GULF STATES UTILITIES COMPANY

RIVER BEND STATION POST OFFICE BOX 220 ST. FRANCISVILLE, LOUISIANA 70775

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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 Licensee Event Report No. 90-048 for River Bend Station - Unit 1. This report is being submitted at this time based on an extension granted by Mr. Phil Harrell (NRC Region IV) on January 23, 1991.

Sincerely,

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

LAE/PDG/GAB/DCH/JLB/AS/pg

cc: U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

NRC Resident Inspector
P.O. Box 1051
St. Francisville, LA 70775

INPO Records Center
1100 Circle 75 Parkway
Atlanta, GA 30339-3064

Mr. C. R. Oberg
Public Utility Commission of Texas
7800 Shoal Creek Blvd., Suite 400 North
Austin, TX 78757

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PDR ADOCK 05000458
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NRC FORM 366 (6-89) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

APPROVED OMB NO. 3150-0104
EXPIRES 4/30/92

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 (P-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): RIVER BEND STATION

DOCKET NUMBER (2): 0 5 0 0 0 4 5 8

PAGE (3): 1 OF 0 8

TITLE (4): Equipment Qualification Lifetimes of Two Hydrogen Igniters Located in the Upper Drywell Apparently Exceeded

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	DOCKET NUMBER(S)
1 2	2 4	9 0	9 0	0 4 8	0 0	0 2	0 1	9 1		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): 1

POWER LEVEL (10): 1 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

	20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
	20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)
	20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER (Specify in Abstract below and in Text, NRC Form 366A)
	20.405(a)(1)(iii)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		
	20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
	20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (AREA CODE)
L. A. England, Director-Nuclear Licensing	5 0 4 3 8 1 - 4 1 4 5

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)	X NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

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

On 12/24/90, it was determined that the equipment qualification (EQ) operability status of two hydrogen igniters (1HCS*IGN28A and 1HCS*IGN30B) apparently exceeded their equipment qualification (EQ) lifetimes during cycle 3. Associated cables apparently exceeded their EQ lifetimes during cycle 2. This is because the temperature data obtained from thermocouples installed during refueling outage 3 indicated temperatures higher than those originally used to calculate the qualified lifetimes of the igniters and cables. Therefore, this event is reportable pursuant to 10CFR50.73(a)(2)(i)(B) as operation prohibited by the Technical Specifications.

Six hydrogen igniters and their associated cables were replaced during the third refueling outage. The replacement equipment is qualified through cycle 4. GSU will continue to monitor temperatures in the upper drywell through cycle 4. Equipment qualification preventive maintenance tasks (EQPMs) will be revised as necessary based on the temperature trending data.

Based on the design of the hydrogen control capability at RBS, analysis results, and the requirements of Emergency Operating Procedure (EOP)-002, GSU concludes that adequate hydrogen control capability existed during this event. Therefore, this event did not adversely affect the health and safety of the public.

REPORTED CONDITION

On 12/24/90, GSU determined that two (1HCS*IGN28A and 1HCS*IGN30B) hydrogen igniters apparently exceeded their equipment qualification (EQ) lifetimes during cycle 3. The associated cables also apparently exceeded their current equipment qualification lifetimes during cycle 2. This determination was made following analysis of temperature data obtained from 15 thermocouples installed in the upper drywell area during the third refueling outage. This data indicated temperatures, in isolated spots, to be higher than those originally used to calculate the qualified life of the igniters and cables. Without extensive requalification testing to extend the EQ lifetimes, the equipment is conservatively considered to have been inoperable. Therefore, this event is reportable pursuant to 10CFR50.73(a)(2)(i)(B) as operation prohibited by the Technical Specifications. Note that the six igniters in upper drywell area (1HCS*IGN28A, 1HCS*IGN28B, 1HCS*IGN29A, 1HCS*IGN29B, 1HCS*IGN30A and 1HCS*IGN30G) and associated cables were replaced during the third refueling outage. Therefore, there is no concern at present regarding qualification or operability of the currently installed equipment.

INVESTIGATION

Background

The six hydrogen igniters in the upper drywell area were originally qualified for 10 years based on an average ambient temperature of 145 degrees F. Based on temperature monitoring during cycle 3, the qualified lifetimes of the igniters was reduced to 5 years. This required replacement of the six igniters during the third refueling outage. During the third refueling outage, 15 thermocouples were installed in the upper drywell area to provide additional temperature data about the temperatures. Analysis of the data from these thermocouples revealed that two of the igniters (1HCS*IGN28A) and 1HCS*IGN30B) and their associated cables had apparently exceeded their qualified lifetimes during cycle 3 and cycle 2, respectively. A chronological summary of drywell high temperature issues follows below.

Second Refueling Outage Findings

During the second refueling outage, problems were identified with flexible conduit and reactor coolant system (RCS) thermocouples and cables which were initially attributed to high drywell temperatures. Investigations performed by Design Engineering indicated that the design temperatures in the drywell were not being exceeded. Degraded equipment was identified in the drywell. However, the degradation of

Category II reactor vessel head thermocouples, cables and connectors was due to the proximity of this equipment to the vessel. Degradation of safety relief valve (SRV) control cables was also identified. However, this was a result of contact with hot piping, and not due to high ambient drywell temperatures. Based on the review of the available data and walkdown results, GSU concluded that RBS was not exceeding the drywell design temperatures.

Cycle 3 Findings

Design Engineering monitored the temperatures recorded for the drywell bulk area, (per the Technical Specifications) drywell unit cooler inlets, and leak detection during the cycle. These temperature data points are readily available for monitoring and are located at various elevations and azimuth in the drywell. The temperature data (14 points) for the month of July (chosen due to high outdoor temperatures) was utilized to estimate the temperature in the upper drywell area. The calculation indicated the temperature to be 188 degrees F at the top of drywell. The EQ calculations were revised and the lifetimes of the affected components (igniters) were found to be 5 years. Thus the igniters were qualified through cycle 3.

Third Refueling Outage Findings

During the third refueling outage, while working to replace the reactor head thermocouple cable runs, it was determined by Maintenance that the cables could not be spliced in the drywell due to their apparently deteriorated condition. This prompted Design Engineering and EQ to inspect all upper drywell cables.

The resistance temperature detector (RTD) cables showed signs of jacket deterioration. However, insulation resistance (IR) readings were well within acceptable limits. Wet towel meggar testing was performed on the cables where jacket deterioration was found. The results of this testing were within acceptable limits. The jacket of the cables was hard and brittle; therefore, it was not possible to determine the flexibility of the insulation in the pull boxes. The cable insulation showed flexibility in the junction boxes at the end of the cables.

Hydrogen igniter cables were meggared and part of the cable run had low IR readings. The investigation to determine the reason for low IR readings revealed that the cables were damaged (insulation cracking or dropping) due to handling during the removal of the igniters or preparation for meggar testing. A closer inspection of the removed cables indicated that the jacket was very brittle and stuck to the insulation but the insulation itself was flexible. Since the results were inconclusive, all hydrogen igniter cables were replaced as a conservative measure. Note that the cable jacket is rated for 113 degrees F and is for mechanical protection only. No credit is taken for the jacket in the qualification program.

The hydrogen igniters located near the drywell ceiling (1HCS*IGN28A, 28B, 29A, 29B, 30A, and 30B) were also inspected. Four out of the six igniters were inspected by equipment qualification (EQ) personnel in the hot shop. The cover gasket material, required to seal the igniter components from moisture, was in "like-new" condition, flexible and no discoloration was observed. The transformer inside the igniter did not show deterioration, the varnish still appeared to be intact and there was no evidence of cracking in the winding. The Scotchcast #9 which is used as a seal for the electric components on the junction box end was still intact. The sealing function was not affected since the terminal strip did not show any corrosion. These indications reveal no signs of deterioration.

An in-depth analysis of the radiation levels in the upper drywell was performed to determine if electrical cables located at the 156 ft. elevation could be receiving radiation exposure in excess of the environmental design criteria (EDC). The integrated gamma dose up to the start of the third refueling outage was found to be 5.4E6 rads, well below the conservative EDC value of 7.5E7 rads. Therefore, radiation exposure did not impact the qualification of the igniters and cables beyond the original design.

A walkdown of the main steam lines and reactor pressure vessel (RPV) skirt plenum area was performed to evaluate the condition of insulation and associated duct work. Some discrepancies were identified and corrected during the third refueling outage.

An evaluation of the effects on the upper drywell concrete was performed, based on an estimated maximum drywell ceiling temperature of 188 degrees F. This evaluation concluded that the drywell ceiling concrete is not adversely affected if the average temperature across the bottom of the slab does not exceed 200 degrees F.

In order to obtain specific temperature information in upper drywell area, 15 temperature sensors were installed during the third refueling outage. This temperature information is required for the determination of high temperature effects on concrete, steel, electrical cable and equipment in the upper drywell area. The objective of this temperature monitoring program is to initiate corrective actions as required if the temperatures affect the bases for EQ life calculations.

Cycle 4 Findings

On 12/18/90 upper drywell temperature monitoring data revealed temperatures at two specific thermocouple locations to be in excess of 200 degrees F. The maximum temperature observed was 240 degrees F. These two locations appear to be "hot spots", and are not representative of the general area temperatures, based on the remaining thermocouple data. The Technical Specification required average ambient temperature of the drywell (145 degrees F) has not been exceeded. GSU extrapolated the hot spot data to the nearest igniters and on 12/24/90 determined that the hydrogen igniters were qualified for a total of three years. The original igniters were in service for 5 years, hence, qualification cannot be substantiated for the last 2 years. Similarly, the cables were determined to have been qualified for only 2 years. In the absence of extensive requalification testing, the qualified life of igniters and cables could not be demonstrated through cycle 3 and cycle 2, respectively. A review of applicable surveillance test procedures (STPs) performed on the igniters showed that the igniters were functional as of July, 1990. Therefore, the igniters including the cables were functional prior to their replacement during the third refueling outage. An additional review was performed to evaluate the impact of local hot spots on the drywell ceiling concrete. The results of this review confirmed the structural integrity of the concrete.

CORRECTIVE ACTION

Six hydrogen igniters and their associated cables were replaced during the third refueling outage. The replacement equipment is qualified through cycle 4. GSU will continue to monitor temperatures in the upper drywell through cycle 4. Equipment qualification preventive maintenance tasks (EQPMs) will be revised as necessary based on the temperature trending data.

SAFETY ASSESSMENT

Section 6.2.5 of the RBS USAR describes the combustible gas control inside the containment and the drywell, including the hydrogen control system (igniters) and mixing system. There are a total of 18 hydrogen igniters in the drywell. Of these, six igniters are located at the 156 ft. elevation. The purpose of the drywell igniters is to prevent the accumulation of pockets of hydrogen gas in concentrations sufficient to cause deflagrations or explosions.

In addition to the hydrogen igniters, hydrogen concentrations in the drywell can also be redistributed and reduced by operation of the hydrogen mixing system in conjunction with the hydrogen recombiners. The hydrogen mixing system allows air from the containment to be drawn into the drywell, and exhausts drywell atmosphere into the upper containment. The hydrogen mixing system exhausts are located in the top of the drywell at elevation 162. This is above all of the drywell hydrogen igniters. This dilutes the hydrogen concentration in the drywell and releases hydrogen to the containment refueling floor, where the hydrogen recombiners are located. The recombiners are heaters, powered from safety-related AC buses, which combine hydrogen and oxygen in the containment atmosphere to form water. There are two independent trains of hydrogen mixing and the hydrogen recombiners.

Technical Specification 3/4.6.6 Bases state:

> "Either primary containment hydrogen recombiner system with either primary containment/drywell hydrogen mixing system is capable of controlling the expected hydrogen generation associated with (1) zirconium-water reactions, (2) radiolytic decomposition of water and (3) corrosion of metals within containment. The primary containment/drywell hydrogen mixing systems are provided to ensure adequate mixing of the primary containment and drywell atmosphere following a LOCA. This mixing action will prevent localized accumulations of hydrogen from exceeding the flammable limit."

Emergency Operating Procedure (EOP)-002, "Primary Containment Control," requires the operators to energize the hydrogen igniters and hydrogen recombiners if containment or drywell hydrogen concentrations exceed 0.5 percent. Hydrogen mixing is to be operated provided the drywell hydrogen concentration exceeds 2 percent and the RPV pressure is below 20 psig. The hydrogen analyzers normally sample 4 locations in the drywell and 20 locations in the containment. The four sample points monitor the 156 ft. and 160 ft. elevations. Therefore, even with the operability of 2 hydrogen igniters indeterminate due to environmental qualification, adequate indications exist for the operators to enter EOP-002 and thus initiate hydrogen recombiners and hydrogen mixing, as required.

Technical Specification 3/4.6.6 Bases state:

> "The operability of the primary containment/drywell hydrogen igniters ensures that hydrogen combustion can be accomplished in a controlled manner following a degraded core event that produces hydrogen concentrations in excess of LOCA conditions."

Therefore, the purpose of the drywell hydrogen igniters is to prevent the potential loss of containment integrity from the deflagration or explosion of hydrogen, generated by a degraded core event. The igniters serve a mitigative function for the consequences of core damage accidents.

As part of River Bend's response to Generic Letter (GL) 88-20, "Individual Plant Examination (IPE) for Severe Accident Vulnerabilities," detailed modeling of post-accident conditions in the containment and drywell is being developed. The NRC's recent SER on the Hydrogen Control Rule (10CFR50.44) defines the station blackout (SBO) scenario as the "acceptable" hydrogen generation event (HGE). Preliminary computer runs using MAAP3.0B indicate that for anticipated transient without scram (ATWS) and SBO, drywell hydrogen concentrations do not reach flammable levels. This is due primarily to that fact that the vast majority of the hydrogen generated in these scenarios is discharged to the suppression pool via the SRVs. Thus the hydrogen is ultimately deposited in the primary containment.

Other scenarios, with the reactor coolant system intact, lead to a similar end-state with regard to drywell hydrogen concentrations. Other possible scenarios are those initiated by a loss of coolant accident (LOCA). The effects of these on River Bend have been analyzed both experimentally and analytically by the Hydrogen Control Owners Group (HCOG), and submitted to the NRC in response to 10CFR50.44. For the large and intermediate LOCA cases, the drywell would be inert due to the steam, and thus the operability of the drywell hydrogen igniters is not germane. Small LOCA initiated scenarios have the potential to generate hydrogen concentrations in the drywell above that predicted for the ATWS and SBO scenarios. However, scenarios of this type are not expected to have a significant impact on the health and safety of the general public. This is based on the fact that these scenarios are below the core damage frequency truncation value (i.e., less than 1.0E-8 per reactor year utilized in the NRC's analysis of Grand Gulf and are not considered in the containment failure analysis. RBS and Grand Gulf are very similar with regard to these scenarios, therefore the Grand Gulf analysis is applicable to RBS (i.e., RBS plant specific IPE analysis is expected to yield similar results).

This preliminary evidence suggests that the drywell igniters will not have a significant impact on the containment failure probability , although the Level II IPE must be completed (October 1992) before this assessment can be finalized. As stated in GSU's response to GL 88-20, the IPE is scheduled to be submitted to the NRC by October 1992.

In addition, successful completion of surveillance test procedures (STPs) showed that the igniters were functional as of July, 1990. This shows that the hydrogen igniter system including the cables was functional prior to the third refueling outage. Therefore, the calculated reduction of the igniter's qualified lifetimes based on hot spot data does not establish that they were inoperable.

NRC FORM 366A (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WTH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-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) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
RIVER BEND STATION	0 5 0 0 0 4 5 8	9 0	— 0 4 8	— 0 0	0 8 OF 0 8

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

Based on this safety assessment, GSU concludes that adequate hydrogen control capability existed while the EQ lifetimes of the igniters and cables were apparently exceeded. Therefore, this event did not adversely affect the health and safety of the public.