

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection Report: 50-458/93-30

License: NPF-47

Licensee: Entergy Operations, Inc.
P.O. Box 220
St. Francisville, Louisiana

Facility Name: River Bend Station (RBS)

Inspection At: RBS, St. Francisville, Louisiana

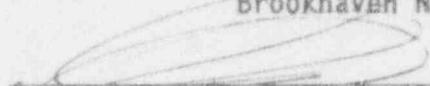
Inspection Conducted: December 13-17, 1993, and January 10-11, 1994

Inspectors: M. E. Murphy, Reactor Inspector, Plant Support Branch
Division of Reactor Safety

H. F. Bundy, Reactor Inspector, Plant Support Branch
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Approved:


G. L. Constable, Chief, Plant Support Branch
Division of Reactor Safety

2/1/94
Date

Inspection Summary

Areas Inspected: Routine, announced inspection of the licensee's corrective actions for previously identified findings involving the fire protection/prevention program.

Results:

- An apparent violation of 10 CFR Part 50, Appendix R, Section III G, involving seven examples of failures to establish fire protection requirements to protect or enable operation of safe-shutdown equipment to such a degree that a fire in the area, in the absence of additional evaluation or modification, could so damage that equipment that shutdown could not have been achieved and maintained using the equipment identified in the fire hazards analysis, was identified (Section 2.2.4).
- The licensee's documentation of the safe shutdown analysis conducted in response to Violation 458/9309-01 did not accurately depict the assumptions, methodology and definitions used in the analysis actually performed (Section 2.2.1).

- The analysis of fire effects on instrument sensing lines had not been documented under criterion 240.201A, safe shutdown analysis, or elsewhere (Section 2.2.2).
- The evaluation of potential spurious equipment operations was found to be based on acceptable assumptions and suitable evaluation methods (Section 2.2.3).
- The corrective action implemented by the licensee to address the lack of an analysis of the common enclosure associated circuit concern were found to be acceptable (Section 2.2.3).
- The licensee took prompt and appropriate corrective actions for each identified instance of non-compliance to 10 CFR 50 Appendix R (Section 2.2.4).

Summary of Inspection Findings:

- Violation 458/9309-01 was closed (Section 2).
- Inspection Followup Item 458/9330-01 was opened (Section 2.2.1).
- Apparent Violation (EEI) 458/9330-02 was opened (Section 2.2.4).
- Inspection Followup Item 458/9309-02 was closed (Section 3.1).
- Inspection Followup Item 458/9309-03 was reviewed but not closed (Section 3.2).
- Licensee Event Reports 458/89-009 and 458/90-003 were reviewed but not closed (Section 4).
- Licensee Event Reports 458/89-010, 458/91-008, 458/92-003, 458/93-014, and 458/93-021 were closed (Section 4).

Attachment:

- Attachment - Persons Contacted and Exit Meeting

DETAILS

1 INSPECTION OBJECTIVE

This inspection was conducted to review and evaluate the licensee's corrective actions for violation 9309-01 (EA 93-091), inspection followup items 9309-02 and 9309-03, any licensee event reports resulting from the corrective actions and other open items related to fire protection/prevention.

2 FOLLOWUP ON CORRECTIVE ACTIONS FOR VIOLATION 9309-01 (92702)

(Closed) Violation 458/9309-01: Failure to assure that a condition adverse to quality was promptly identified and corrected.

2.1 Background

In 1988, the licensee began a study to compare the River Bend Fire Hazards Analysis (FHA) to plant procedures and valve lineup requirements as part of corrective actions for improperly installed fire walls at the remote shutdown panel. The licensee discovered that 19 motor-operated valves required to be deenergized by the FHA during operations, were actually energized because procedural controls had not been established to fulfill FHA requirements. The NRC reviewed this issue during inspections conducted in October 1989 and January 1990, and subsequently issued a Notice Of Violation (EA 90-039) in April 1990. The licensee stated in their response to the violation that a contributing cause of the failure to implement fire protection requirements was a lack of knowledge of fire protection issues within the engineering organization and a lack of organizational maturity at the time of transition of responsibility from the architect/engineer to the licensee in 1985.

Part of the extensive corrective actions included retaining a contractor to independently review the FHA and its implementation at River Bend Station. This review was completed in January 1991 and identified 106 discrepancies that required further review. The NRC conducted a followup inspection in January 1992 to assess the adequacy and timeliness of corrective actions and to assess a number of emerging Thermo-Lag issues. At that time, the evaluation of the issues identified by the contractor was not complete, and as a result, the FHA update had not been completed. The inspection findings were identified as unresolved items and the licensee was requested to respond to the issues raised and to provide a schedule for completion of planned actions. The inspection report noted that, "The many examples of fire protection weaknesses and inadequacies documented in this report demonstrate an apparent lack of management attention to the fire protection program at River Bend Station." At a management meeting with the NRC on April 20, 1992, the licensee committed to complete the FHA by October 30, 1992.

During the period March 29 through April 2, 1993, the NRC conducted an inspection of the licensee's corrective actions to the previously identified fire protection findings. The inspection, documented in NRC Inspection

Report 93-09, included a broad evaluation of the approved River Bend Station Fire Protection Program including the fire protection features and procedures used to achieve a post-fire safe shutdown. Based on the results of this inspection a violation was issued and considered for escalated enforcement action (EA 93-091). The violation cited the licensee's failure to have completed an associated circuits analysis as required by Section III G of 10 CFR Part 50, Appendix R and a failure to have an independent contractor provide fully detailed documentation of the design bases and assumptions supporting conclusions in the FHA as committed to in response to EA 90-039. During the enforcement conference, the licensee stated that its fire protection program assures the safety of the facility through defense in depth -- fire prevention, fire detection and suppression, and the performance of essential plant functions. The licensee also stated that the NRC-identified deficiency in FHA supporting documentation was limited to low-voltage control circuits and that based on a review of approximately 200 such circuits in the drywell and main steam tunnel, which found no actual design flaws, few problems were expected to be discovered when the detailed analyses were completed.

In response to Violation 458/9309-01, the licensee committed to procure the services of a consultant group to provide a complete post-fire safe shutdown analysis and to complete the associated circuits analysis by October 29, 1993. During and at the conclusion of the corrective actions, the licensee advised the NRC of seven instances in which modifications to equipment or procedure changes were required as a result of the analyses.

2.2 Inspection Results

During this inspection the results of the revalidation effort were found to be documented in Design Criterion Document 240.201A, Revision 1, dated November 5, 1993, and in Calculation No. G13.18.3.6*07, "Safe Shutdown Common Enclosure Analysis," Revision 1, dated October 22, 1993, comprising the licensee's safe shutdown analysis (SSA). These documents were reviewed by the inspectors for overall adequacy and specifically for the spurious actuation concern and common enclosure concern. The inspectors also reviewed the details of the seven instances in which modifications to equipment or procedure changes were identified during the development of the revised SSA.

2.2.1 Overall Review of the Analysis

Design Criterion 240.201A documented the results of the revalidation effort performed by the licensee to demonstrate River Bend Station compliance with Appendix R to 10 CFR Part 50. This analysis superseded the previous Fire Hazard Analysis (FHA) Criterion 12210-240.201 in its entirety and the licensee stated that it would continue to be updated to reflect future changes in the plant configuration as it relates to compliance with Appendix R to 10 CFR 50.

Criterion 240.201A was organized into several volumes and was found to provide a single source of comprehensive and detailed design basis information related

to the post-fire safe shutdown capability of River Bend Station. Review of these documents and discussions with licensee representatives, determined that the analysis assumptions and methodology, as described in the text of Criterion 240.201A, did not accurately depict the assumptions and methodology of the analysis performed to demonstrate compliance with Appendix R. For example, Section 4 of Criterion 240.201A contained the assumptions and positions made by the licensee in the course of its analysis to ensure that the study reflected the impact of fire on safe shutdown capability. With regard to types of cable faults considered in the analysis, Section 4.1.1, "Electrical Cable Fire Damage," subparagraph (3), was found to indicate that fire initiated cable to cable faults had not been considered credible except for hi/lo pressure interface boundary valves. Specifically, this subparagraph stated, in part: "The fire damaged cable conductors will either short to other conductors in the same cable or short to ground through the enclosure or the conductor will separate thus causing an open circuit." Based on this stated definition, it did not appear that cable-to-cable hot-shorts (i.e., a deenergized cable becoming energized by shorting to an energized cable) were considered in the analysis to be a credible type of fire damage to electrical cables. However, from subsequent discussions with licensee engineers, and through reviews of specific components evaluated in the analysis, it was determined that the analysis had, in fact, considered cable-to-cable faults as a credible fire event.

In a discussion related to the potential effect of fire on instrument sensing lines, Section 4.1.3 of Criterion 240.201A was found to indicate that the effects of fire on instrument sensing lines (i.e. heat causing reduction of process fluid density thereby resulting in inaccurate instrument indications and/or spurious equipment actuations) were not fully considered. Specifically, this section of the analysis states, in part, that instruments were "assumed to suffer damage in a manner similar to electrical cables. If these devices are exposed to fire only associated cables are damaged. The instrument fluid boundary remains undamaged."

During subsequent interviews a licensee representative stated that the potential detrimental effects of fire on instrument sensing lines had, in fact, been evaluated and the intent of the wording of Section 4.1.3 was to only indicate that the physical construction (boundary) of instrument lines were assumed to remain intact during a fire event.

The inspectors requested the licensee to demonstrate how the analysis of fire effects on instrument sensing lines was incorporated into the SSA. In response to the inspectors concern, a licensee representative stated that although an analysis was performed, it had not been documented in Criterion 240.201A or elsewhere. A licensee representative subsequently committed to incorporate the analysis and results in the criterion.

With regard to the licensee's analysis of the spurious actuation associated circuit concern documented in Criterion 240.201A the following was noted:

- Section 1.1 "Purpose," states, in part: "The methodologies applied in resolving the issues of associated circuits of concern and spurious actuation are also presented in Section 5 and Appendix A respectively."
- Section 5.5.2 "Circuits Associated By Spurious Operation Potential;" states, in part: "Refer to Appendix A of this document for details of the spurious actuation analysis." Additionally, Section 5.5.2.2 "Analysis Description and Results," states: "Appendix A of this document documents the methodology utilized to identify the spurious actuation concerns, and the results of the analysis."
- Appendix A, "Spurious Operation Component Analysis," Section 1, "Purpose," states, in part: "Appendix A includes the analysis of potential spurious operations to Appendix R credited electrical components including valves and pumps for River Bend Station Unit 1. This analysis is intended to provide assurance that under a credited post-fire scenario, for any spurious operation of components which comprise credited safe shutdown systems or groups thereof, the safe shutdown capability of the facility is maintained."

However, the analysis of spurious signals, as presented in Appendix A of Criterion 240.201A, did not (and was not intended to) provide a concise and comprehensive discussion of all potential spurious signal concerns. Rather, Appendix A was limited to a review of those spurious actuations that might occur to non-credited systems within a given fire area. Components whose spurious operation could adversely affect a credited shutdown method for a specified fire area had been treated by the licensee in the same manner as required circuits.

Additionally, the review of Section 6, "Shutdown Analysis Methodology," Volume 1 of Criterion 240.201A found it to refer the reader to Appendix G for a detailed definition of spurious components of concern. However, a review of Appendix G found it to define "Spurious Operation Concern" as: "The spurious operation of the component could cause an uncontrolled loss of primary coolant." The inspectors informed the licensee that this definition was too narrowly focused on High-Low pressure interface valves and did not adequately envelope all potential concerns of spurious equipment actuations such as those that could adversely affect the successful achievement of a credited safe shutdown method.

The above examples indicated that Criterion 240.201A was not a "stand-alone" document that accurately depicted the assumptions, methodology and definitions used in the analysis actually performed. It was the inspectors' view that as written, Criterion 240.201A did not provide a clear, accurate, description of the post-fire safe shutdown reverification effort performed by the licensee. Of particular concern was that personnel evaluating future plant modifications for a potential impact on the existing post-fire safe shutdown capability

could misinterpret the intent of the text presented in Criterion 240.201A, resulting in an inadequate evaluation.

The inspectors held several discussions with licensee representatives to ensure that the concern was clearly understood. The licensee committed, at a meeting held on December 16, 1993, to revise the Safe Shutdown Analysis to supplement the appropriate sections of the text to provide additional detail of how the spurious actuation analysis requirements as described in NRC Generic Letter 86-10, "Implementation of Fire Protection Requirements," were applied. The licensee further committed to incorporate the effects of fire on the instrument sensing line process fluid into the instrument damage discussion and include an instrument tubing table with instrument mark number, fire area/zone, tubing route by fire area/zone, and location of tubing endpoints. This commitment was to be completed by the end of the fifth refueling outage, scheduled for the spring of 1994. The licensee's actions to meet the commitment to revise the SSA will be reviewed during a future inspection (Inspection Followup Item 458/9330-01).

2.2.2 Evaluation of Spurious Signals Analysis

The approach implemented by the licensee included the identification of all components whose spurious operation could adversely affect the successful accomplishment of a credited method of achieving safe shutdown conditions within a specified fire area. Once such potential spurious components of concern were identified, they were then provided with a suitable level of isolation or fire protection. For fire areas not requiring control room evacuation, spurious components of concern were protected in the same manner as required equipment (i.e., protection equivalent to that required by Section III.G.2 of Appendix R). In the event of fire in the main control room, all circuits required for safe shutdown were electrically isolable from the control room by isolation transfer switches. In addition to providing protection for potential spurious components within a credited system, the analysis performed by the licensee for each fire area also conservatively assumed one "worse-case" spurious actuation of a non-credited system as a result of fire.

The reverification of potential spurious equipment operations, as presented in Criterion 240.201A, was found to be based on acceptable assumptions and suitable evaluation methods.

2.2.3 Evaluation of Common Enclosure Associated Circuits Analysis

As part of its corrective actions the licensee performed a comprehensive analysis of the potential effects of fire damage on non-essential cables routed within a common enclosure (i.e., raceway) with cables of equipment required to achieve post-fire safe shutdown. This analysis was documented in Calculation No. G13.18.3.6*07, "Safe Shutdown Common Enclosure Analysis."

The licensee's analysis of this concern identified two instances of a lack of adequate cable overcurrent protection. These occurrences are discussed in

detail in Section 2.2.4. Based on the results of this review the corrective actions implemented by the licensee to address the lack of an analysis of the common enclosure associated circuit concern were found to be acceptable.

2.2.4 Review of Modifications and/or Procedure Changes Identified During the Analysis

During the safe shutdown analysis the licensee identified six concerns that required modifications, procedure changes, or both. These concerns were reported to the NRC by licensee Letter RBG-39532, dated December 6, 1993. An additional concern, the effect of a fire on instrumentation tubing, was identified by the inspectors during review of the licensee's documentation of enhancements to post-fire safe shutdown procedures. It was also determined by the inspectors that the concern involving a 10 CFR Part 50.59 review for installing a water curtain, included in the letter, was not relevant to the safe shutdown analysis concerns. The licensee committed to revise and resubmit this letter to insure a correct and concise identification of the safe shutdown concerns. The licensee's compensatory actions and corrective actions already completed or planned, were found to be prompt and acceptable. These concerns are detailed below:

- Associated Circuits, Common Enclosure

Ten circuits, consisting of 12 cables, which had the potential to damage cables required for Safe Shutdown Method 1E (alternate shutdown), in the event of a main control room fire, were found to lack adequate overcurrent protection. In the event of a fire in the main control room, the lack of adequate electrical protection could cause the 10 identified circuits to experience excessive overtemperature conditions as a result of fire induced faults. The excessive temperatures could then cause damage to required safe shutdown cables sharing raceways remote from the main control room. Some examples of affected safe shutdown equipment that were identified were the Division I emergency diesel generator breaker controls and breaker controls for Division I standby service water pump.

To correct this deficiency the licensee initiated Modification Request (MR) 93-0060 to install properly sized fuses in the 10 circuits. MR 93-0060 was scheduled to be completed before the end of refueling outage five. In the interim, the affected cables had been treated as having a missing fire barrier and a roving fire watch had been established in areas of the plant containing the affected raceway.

- Standby Service Water Cooling Tower Fans

The licensee's analysis of the control circuits for the Division I standby cooling tower (SCT) fans identified the potential loss of the ability to start the Division I SCT fans from their local motor control center (MCC) following a main control room fire, which could cause the

control circuits to short and blow the fuses protecting the circuits. The circuit was not isolated from the main control room; therefore, after repositioning the local/remote selector switch at the MCC, fan starting would not occur due to the short circuit. These fans are credited safe shutdown equipment and provide cooling for the ultimate heat sink.

To correct this deficiency the licensee initiated and completed Modification Request 93-0056 to install additional fuses. These fuses isolated portions of the affected circuits which enter the main control room from the portions of the circuit required for remote shutdown functions.

- Division III Control Circuits

The licensee identified a conduit in fire area C-24 that had not been fire wrapped. This conduit contained cables providing control power to 4.16 kV circuit breakers associated with Division III incoming line Breaker 1E22*ACB04, Division III diesel generator output Breaker 1E22*ACB01, and Division III 480 volt supply transformer Breaker 1E22*ACB03. This equipment was credited for post fire safe shutdown for a fire in Fire Area C-24. If a fire damaged safe shutdown cables in this conduit, Division III power might not be available to standby service water components served by Division III power.

To correct this deficiency the licensee changed the shutdown methodology credited in the SSA which eliminated the need to protect the conduit. This change was also incorporated into Abnormal Operating Procedure 0052, "Fire Outside Main Control Room (In Areas Containing Safety Related Equipment)."

- Service Water Valves

The spurious operation of four service water valves were identified as a concern during a fire event. These valves could spuriously misposition and divert flow from one division to the other or prevent the flow of standby service water through the Division III diesel generator cooling water heat exchanger or through the high pressure core spray room unit cooler.

The licensee's corrective action was to add operator actions to AOP-0031, "Shutdown From Outside the Main Control Room," and AOP-0052, "Fire Outside Main Control Room (In Areas Containing Safety Related Equipment)," to verify that the valves are in the correct configuration as the situation may require.

- Remote Shutdown Panel

The licensee identified that 17 fuses protecting the control circuits for 4160V and 480V circuit breakers were improperly sized. These breakers supply power to loads required for remote shutdown outside the main control room. This condition required the licensee to enter a Technical Specification Limiting Condition for Operation (LCO).

As a corrective action the licensee had installed fuses of the proper size under MR 93-0060. This installation was expeditiously completed within the time limit for the LCO. The licensee also conducted a thorough review of the remote shutdown system to verify that no other control circuits for 4160 volt and 480 volt circuit breakers could prevent remote shutdown capability in the event of a main control room fire.

- Reactor High Water Level Trip

A fire in Panel 1H13-P612 or 1H13*P680 in the main control room could disable the continuity of the 125 volt DC circuit to the "Reactor High Water Level" (Level 8) trip circuitry or the breaker control circuitry for the reactor feedwater pumps. This would cause the loss of automatic shut-off of feedwater supply into the reactor pressure vessel, resulting in overfill of the vessel, flooding of the main steam headers with the potential for loss of coolant through the safety valves. The loss of the 125 volt DC circuit continuity would occur if the fire created circuit faults such as open circuits or hot shorts which resulted in a loss of the ability to provide power to trip coils or which blew control circuit fuses.

Upon discovery of this condition, the licensee immediately established interim compensatory measures. A main control room Fire Response Brief was written to inform oncoming shifts of the concern and established that a dedicated operator would be immediately dispatched to the normal power supply switchgear located in the normal switchgear building regardless of the fire severity. The licensee had identified two alternative long term corrective actions. The first was to provide adequate separation of the redundant ability to secure the reactor feedwater pumps from the control room. The second was to establish a control location independent from the main control room to secure the reactor feedwater pumps. The licensee will determine the appropriate action and issue a modification request to implement the selected action to be completed by the end of refueling outage five.

- Instrument Tubing Evaluation

The licensee determined that the original safe shutdown analysis did not assume any erroneous indication due to fire induced changes to fluid contained in instrumentation lines. During the development of the

revised safe shutdown analysis, this condition was analyzed and the potential for loss of automatic initiation of standby service water due to a fire in Fire Area AB-7 was identified.

To correct this deficiency the licensee issued a change to Abnormal Operating Procedure 0052, "Fire Outside Main Control Room (In Areas Containing Safety Related Equipment)," to ensure manual initiation of standby service water in the event of a fire in fire area AB-7.

These concerns are considered specific examples of an apparent violation (EEI 458/9330-02) of 10 CFR Part 50, Appendix R, Section III.G, involving a failure to establish fire protection requirements to protect or enable operation of safe-shutdown equipment to such a degree that a fire in the area, in the absence of additional evaluation or modification, could so damage that equipment that shutdown could not have been achieved and maintained using the equipment identified in the fire hazards analysis.

3 FOLLOWUP (92701)

3.1 (Closed) Inspection Followup Item (IFI) 458/9309-02: Potential Deficiencies in Procedure AOP-0031, "Shutdown From Outside Main Control Room"

This item involved potential deficiencies in Procedure AOP-0031 primarily related to insufficient information available to support operator required actions. These issues were resolved as follows:

- Jumpering of Air Compressor LSV*C3A to provide air for cycling safety relief valves - Further analysis by the licensee indicated that this compressor would be required much earlier than assumed in the design criteria for safe shutdown. Therefore, the licensee installed a transfer switch and local control switch at the motor control center for this compressor to resolve this issue. Revised operating instructions were inserted in the procedure by Change Notice 93-1177. The inspector observed that new Emergency Transfer Switch SI-1LSVA08 was included in the appropriate surveillance test procedure. However, it was not included with other transfer switches in Technical Specification 3.3.7. The licensee stated that an amendment request had been submitted to remove these transfer switches from the Technical Specifications with the understanding that they would be placed in a technical requirements manual. This amendment was part of a program to implement improved Technical Specifications. There did not appear to be administrative controls in place to assure that this switch would eventually be placed in the technical requirements manual. Therefore, the failure to include Emergency Transfer Switch SI-1LSVA08 in the Technical Specifications is an example of an apparent programmatic weakness. The licensee stated at the exit that a team reporting to the licensing manager had been appointed to coordinate a smooth transition to the improved Technical Specifications. The licensee's resolution was considered acceptable.

- Time available to verify emergency diesel generator ventilation fans running - The figure in Procedure AOP-0031 did not appear to be supported by the existing analysis. After further study, the licensee concluded that the existing analysis was correct and changed the time specified in Procedure AOP-0031 for verification of ventilation fans running from 15 to 10 minutes after control room evacuation.
- High reactor pressure vessel level trip not protected - In the event of a control room fire the high reactor pressure vessel level trip could be lost and water could be forced out the safety relief valves without operator action. The licensee resolved this issue by placing a caution statement in Procedure AOP-0031 that local manual action might be required to secure injection on high reactor pressure vessel level.

3.2 (Open) IFI 458/9309-03: Generic Thermo-Lag Issues

This IFI was issued to track Thermo-Lag issues originally identified in NRC Inspection Report 50-458/92-04 as follows:

- Issue 4.2.3, "Qualification Testing of Installed Configurations";
- Issue 4.2.4, "Electrical Cable Ampacity Derating"; and
- Issue 4.2.5, "Fire Test Acceptance Criteria."

These issues remain open pending completion of the NUMARC Thermo-Lag testing program and application of the results to the River Bend Station. The licensee was in receipt of a letter from the NRC dated July 14, 1993, concerning response to Generic Letter 92-08, "Thermo-Lag 330-1 Fire Barriers." The letter stated that it is expected that licensees referencing the NUMARC test program will review the results and, within 30 days after completion of the program, inform the NRC of the actions necessary and the schedule for restoring the operability of these fire barriers. The licensee was also expected to confirm in writing completion of required corrective actions. The licensee indicated an intent to comply with these expectations.

4 ONSITE REVIEW OF LICENSEE EVENT REPORTS (LERs) - (92700)

4.1 (Open) LER 458/89-009: Inadequate Thermo-Lag Coverings as Fire Barriers Per Technical Specification 3.7.7.a

Final resolution of this LER is contingent on completion of the NUMARC Thermo-Lag testing program as discussed above. This issue will be revisited after the licensee's corrective action schedule has been submitted.

4.2 (Closed) LER 458/89-010 Supplement 4: Missing or Inadequate Penetration Seals Per Technical Specification 3.7.7.a

This issue was discovered as a result of a routine quality control inspection that identified several nonconforming penetration seals. The licensee established a task force that developed a corrective action program to sample all types of fire barrier penetration seals. The number of failures resulting from this effort required a 100 percent inspection of all fire rated barriers. This inspection, covering 3385 seals, was completed on December 7, 1993. The inspection identified 1961 seals that were unacceptable based on one or more acceptance criteria. These criteria were established based on qualifying fire tests or engineering evaluation. As a result the licensee identified that they did not have valid fire tests for many of the installed configurations.

The licensee contracted with two different independent testing laboratories to conduct fire tests on several configurations. These configurations were designed to envelope the existing nonqualified barrier penetrations. The first test was run in the Spring of 1993 and the second test in the Fall. Each test, consisting of several configurations, had two configuration failures. The first failure in the Spring test was concluded to be due to improper installation techniques used during the test panel fabrication and the second was concluded to be due to the configuration. Although the licensee had not completed the evaluation of the Fall test, the initial results indicated that the first failure was inconclusive but appeared to be due to test panel fabrication and the second one to configuration. The licensee had reviewed the installed configurations and determined that there were no actual installations in the plant of the failed configurations. The inspectors verified the licensee's conclusion by comparing selected fire barrier penetrations with the failed configuration details. The installed configurations that were to be qualified by these failed tests will now be reworked or subjected to a Generic Letter 86-10 evaluation.

As of December 15, 1993, there were 383 seals remaining to be dispositioned. These seals will be cleared by one of the following methods: 1) the seal will be reworked; 2) an engineering evaluation of the adequacy of the seal as related to the fire hazards associated with the barrier will be completed; or, 3) the seal will be reworked based on an engineering evaluation of the adequacy of the reworked seal as related to the fire hazards associated with the barrier. All penetration rework has been scheduled by the licensee to be completed by the end of refueling outage five. Compensatory measures consisting of roving fire watches will remain in place until the fire barriers are declared operable.

4.3 (Open) LER 458/90-003, Supplement 4: Inadequate Thermo-Lag Fire Barrier Envelopes Surrounding Safe Shutdown Circuits Per Technical Specification 3.7.7

Final resolution of this LER is contingent on completion of the NUMARC Thermo-Lag testing program as discussed in Section 3.2. This issue will be revisited after the licensee's corrective action schedule has been submitted.

4.4 (Closed) LER 458/91-008, Supplement 6: Fire Hazards Analysis Deficiencies Including Lack of Fire Wrap/Inadequate Fire Barrier

This LER was reopened to address additional information provided by the licensee in response to violation 458/9309-01. Several issues were identified by the licensee during performance of a safe shutdown analysis for associated circuits concerns in response to Violation 458/9309-01. With two exceptions, the licensee had implemented satisfactory corrective actions. One exception involved possible loss of spent fuel pool cooling because of improper positioning of ventilation dampers caused by a control room fire. The licensee had inserted sufficient instructions in Procedure AOP-0031 to recover spent fuel pool cooling if this event should occur. The licensee also had an action pending to consider hardware changes to preclude this event.

A second exception involved 14 raceways in Fire Area ET-1 having missing barriers. The licensee had taken appropriate compensatory actions by establishing fire watches. To resolve the issue the licensee had issued Modification Request 88-0220, Field Change Notice 8, which involved installing a fire door in the opening between the room below the Division II diesel generator room and the "B" tunnel, which will establish the wall as a barrier. This modification request was scheduled for installation during Refueling Outage No. 5.

All other issues have either been resolved or are being considered for enforcement action (See Section 2.2.4 of this report - EEI 458/9330-02).

4.5 (Closed) LER 458/92-003, Supplement 2: Deviations From Approved Designs In Structural Steel Fireproofing

This condition was identified by the licensee during a review of Design Specification 210.505, "Fireproof Coatings." The review was conducted as part of the corrective action required for fire barrier deficiencies previously identified in Corrective Action Report S-8901. The review determined that the structural steel supporting required fire barrier walls and floors could not be considered as being protected to a fire resistance rating of 3 hours in accordance with Underwriters Laboratories tested designs. The licensee also determined that the fire loading in the affected areas was below the level that would result in a temperature rise of concern.

The licensee declared structural steel fireproofing inoperable and established an hourly fire watch in the affected areas in accordance with Technical Specification 3.7.7. Design Specification 210.505 was revised to add appropriate detail and references to ensure that fireproofing construction conforms to specified requirements. The licensee has completed a program to identify structural steel fireproofing that deviates from the tested designs and areas that require additional fireproofing. Installation and rework of the fireproofing material was in progress at the time of this inspection. The licensee had scheduled all structural steel rework for completion by April 15, 1994.

During this inspection the inspectors observed installation work in progress, reviewed the controlling work order on the job site, and interviewed both craft personnel and quality control inspectors on the work site. The role of the quality control personnel in the ongoing operations was discussed at length with the craft supervisor and it was determined that although continuous quality control coverage is not required by the work instructions, the quality control personnel are normally in the area and move with the work flow. The work package contained required inspection attribute signoffs for the inprocess observations and were up to date.

4.6 (Closed) LER 458/93-014 Supplement 1: Improper Substitution of a Sprinkler System for a Passive Fire-Rated Barrier

The licensee identified, as part of a corrective action review for problems with the containment airlocks, a deficiency in fire barrier separation requirements. This deficiency resulted from an improper understanding of the extent to which an approved deviation could be extended to include post-fire safe shutdown components under a 10 CFR Part 50.59 evaluation associated with a modification request. Two safe shutdown valves, 1E12*MOVFO68B (RHR B heat exchanger service water outlet) and 1SWP*MOV096B (Normal service water return isolation), were affected in Fire Area AB-7, and one safe shutdown valve, 1SWP*MOV501A (Service water supply to reactor plant component cooling water heat exchanger), was affected in Fire Area PT-1.

The fire barriers in the two affected fire areas were declared inoperable and an hourly fire watch was established in accordance with Technical Specification 3.7.7. The licensee has identified permanent corrective action for each affected valve. A 10 CFR Part 50.59 evaluation justifying equivalent separation criteria for Valve 1SWP*MOV501A from redundant valves in fire area PT-1 was completed and submitted for inclusion in the next SAR revision in accordance with Generic Letter 86-10. Manual operator action will be required outside of the area of concern and included in Procedure AOP-0052, "Fire Outside the Main Control Room (In Areas Containing Safety Related Equipment)," for Valve 1SWP*MOV096B in the event of a fire in Fire Area AB-7. A one-hour rated Thermo-Lag fire barrier was to be installed in fire area AB-7 to protect Valve 1E12*MOVFO68B; however, the schedule for this installation was indeterminate and depended on the final resolution of the licensee's overall Thermo-Lag issues.

4.7 (Closed) LER 458/93-021: Associated Circuits Common Enclosure Concern Identified With Control Circuits for 4160 V and 480 V Loads to Remote Shutdown System

This issue was discovered by the licensee during performance of a safe shutdown analysis for associated circuits concerns in response to Violation 458/9309-01. It involved the fuses for 17 circuits not being adequately sized to protect the cables in the event of a control room fire.

The licensee installed appropriately sized fuses in accordance with Modification Request 93-0060. This issue has been identified as an example of an apparent violation of 10 CFR Part 50, Appendix R, Section III.G as discussed in Section 2.2.4 of this report.

ATTACHMENT

1 PERSONS CONTACTED

1.1 Licensee Personnel

- + R. Barnes, Supervisor, Engineering
- + O. Bulich, Director, Licensing
- * J. Burton, Supervisor, Nuclear Safety Engineering
- N. Brumfield, Control Operating Foreman
- + D. Domingue, Student Engineer
- + B. Ellis, Senior Maintenance Engineer, Fire Protection Coordinator
- +* J. Fisicaro, Manager, Safety Assessment and Quality Verification
- + W. Fountain, Senior QA Engineer
- + K. Garner, Licensing Engineer
- +* A. Garrett, Senior Electrical Engineer
- +* J. Hamilton, Manager, Engineering
- +* T. Hoffman, Supervisor, Civil/Structural Engineering
- +* R. Kerar, Fire Protection Engineer
- + B. Lenox, Senior Civil/Structural Engineer
- +* T. Leonard, Manager, Engineering/Systems Engineering
- + J. Lorfing, Supervisor, Licensing
- +* J. Maher, Licensing Engineer
- * J. McGaha, Vice President, River Bend Nuclear Group
- + J. Miller, Director, Nuclear Engineering
- + S. Radebaugh, Manager, Modification and Construction
- +* T. Reichardt, Nuclear Engineer
- +* M. Sellman, Plant Manager
- +* M. Stein, Director, Plant Engineering
- +* K. Suhrke, Manager, Site Support
- + R. Whitlay, Supervisor, Quality Control

1.2 Cajun Electric

- + W. Curran, Site Representative
- + W. Day, Joint Ownership

1.3 NRC Personnel

- + C. Skinner, Resident Inspector
- * W. Smith, Senior Resident Inspector

In addition to the personnel listed above, the inspectors contacted other personnel during the inspection.

+ Denotes personnel attending the interim exit meeting held on December 17, 1993.

* Denotes personnel attending the final exit meeting held on January 11, 1994.

2 EXIT MEETING

An interim exit meeting was conducted of December 17, 1993, and a final exit meeting was conducted on January 11, 1994. During these meetings, the

inspectors reviewed the scope and findings of the report. The licensee did not express a position on the inspection findings documented in this report. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.