



**GULF STATES UTILITIES COMPANY**

RIVER BEND STATION POST OFFICE BOX 221 ST. FRANCISVILLE, LOUISIANA 70775

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February 4, 1991  
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U. S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D. C. 20555

Gentlemen:

River Bend Station - Unit 1  
Docket No. 50-458

Please find enclosed Revision 2 to Licensee Event Report No. 90-003 for River Bend Station - Unit 1. This revision is submitted to provide the current status of issues concerning Thermo-Lag fire barriers at River Bend Station.

Sincerely,

W. H. Odell  
Manager-Oversight  
River Bend Nuclear Group

IAE/PDG/GAB/DCH/RJK/ch

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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (PA-30) U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20585, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  
RIVER BEND STATION

DOCKET NUMBER (2)  
05000458

PAGE (3)  
1 OF 07

TITLE (4)  
Inadequate Thermo-Lag Fire Barrier Envelopes Surrounding Safe Shutdown Circuits per TS 3/4.7.7

EVENT DATE (5)			LER NUMBER (6)		REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES
02	06	90	90	003	020			91	
									DOCKET NUMBER(S): 050000
									050000

OPERATING MODE (9)  1

POWER LEVEL (10) 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 101:

<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.406(c)	<input type="checkbox"/> 50.73(a)(2)(ix)	<input type="checkbox"/> 73.71(b)
<input type="checkbox"/> 20.406(a)(1)(ii)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(c)
<input type="checkbox"/> 20.406(a)(1)(i)	<input type="checkbox"/> 50.35(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)	OTHER (Specify in Abstract below and in Text NRC Form 386A)
<input type="checkbox"/> 20.406(a)(1)(iii)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(vi)(A)	
<input type="checkbox"/> 20.406(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(vi)(B)	
<input type="checkbox"/> 20.406(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 50.73(a)(2)(ix)	

CHECK ONE OR MORE OF THE FOLLOWING (11)

LICENSEE CONTACT FOR THIS LER (12)

NAME: L. A. England, Director-Nuclear Licensing

TELEPHONE NUMBER: 504 381-4145

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13):

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)  NO

EXPECTED SUBMISSION DATE (15): 06 30 91

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16):

During the performance of Surveillance Test Procedure STP-000-3602 on 02/06/90 through 02/08/90 with the unit in Operational Condition 1 (full power), it was found that several minor deficiencies existed in the Thermo-Lag fire barrier envelopes around redundant safe shutdown circuits. These deficiencies consisted of small holes, cracks and unfilled seams in the Thermo-Lag material. A fire watch had already been established in areas utilizing Thermo-Lag as a fire barrier.

GSU is currently working with the vendor to resolve the identified discrepancies which occurred during construction and the deficient Thermo-Lag barriers. Fire tests were conducted during November and December 1990 on typical configurations of installed barriers used in the plant. Repair methods were developed where applicable. This revision to LER 90-003 is submitted to provide the results of fire barrier testing.

The combination of the cable jacket properties, the control of transient combustibles, the use of suppression systems in the plant, and the minor nature of the defects in the barriers provides assurance that plant safety and the health and safety of the public has not been jeopardized.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST, 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  RIVER BEND STATION	DOCKET NUMBER (2)  0 5 0 0 0 4 5 8 9 0	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		0 0 3	0 2	0 2	OF	0 7	

TEXT (if more space is required, use additional NRC Form 366A's) (17)

REPORTED CONDITION

During the performance of Surveillance Test Procedure STP-000-3602 on 02/06/90 through 02/08/90 with the unit in Operational Condition 1 (full power), it was found that several minor deficiencies existed in the Thermo-Lag fire barrier envelopes around redundant safe shutdown circuits. These deficiencies consisted of small holes, cracks and unfilled seams in the Thermo-Lag material. Condition reports (CR) 90-0094, 90-0095, 90-0101, and 90-0106 were initiated to evaluate the conditions according to 10CFR50, Appendix R, fire barrier requirements. A fire watch had already been established in areas utilizing Thermo-Lag as a fire barrier, thus Technical Specification Section 3/4.7.7 action statement requirements had already been fulfilled. Since these deficiencies rendered the fire barrier inoperable and the unfilled seams existed since construction, this event is reportable pursuant to 10CFR50.73(a)(2)(i)(B) as a condition prohibited by Technical Specifications.

This revision to LER 90-003 is submitted to provide the results of fire barrier testing.

INVESTIGATION

Thermo-Lag fire barriers have been under review at River Bend Station since late 1989. Potential discrepancies between the installation manual of Thermal Science Incorporated (TSI) (a GEU subcontractor during construction) and the actual site installation practice, and discrepancies between TSI installation manual and the qualification fire test results were discovered at that time. Due to these issues, the fire barriers were indeterminate for operability and firewatches were established for all areas utilizing Thermo-Lag as a fire barrier. An Informational Report was submitted to the NRC on 01/09/90 concerning this subject.

The performance of STP-000-3602 was intended to identify conditions in fire barriers where normal wear and tear had caused damage to the barriers. The small holes and miscellaneous cracks that were identified during the performance of the STP fall into this category. Normally a fire watch would be established and the holes and cracks would be repaired. However, the unfilled seams in the Thermo-Lag installations that were identified during the performance of the STP are a condition that must have existed from the time of initial construction and are not in accordance with either the vendor installation manual, nor normal site practices. In accordance with the vendor manual, the seams between boards of Thermo-Lag were to be prebuttered with a trowel grade material and then joined, or alternatively, dry fitted together with trowel grade material then applied to the joint. In either case, the seams were to have been



LICENSEE EVENT REPORT (LER)  
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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
RIVER BEND STATION	0 5 0 0 0 4 5 8 9 10	—	0 0 3	—	0 2	0 3 OF 0 7

TEXT (If more space is required, use additional NRC Form 366A's) (17)

grouted with the trowel grade material and they were not. The preexisting firewatches satisfy the action statement of section 3/4.7.7 of the Technical Specifications. Eight fire areas were identified by the condition reports as having Thermo-Lag barriers exhibiting the unfilled seams. A brief description of each area follows.

Fire area C2A is the southeast cable chase at elevation 70 feet of the control building (\*NA\*). Fire area C2C is in the same cable chase but located at elevation 115 feet. These areas have safety related cabling feeding through up to the termination cabinets in the main control room. The areas have sprinkler suppression systems (\*KP\*) on the cable trays, which comprise the exposed fixed combustible in the areas. Area C6 is adjacent to area C2A on the west side. The area contains safety related air accumulators as well as safety related cabling. The exposed cables in cable trays, which comprise the exposed fixed combustible in the area, are protected by a sprinkler suppression system.

Fire area AB2/Z2 is located in the auxiliary building (\*NF\*) at elevation 95 feet in the southeast corner of the building. The area contains safety related instruments, piping and safety related cables. The cabling, which makes up the fixed combustible in the area, represents a fire loading of 1.0 hour. Fire area AB7 is the "D" tunnel located at elevation 70 feet on the south end of the auxiliary building. Safety related piping and motor operated valves (MOV) (\*FCV\*) are located in the area in addition to the safety related cabling. The cable trays and the MOVs are protected by a water deluge sprinkler system (\*KP\*).

Fire FB1/Z1 is located at elevation 70 feet of the fuel building (\*ND\*). The area contains fuel pool cooling piping (\*DA\*) and equipment, reactor plant component cooling water piping (\*CC\*) and MOVs as well as safety related cabling. The crescent area, near the reactor building shield wall (\*NH\*), contains the major portion of the cable trays in the area. The cable trays represent a fire loading of 21 minutes and are the fixed combustible in the area. Fire areas FB3 and FB4 are the charcoal filter rooms located at elevation 148 feet of the fuel building. The ventilation system charcoal filters and fans are contained in the area. All cabling is routed in conduit in these areas. The charcoal filters are the fixed combustible for this area. They are protected by manually actuated water spray systems. The charcoal in each area is a fire loading of 45 and 46 minutes respectively for areas FB3 and FB4.

Fire area PT1 is the pipe tunnel at elevation 70 feet which extends from the standby cooling tower (\*CTW\*) to the fuel building. The area contains piping, MOVs, and instrumentation in addition to the safety

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATIONESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS  
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COMMENTS REGARDING BURDEN: 7IMATE TO THE RECORDS  
AND REPORTS MANAGEMENT BRANCH (F-530), U.S. NUCLEAR  
REGULATORY COMMISSION WASHINGTON, DC 20545 AND TO  
THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE  
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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
RIVER BEND STATION	0 5 0 0 0 4 5 8 9 0	- 0 0 3	- 0 2	0 4	OF	0 7

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related cabling. The cable trays are the only fixed combustible in the area and are protected by a sprinkler suppression system. The cable trays represent a fire loading of 29 minutes.

In addition to the Informational Report submitted on 01/09/90, LERs 87-005 and 89-009 were reviewed for similarity. This is the first time unfilled seams have been identified.

CORRECTIVE ACTION

GSU has conducted a series of fire endurance tests in accordance with ASTM E119, followed by water hose stream tests, using American Nuclear Insurer's Bulletin B.7.2, 11/87, Attachment B. Electrical circuit integrity monitoring was also performed throughout the fire endurance and water hose stream tests. These tests were done with the cooperation of the vendor, Thermal Science Incorporated. The tests were performed in two stages. The first stage consisted of duplicating the installation process that was used at River Bend for barriers on conduit, cable tray, supports and enclosures. Each item was tested in both a one hour and a three hour barrier configuration.

The results of the in situ tests are as follows:

<u>Test Article</u>	<u>Duration of Test</u>	<u>Test Result</u>
1 Hour Conduit	25 minutes	Fail
3 Hour Conduit	1 hour : 25 minutes	*
1 Hour Cable Tray	15 minutes	Fail
3 Hour Cable Tray	56 minutes	Fail
1 Hour Unistrut Support	1 hour : 5 minutes	Pass
3 Hour Unistrut Support	3 hour : 0 minute	Pass
1 Hour Vault Enclosure	1 hour : 2 minutes	Pass
3 Hour Vault Enclosure	2 hour : 37 minutes	Fail

\* Test stopped at GSU request.

Three (3) Thermo-Lag test articles successfully passed in their in situ configuration. Rework will not be required for these barriers.

The second stage consisted of additional tests of upgraded configurations of the failed in situ articles. The results of the upgraded tests are as follows:

LICENSEE EVENT REPORT (LER)  
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FACILITY NAME (1)  RIVER BEND STATION	DOCKET NUMBER (2)  0 5   0   0   0   4   5   8 9   0	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		— 0   0   3	— 0   2	0   5	OF	0   7

(TEXT (if more space is required, use additional NRC Form 366A's) (17)

Test Article	Duration of Test	Test Results
1 Hour Conduit	1 hour : 5 minutes	Pass
3 Hour Conduit	3 hour : 4 minutes	Pass
1 Hour Cable Tray	1 hour : 0 minutes	Pass
3 Hour Cable Tray	1 hour : 45 minutes	Fail
3 Hour Vault Enclosure	3 hour : 0 minutes	Pass

The tests of the upgraded configurations were successful, with the exception of the 3 hour cable tray test article. Based on the successful tests of the upgraded Thermo-Lag barriers, rework will be performed as follows:

Configurations Needing Upgrade

- 1 Hour Conduit
- 3 Hour Conduit
- 1 Hour Cable Tray
- 3 Hour Vault Enclosure

GSU Design Engineering will issue a procedure to instruct persons in the correct application of the upgrade process. Until the improvements are in place, a roving one-hour fire watch will remain.

The rework of the above Thermo-Lag configurations will be included in the scope of work of the fire barrier task force. The fire barrier task force was formed in response to Corrective Action Report (CAR)-5-8901 to address the problem of deficient fire barrier penetration seals. As described in revision 3 to LER 89-010, inspection, evaluation and corrective actions for safety-related fire barrier penetration seals are scheduled to be completed prior to January, 1994.

A third 3 hour cable tray test article was constructed using information obtained during the evaluation of the two previous failures. When tested, this configuration failed in 2 hours : 55 minutes. After two unsuccessful attempts to design an acceptable upgrade for the three-hour cable tray, methods other than Thermo-Lag barriers are being investigated. These other methods include, but are not limited to, (a) a three-hour wrap manufactured by a vendor other than Thermal Science, Inc., (b) installation of an area wide suppression system, and (c) rerouting of the affected cable. Only two fire areas contain wrapped three-hour cable trays, they are: FB-1 (fuel building electrical cable chase, E1 148'-0" to E1 70'0") and C-16 (control building, column lines 3 to 4, E1 98'0"). The compensatory Technical Specification hourly fire watch will remain in place until a satisfactory solution is found. The resolution of the



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FACILITY NAME (1)  RIVER BEND STATION	DOCKET NUMBER (2)  0 5 0 0 0 4 5 8	LER NUMBER (6)			PAGE (3)	
		YEAR 9 0	SEQUENTIAL NUMBER - 0 0 3	REVISION NUMBER - 0 2	0 6	OF 0 7

TEXT (if more space is required, use additional NRC Form 366A's) (17)

three-hour cable tray barrier question will be submitted to the NRC as a supplemental response to this LER by 6/30/91.

**SAFETY ASSESSMENT**

The primary fixed combustible at River Bend in the areas containing the Thermo-Lag fire barrier material is cable jacketing on the electrical cables. The predominant type of cable used at River Bend is IEEE 383 rated which is resistant to ignition and is fire retardant.

Automatic fire detection systems are located in all areas, providing early detection if a fire should occur. Detection is provided by ionization and/or thermal type detectors.

Procedure FPP-0040 establishes controls for the use of transient combustibles throughout the protected area. The hot work permit procedure, FPP-0060, establishes controls associated with ignition sources.

In the areas containing one-hour rated barriers, automatic fire suppression systems are in place. Actuation of sprinkler systems in areas with open heads would occur upon a signal given by the detection system. In areas protected by a wet pipe system, sprinkler heads are fused to actuate at a temperature of 165 degrees Fahrenheit. The Thermo-Lag barrier failed in the fire test at a furnace temperature of approximately 1400 degrees Fahrenheit. Actuation of the sprinkler systems would be expected well before temperatures could rise to the 1400 degrees Fahrenheit range and provide protection for the required circuits.

Also, as compensatory action in accordance with Technical Specification Section 3/4.7.7, a one-hour fire watch patrol has been in effect for the areas containing Thermo-Lag barriers since November 1989 as a result of Condition Report (CR) 89-1144. The actions of the fire watch are two fold. First, the patrols are to monitor an area for conditions likely to start and/or spread fire and for compliance with housekeeping requirements. These actions are designed to maintain the combustible loading in each area at the acceptable levels. The second function is to inspect for evidence of fire. The objective is to discover indications of a fire prior to activation of the detection system. Based on the discussion above, the defense-in-depth approach utilized on-site provides assurance that plant safety and the health and safety of the public is not compromised.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

DOCKET NUMBER (2)

LER NUMBER (6)

PAGE (3)

RIVER BEND STATION

0 | 5 | 0 | 0 | 0 | 4 | 5 | 8 | 9 | 0 | - | 0 | 0 | 3 | - | 0 | 2 | 0 | 7 | OF | 0 | 7

YEAR	SEQUENTIAL NUMBER	REVISION NUMBER

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NOTE: Energy Industry Identification System Codes are identified in the text as (\*XX\*).