIV PWR & EIHP - Some diagnosis would be necessary to determine the high temperature in SWGR RM A was due to the chiller interlock and the failed damper. However, the high temperature condition is assumed to occur over hours thus increasing the operator response time. Also, it is assumed that the position indication and alarms on the MCB would alert the control operator to the problem. Recovery is a relatively simple operator action outside the control room using procedures OP-172, step 5.6 and OMM-004. Therefore, recovery is credited as an OPERATOR ACTION. Due to the Note at the bottom of the Risk Estimation Worksheet, use of the spare CSIP is not considered credible.

5. DIV PWR & HPR - Some diagnosis would be necessary to determine the high temperature in SWGR RM A was due to the chiller interlock. However, the high temperature condition is assumed to occur over hours thus increasing the operator response time. Also, it is assumed that the position indication and alarms on the MCB would alert the control operator to the problem. Recovery is a relatively simple operator

action outside the control room using procedure OP-172, step 5.6 (Refer to Attachment 1). Therefore, recovery is credited as an OPERATOR ACTION.

6. EAC - Before the high temperature in SWGR RM A affected EDG A operation (output breaker controls, bus lockout relays, ventilation support system breaker controls, or breaker co-ordination relaying tripping power to the EDG components), recovery consistent with the discussion on DIV PWR, EIHP and HPR function is applicable. Therefore, recovery is credited as an OPERATOR ACTION.

7. It must be recognized that DIV PWR, HPR, EAC and EHIP recovery require the same operator recovery actions and recovery credit can only be applied once when the there are multiple functional failures being simultaneously recovered by a single recovery action.

Integrating Functions into the Risk Estimation Worksheet Assuming Barrier Failure

Applying the considerations above, into the Risk Estimation Worksheet that was developed from the special event tree for this performance deficiency:

RISK ESTIMATION WORKSHEET FROM SPECIAL EVENT TREE - Division B Fire & Possible LOSP

Safety Functions Needed:	*Full* Creditable Mitigation Capability for each Safety Function:
Secondary Heat Removal (AFW)	1 / 2 MDAFW trains (1 multi-train system) or 1 TDAFW train (1 ASD train)[1]
Early Inv., High Pressure Injection (EIHP)	1 / 2 CSIPs (1 multi-train system)[2]
Primary Heat Removal, Feed/Bleed (FB)	1 / 3 PORVs or 1 / 3 SRVs open for Feed/Bleed (operator action)
High Pressure Recirc (HPR)	1 / 2 CSIPs with 1 / 2 RHR pumps and with operator action for switchover (operator action)
Recovery of AC Power in < 2 hrs (REC)	SBO procedures implemented (operator action under high stress)[3]
Emergency AC Power (EAC)	1 / 2 Emergency Diesel Generators (1 multi-train system)
Essential Bus Power (DIV PWR)	1 / 2 Essential Buses remains in service (1 highly reliable multi-train system)[4]

Circle Affected Functions	Recovery of Failed Train	*Possible Spurious Actuations*	*Remaining* Mitigation Capability Rating for Each Affected Sequence	Final Sequence Number
1 FIRE - **DIV PWR** (2)	Div Pwr - yes	no	2 (Recovery of Division A Ventilation maintaining Division Essential Bus in service - operator action) = 2	2
2 FIRE - **AFW** -HPR (4)	AFW - yes	no	1 (AFW failed train recovery) + 2 (Operator Action) = 3	3
3 FIRE - **AFW** - FB (5)	AFW - yes	no	1 (AFW failed train recovery) + 2 (Operator Action) = 3	3
4 FIRE - **AFW** - EIHP (6)	AFW - yes	no	1 (AFW failed train recovery) + 2 (Single Train) = 3	3
5 FIRE - **AFW** - **DIV PWR** (7)	AFW - yes Div Pwr- yes	no	1 (AFW failed train recovery) + 2 (Recovery of Division A Ventilation maintaining Division Essential Bus in service - operator action) = 3	3
6 FIRE - **EAC** - REC (9)	EAC - yes	no	2 (Recovery of Division A Ventilation maintaining Division Essential Bus in service - operator action) + 1 (hi stress operator action) = 3	3

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event: SEE ATTACHED ANALYSIS ASSOCIATED WITH RECOVERY ACTIONS If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

(1) The value assessed by the IPE (Table 3-26, page 3-214, and Table 3-27, page 3-216) for the failure of the TDP of AFW is 1.8E-1 (assuming a mission time of 24 hours). For the SDP calculation, a value of 1E-1 can be used.

(2) The IPE (page 3-77) states that the spare pump can be connected to the B train within a few minutes, and this recovery action can be credited (operator action). However, connection to the A train will require up to eight hours to complete, and in most cases the injection is needed before this time; hence such recovery action cannot be credited in the models when only train A is available.

(3) The IPE's human action that is similar to "Recovery of AC Power in < 2 hrs (REC2)": is "Operator fails to locally align offsite AC (breaker fail-to-close, early)" (OPER-R15), and it has a human error probability equal to 1.0E-1.

(4) The IPE (page 3-18) states that failure rate for loss of an emergency bus is 2E-3. Therefore, a single bus is worth 3 points.

Ascertaining the CDF Assuming A Degraded Thermo-Lag Barrier by Merging the Fire Ignition Frequency with the CCDP As previously stated, the fire ignition frequency associated with the performance deficiency is 6.89E-5. Also, the "points" assigned in the Risk Estimation Worksheet can be converted to a failure probability. A two signifies a failure probability of 1E-2 and so on which constitutes the CCDP. The CDF associated with the performance deficiency is:

ACCIDENT SEQUENCE	FAILURE PROBABILITIES	CDF
FIRE - **DIV PWR**	6.89E-5 * 1E-2	6.89E-7
FIRE - **AFW** -HPR	6.89E-5 * 1E-3	6.89E-8
FIRE - **AFW** - FB	6.89E-5 * 1E-3	6.89E-8
FIRE - **AFW** - EIHP	6.89E-5 * 1E-3	6.89E-8
FIRE - **AFW** - **DIV PWR**	6.89E-5 * 1E-3	6.89E-8
FIRE - **EAC** - REC	6.89E-5 * 1E-3	6.89E-8
TOTAL CDF		1.04E-6/yr

Ascertaining the CDF Assuming No Degraded Thermo-Lag Barrier Using the special Risk Estimation Worksheet without any lost functions and converting the "points" into a failure probabilities establishes the CCDP. Applying this ignition frequency to the mitigating functions available provides a CDF of:

ACCIDENT SEQUENCE	FAILURE PROBABILITIES	CDF
FIRE - DIV PWR	1.23E-6 * 1E-2	1.23E-8
FIRE - AFW -HPR	1.23E-6 * 1E-1 * 1E-2	1.23E-9
FIRE - AFW - FB	1.23E-6 * 1E-1 * 1E-2	1.23E-9
FIRE - AFW - EIHP	1.23E-6 * 1E-1 * 1E-2	1.23E-9
FIRE - AFW - DIV PWR	1.23E-6 * 1E-1 * 1E-2	1.23E-9
FIRE - EAC - REC	1.23E-6 * 1E-2 * 1E-1	1.23E-9
TOTAL		1.85E-8/yr

Determining the CDF Change Subtracting the CDF with a degraded Thermo-Lag barrier from the CDF without a degraded barrier:

1.04E-6/yr - 1.85E-8/yr = 1.02E-6/yr or 1E-6/yr

SERP Evaluation The total change in CDF, due to the performance deficiency, is 1E-6. The key factors in this risk determination were the degradation factors assigned to the Thermo-Lag barrier, lack of an automatic fire suppression system throughout the area considered, and the limited credit for fire brigade performance when selecting the fire severity factors. The color associated with this magnitude of change in CDF is WHITE. Therefore, this finding is determined to be White issue.