OPEN REGULATORY CONFERENCE

SHEARON HARRIS NUCLEAR POWER PLANT

JANUARY 31, 2002
NRC REGION II OFFICE, ATLANTA, GA.

I. OPENING REMARKS, INTRODUCTIONS AND MEETING INTENT
Dr. Bruce Mallett, Acting Regional Administrator

II. NRC REGULATORY CONFERENCE POLICY
Chuck Casto, Director, Division of Reactor Safety

III. STATEMENT OF THE ISSUE WITH RISK PERSPECTIVES
Chuck Casto, Director, Division of Reactor Safety

IV. SUMMARY OF APPARENT VIOLATION
Chuck Casto, Director, Division of Reactor Safety

V. LICENSEE RISK PERSPECTIVE PRESENTATION

VI. LICENSEE RESPONSE TO APPARENT VIOLATION

VII. BREAK / NRC CAUCUS
Dr. Bruce Mallett, Acting Regional Administrator

VIII. CLOSING REMARKS
Dr. Bruce Mallett, Acting Regional Administrator

Tab 1

## Apparent Violation

10 CFR 50.48 requires 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 licensee failed to implement and maintain NRC approved fire protection program safe shutdown system separation requirements for the Thermo-Lag fire area separation barrier between the B Train Switchgear Room/ACP Room and the A Train CSR. The fire area separation barrier had an indeterminate fire resistance rating instead of three hours as referenced in the Harris UFSAR and the NRC SERs that established the approved fire protection program.

Note: The apparent violation discussed at this Regulatory Conference is subject to further review and subject to change prior to any resulting enforcement action.

(Tab7)

-OPEN PRE-DECISIONAL ENFORCEMENT CONFERENCE-

SHEARON HARRIS NUCLEAR POWER PLANT

JANUARY 31, 2002
NRC REGION II OFFICE, ATLANTA, GA.

I. OPENING REMARKS AND INTRODUCTIONS
B. Mallett, Acting Regional Administrator

II. NRC ENFORCEMENT POLICY
C. Evans, Enforcement Officer

III. SUMMARY OF THE ISSUE
B. Mallett, Acting Regional Administrator

IV. STATEMENT OF CONCERN/APPARENT VIOLATION
C. Casto, Director, Division of Reactor Safety

V. LICENSEE RESPONSE/PRESENTATION

VI. BREAK / NRC CAUCUS

VII. NRC FOLLOWUP QUESTIONS

VIII. CLOSING REMARKS
B. Mallett, Acting Regional Administrator

Tab 12

## Apparent Violation

**License Condition 2.F to the Shearon Harris Operating License NPF-63 states:**

**"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. 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 licensee made changes to FSAR Sections 9.5 and 9.5A revising the rating of the Thermo-Lag fire barrier assembly from 3-hour rated to that suitable for the hazard. 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.**

**Note: The apparent violation discussed at this Enforcement Conference is subject to further review and subject to change prior to any resulting enforcement action.**

Tab 17 [SLIDE]

# Harris Nuclear Plant

## Fire Protection Program
## Thermo-Lag Risk Analysis

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# Harris Plant Attendees

- Jim Scarola, Harris Plant Vice-President
- George Attarian, Engineering Manager
- Eric McCartney, Engineering Superintendent
- Dick Field, Regulatory Affairs Manager
- John Caves, Licensing Supervisor
- Kiang Zee, ERIN Engineering

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# Introduction

- Analysis approach
- Area description
- Fire event development
- Ignition sources
- Propagation probability
- Manual suppression capability
- Fire barrier capability
- Risk evaluation results

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# Analysis Approach

- The change in core damage frequency, CDF, is dependent on 5 key factors and can be expressed as:
- CDF = (IF) x (PP) x (MS) x (BD) x (SSD)
  - IF = Ignition frequency
  - PP = Propagation probability
  - MS = Manual suppression
  - BD = Barrier degradation
  - SSD= Safe shutdown equipment

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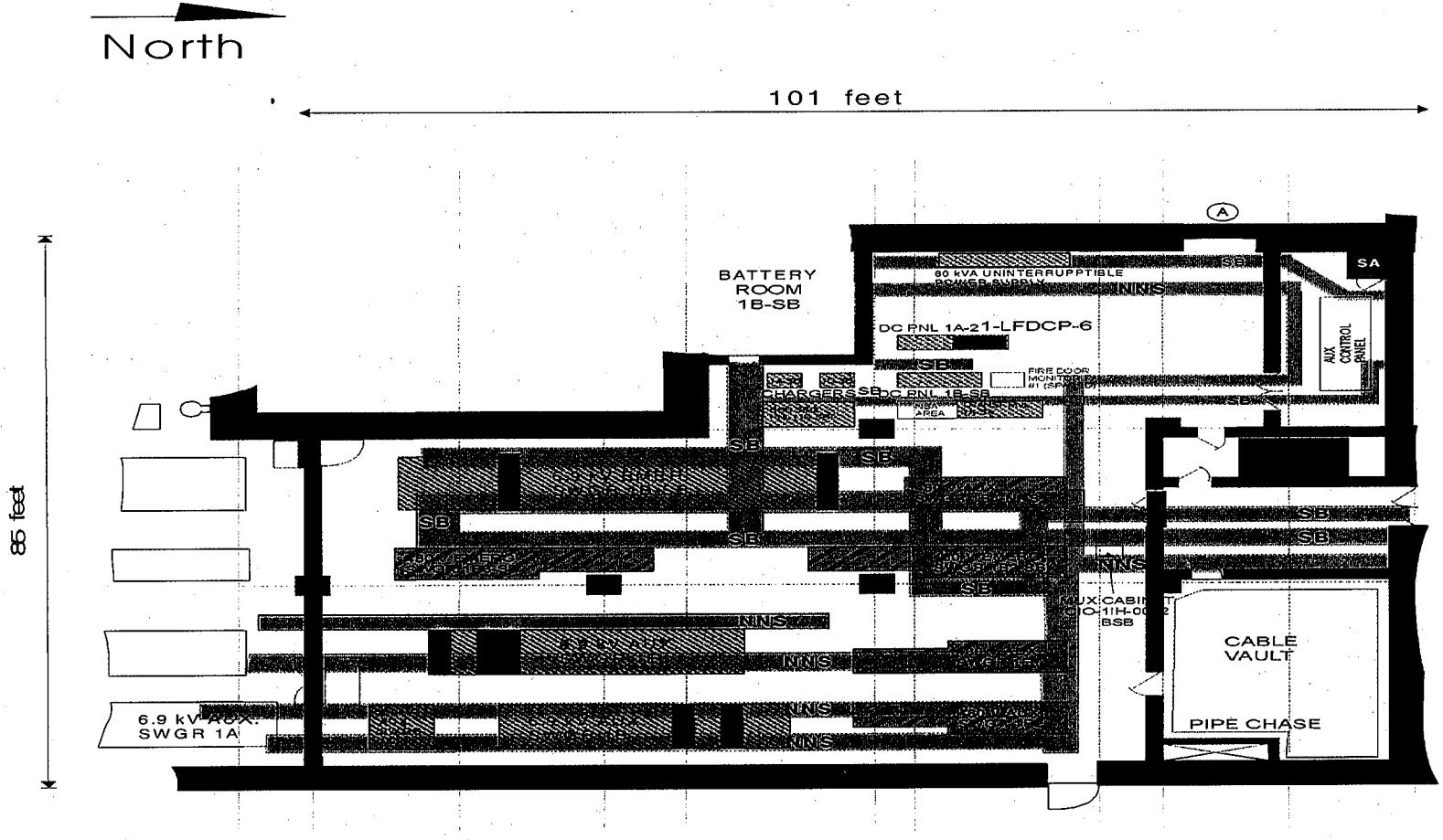
# Area Description



# Area Description

- 5700 $ft^2$ floor area, 91,300 $ft^3$ volume.
- Contains four 6.9 KV cabinets, five 480 VAC cabinets, battery chargers, UPS, and associated IEEE 383 cables.
- Automatic detection alarms in MCR and locally, no automatic suppression.
- 2 $CO_2$ type BC extinguishers.
- Hose racks located in adjacent rooms.

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# Fire Area

- Combustible loading as described in our Fire Hazards Analysis in the FSAR:
  - Cable insulation = 121,055 BTU/sq ft.
  - Permanent non-fixed = 1,478 BTU/sq ft.
  - Thermo-Lag = 1,897 BTU/sq ft.
  - Total = 124,430 BTU/sq ft.
- 1 hr barrier per 80,000 BTU/sq ft is the methodology we used to determine required barrier rating. This loading would result in a 1.6 hr barrier required.

# Credible Fire Event

- Consistent with the Staff's analysis, the Thermo-Lag barrier can only be challenged if a Hot Gas Layer develops and reaches the barrier.
  - Lack of ignition source next to the barrier.
  - Large distances between credible ignition sources and the Thermo-Lag barrier with no mechanism to propagate flame.

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# Fire Development

- Fire initiates in switchgear due to a fault.
- MCR receives fault alarm and investigates. If fire is severe, verbal notification to the Control Room will likely precede detection system. If not severe, it will be extinguished with a fire extinguisher.
- Fire must then burn beyond cabinet and last sufficient duration to ignite cables overhead.
- Nominal fire brigade response to apply effective suppression is 18 minutes as documented in IR 50-400/99-13, paragraph 2.4.b.

# Fire Development (cont.)

- MCR initiates a reactor trip per Abnormal Operating Procedures for large fire in the switchgear rooms.
- Based on cable insulation loading above credible ignition sources, fire duration till the development of a hot gas layer would be approximately 30 minutes.
- Off-site fire response is called for any fire in safety related areas with response times nominally within 20 - 30 minutes.

# Ignition Sources

- There are no credible ignition sources within the ACP Zone, therefore the fire does not initiate in the ACP room.
- Per HNP IPEEE, the dominant ignition sources are:
  - Electrical cabinets at 7.3 E-3.
  - Transformers at 3.29 E-3
  - Battery chargers at 1.00 E-3

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# Ignition Sources

- Consistent with the Staff's analysis, all other ignition sources are several orders of magnitude lower and, therefore, not considered in this analysis.
- Consistent with the Staff's analysis, battery chargers are not capable of causing propagating fires per IPEEE and are excluded.
- Transformers are dry type and are not capable of causing propagating fires per IPEEE and are excluded. This is based on the minimal combustible loading and operating experience supporting a lack of propagation.

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# Propagation Probability

- Ignition frequency:
  - Electrical cabinets = 7.3E-3
- Not all cabinets are capable of propagation, only consider severe fires.
  - Using EPRI FPRAIG and EPRI Fire events data base:
    - 21 events
    - 4 severe and 1 half severe

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# Propagation Probability

- Severity Factor = Conditional probability that the ignition source is sufficiently severe to cause conditions represented by fire models.
  - (4 + ½)/21 = 0.214
- Applied to the cabinet IF:
  - Recall, (IF) x (PP)
  - 7.3E-3 * 0.214 = 1.6 E-3
- Represents the probability of fires that can initiate and propagate beyond the cabinet.

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# Manual Suppression

- Factors that contribute to a successful fire brigade:
  - Close proximity to Control Room allows for rapid evaluation of severity resulting in faster activation of fire brigade and off-site fire fighters.
  - Access available from 5 locations around the area.
  - Fire protection equipment readily available.
  - Non-radiological-controlled area that can be ventilated to the turbine building which is open.
  - Brigade is lead by plant operators with a high degree of familiarity with switchgear rooms.

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# Manual Suppression

- NAS reports documented some fire program issues related to pre-fire plans in 1997 and 1998.
  - NAS issues are based on industry best performance versus minimum acceptable.
  - Pre-fire plans concerns were not specific to switchgear room application.
  - NAS reports also stated the issues were programmatic versus performance based.
- NRC also noted a lack of drills conducted in the switchgear rooms.
  - Brigade teams trained in less risk adverse switchgear rooms in other plant locations.

# Manual Suppression

- Inspection Report 50-400/99-13 documented observation of fire brigade performance for a drill in the B switchgear room stating :
  - "The brigade demonstrated good fire fighting tactics, the proper use of the pre-fire plan and fire fighting equipment, and adequate recovery operations. The fire brigade leader's direction and performance was also good."

# Manual Suppression

- No fire brigade performance deficiencies identified in Staff's inspection reports back to 1994.
- Based on this discussion, the fire brigade has a higher probability of success in this area.
  - (MS) = 10exp(-1.0) = 0.1

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# Barrier Failure Probability

- Consistent with the Staff's analysis, the Thermo-Lag barrier is considered "moderately degraded".
- Barrier failure probability
  - BD = 10exp(-1.25) = 0.056

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# Resulting Fire Mitigation Frequency

- Recall, (IF) x (PP) x (MS) x (BD) = FMF.
- Therefore, we conclude:
  - FMF = (7.3E-3) x (0.214) x (0.1) x (0.056)
  - FMF = 8.7E-6

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# Safe Shutdown Equipment

- Consistent with the Staff's analysis, safe shutdown functions impacted:
  - Train A MDAFW
  - TDAFW
  - SG PORVs
- Operator action required to recovery functions:
  - AC power A train
  - A MDAFW, HPR, EIHP, and EAC

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# Core Damage Frequency

- Summation of the product of fire mitigation frequency and failure probabilities:
  - Result with degraded barriers:
    - 1.3 E-7
  - Result with no degraded barriers:
    - 2.4 E-9
- Delta CDF
  - 1.3 E-7 minus 2.4 E-9 = 1.28 E-7

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# Conclusion

| *CDF* | *IF* | *PP* | *MS* | *BD* |
|---|---|---|---|---|
| 1.28 E-7 | Reduced ignition sources | Increased severity factors based on more current FEDB data eliminating dependency on suppression. | Developed specific credit for fire brigade failure probability. | Consistent with Staff's analysis. |
| Qualitative | | Significant distance between ignition sources and degraded barrier. | Off-site fire fighters can respond well before barrier is breached.<br><br>Operator knowledge of switchgear exposures | |

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# Conclusion

- Ample time exists for fire brigade to respond and prevent Hot Gas Layer development from impacting ACP room.
- Staff analysis does not credit any fire fighting activity beyond initial personnel response.
- HNP has off-site fire response well within the assumed barrier failure time.
- Violation should be classified as “Green”.

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# Harris Nuclear Plant

## Pre-Decisional Enforcement Conference
## Change to Fire Protection Program

NGG Nuclear Generation Group

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# Background

## License Condition 2.F.

*CP&L shall implement and maintain in effect all provisions of the approved fire protection program as described in the FSAR as amended, and as approved in the SER, subject to the following provision below. 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.*

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# Background (cont'd)

- Harris licensed in 1987
- Generic Letter 92-08 required analysis of installed Thermo-Lag configuration
- Harris Thermo-Lag testing occurred in 1994 and 1995

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# Background (cont'd)

- Test data, combined with heat transfer analysis, demonstrated that the temperature at the closest cable would not exceed the temperature limit for the 3-hour test.
- A valid test would have required testing the composite barrier without the need for extensive supplemental analysis.

# Background (cont'd)

- Fire Protection program description was changed in FSAR, based upon testing and analysis results.
- If testing per NRC guidance of the composite barrier demonstrated temperature satisfied acceptance criteria, then the change would not adversely affect the ability to shutdown the reactor.
- The relationship between the inadequate barrier and change to FP program are clearly cause and effect.

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# Root Cause

- Inappropriate change to the Fire Protection program was due to crediting an inadequate test.
- The root cause is the same for both the Thermo-Lag barrier not meeting the 3-hr requirements, and the unacceptable change to the Fire Protection program.

# Summary

- The two violations were cited against adjacent sentences in the license condition, the same regulatory requirement.
- The two violations cite two dependent outcomes of the same event, licensee acceptance of an inadequate test.
- The two outcomes had the same root cause.

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# Summary (cont'd)

- The same corrective actions will correct both violations.
- The failure to perform adequate testing resulted in the unacceptable change to the fire protection program. If the test of the credited composite barrier met the GL 86-10 criteria for a 3-hour barrier, the change to the Fire Protection Program would not adversely impact the ability to achieve and maintain safe shutdown.

# Conclusion

- Harris respectfully requests the Staff to consider that the second violation be withdrawn based upon Staff enforcement guidance.
- Independent of the Staff action on this matter, Harris is committed to restoring compliance in a timely manner.

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