

Docket No. 50-458  
License No. NPF-47  
EA 91-132

FEB 5 1992

Gulf States Utilities  
ATTN: James C. Deddens  
Senior Vice President (RBNG)  
P.O. Box 220  
St. Francisville, Louisiana 70775

Gentlemen:

SUBJECT: NRC INSPECTION REPORT NO. 50-458/91-26

Thank you for your letters of December 20, 1991, and January 20, 1992, in response to our letter and Notice of Violation dated November 26, 1991, and our discussions. We have reviewed your replies and find them responsive to NRC concerns and questions. We will review the implementation of your corrective actions during a future inspection to determine that full compliance has been achieved and will be maintained.

Sincerely,

Original Signed By

*L. A. Yandell*

A. Bill Beach, Director  
Division of Reactor Projects

cc:  
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D:DRP  
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2/5/92 *Yandell*

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Gulf States Utilities

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bcc to DMB (IE01)

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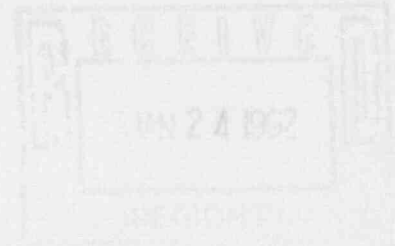
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**GULF STATES UTILITIES COMPANY**

RIVER BEND STATION    POST OFFICE BOX 220    ST. FRANCISVILLE, LOUISIANA 70775  
AREA CODE 504    C35 6094    346 6081

January 20, 1992  
RBG- 36, 275  
File No. GS.5, G15.4.1



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

Gentlemen:

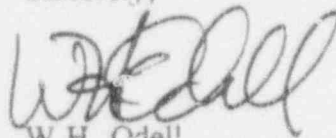
River Bend Station - Unit 1  
Docket No. 50-458/91-26

Gulf States Utilities Company provided its response to the Notice of Violation contained in Inspection Report 50-458/91-26 in a letter dated December 20, 1991. Mr. Phil Harrell, of NRC's Region IV, requested additional information concerning our initial response. The following information is provided as requested.

GSU will perform the hydrogen mixing system test, which is referred to in Attachment 1 to our initial response letter, during the fourth refueling outage schedule to begin in March, 1992. This test will be performed on an 18 month basis as part of the emergency core cooling test. GSU also confirms that we will revise documentation to clearly describe the hydrogen igniter system function as redundant to the combustible gas control system function during a LOCA. This commitment was initially made by GSU during the enforcement conference held October 23, 1991, and was documented in the NRC's letter to GSU dated November 26, 1991. GSU will include this information in the next revision to the Updated Safety Analysis Report (USAR) scheduled for submittal prior to August 29, 1992.

If you have any additional questions please contact David Lorfing at (504) 381-4157.

Sincerely,



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

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92-0127

cc: NRC Resident Inspector  
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U.S. Nuclear Regulatory Commission  
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**GULF STATES UTILITIES COMPANY**

RIVER BEND STATION POST OFFICE BOX 220 ST. FRANCISVILLE, LOUISIANA 70776  
AREA CODE 504 835-8094 346-8651

December 20, 1991  
RBG- 36,140  
File Nos. G9.5, G15.4.1

Director, Office of Enforcement  
U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555

Gentlemen:

River Bend Station - Unit 1  
Docket No. 50-458/91-26 (EA 91-132)

This letter provides Gulf States Utilities Company's (GSU) Reply to the Notice of Violation and Proposed Imposition of Civil Penalty for NRC Inspection Report No. 50-458/91-26 dated November 26, 1991. The inspection was conducted September 19-24, 1991, of activities authorized by NRC Operating License NPF-47 for River Bend Station - Unit 1 (RBS). GSU's Reply to the Notice of Violation pursuant to 10CFR2.201 is enclosed as Attachment 1. Enclosed with this letter is a check which constitutes GSU's payment of the proposed civil penalty in the amount of \$75,000. The primary cause was determined to be failure to properly implement a design change to the hydrogen mixing system outlet valve control circuit during the construction phase of River Bend Station. Corrective actions include permanent modification to the subject circuit, a 100 percent design verification of Category I system logic and elementary diagrams, and periodic retesting of the hydrogen mixing system. Attachment 2 responds to specific issues raised by the NRC in the subject letter. These issues concerned the timeliness and extent of GSU's corrective actions and the NRC questions regarding GSU's preoperational test program.

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GSU believes that the actions taken as described in Attachments 1 and 2 are prompt and extensive. These actions have not resulted in the identification of any programmatic deficiency in either the design process used during construction, the design process currently being used, or the preoperational test program.


GSU also performed a detailed safety assessment of the condition described in the Notice of Violation. Details concerning this assessment are provided in LER 91-17 Revision 1. The assessment included a license basis analysis, mechanistic analysis, human reliability analysis, and a probabilistic risk assessment. The conclusion of this assessment was that the safety significance of the condition was low.

Should you have any questions concerning this request, please contact Mr. L.A. England at (504) 381-4145.

Sincerely,



J.C. Deddens  
Sr. Vice President  
River Bend Nuclear Group

 WHO/LAE/PDG/GAB/JRH/DNL/kvm

Attachments

Enclosures

cc: Regional Administrator  
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611 Ryan Plaza Drive, Suite 400  
Arlington, TX 76011

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

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

STATE OF LOUISIANA )

PARISH OF WEST FELICIANA )

In the Matter of )

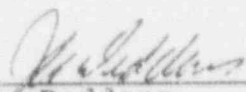
GULF STATES UTILITIES COMPANY )

Docket No. 50-458


(River Bend Station - Unit 1)

AFFIDAVIT

J. C. Deddens, being duly sworn, states that he is a Senior Vice President of Gulf States Utilities Company; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission the documents attached hereto; and that all such documents are true and correct to the best of his knowledge, information and belief.

  
\_\_\_\_\_  
J. C. Deddens

Subscribed and sworn to before me, a Notary Public in and for the State and Parish above named, this 27<sup>th</sup> day of December, 1991. My Commission expires with Life.

  
\_\_\_\_\_  
Claudia F. Hurst  
Notary Public in and for  
West Feliciana Parish, Louisiana

## Attachment 1

### Reply to Notice of Violation 50-458/91-26 Level III

#### REFERENCE

Notice of Violation - Letter from Robert D. Martin to James C. Deddens dated November 26, 1991

#### VIOLATION

River Bend Station Technical Specification 3.6.6.2 states, in part, that two primary containment/drywell hydrogen mixing system shall be operable in Operational Conditions 1, 2, and 3.

Technical Specification 3.6.6.2 also states, in part, that with one primary containment/drywell hydrogen mixing system inoperable, the inoperable system must be restored to operable status within 30 days or the unit must be in at least hot shutdown within the next 12 hours.

Technical Specification 3.0.3 states, in part, that when a limiting condition for operation is not met, except as provided in the associated action requirements, action shall be initiated within 1 hour to place the unit in a specified operational condition, as applicable, in which the Specification does not apply.

Contrary to the above, between July 1985 and September 18, 1991, the licensee: (a) operated the facility in Operation Conditions 1, 2, and 3 with both primary containment/drywell hydrogen mixing systems inoperable; (b) failed to restore either system to operable status during this period and failed to put the unit in at least hot shutdown as a result of such inoperability; and (c) no exceptions being applicable, failed to place the unit in an applicable operational condition as specified in Technical Specification 3.0.3.

#### ADMISSION OF VIOLATION

GSU admits to the violation.

#### REASON FOR VIOLATION

The hydrogen mixing system consists of two 100 percent capacity trains, A and B. There are four motor operated valves in each train, two inlet valves and two outlet valves. The hydrogen mixing system inlet and outlet valves close on a LOCA signal. If the hydrogen volume reaches a preset value, the operator is directed to override the LOCA signal, open the valves, and start the system. During the review of SOP-0040 by GSU, it was discovered that the LOCA signal to outlet valves could not be bypassed to permit the valves to be opened and remain open.



## Attachment 1

Upon discovery of the problem, all associated wiring, elementary, and logic diagrams, various manuals, and records of previous modifications were reviewed. A point-to-point wiring check was also performed to confirm the actual installation. The as-built condition was found to be in conformance with the (erroneous) elementary diagram.

In response to NRC FSAR question 421.039, RBS agreed to provide a LOCA isolation signal to the hydrogen mixing system valves. As documented on the "Record of Change," this was accomplished in mid-January, 1984, on Revision 6 to logic diagram (LSK) 27-24A. Within six weeks of this change (early March 1984), the LSK was again revised (Revision 7). This LSK revision provided for overriding the LOCA signal on both the inlet and outlet valves, but only the electrical elementary diagrams (ESKs) for the inlet valves were changed to implement this feature.

Other than human error as discussed herein, the reason for this mistake is unknown; however, the reason given in the "Record of Change" for the LSK revision was to override a false LOCA signal generated by a loss of offsite power (LOOP). Upon a LOOP, drywell cooling would be lost and the resultant heatup could cause drywell pressure to increase to the point where a false high drywell pressure LOCA signal (1.68 PSIG) would be reached. Such a false high drywell pressure signal could be eliminated by opening only the hydrogen mixing system inlet valves. This may have contributed to the error. However, it is clear that the changes to the LSK were not properly implemented in the applicable ESKs.

The original preoperational test for the hydrogen mixing system was developed from the ESK revisions that implemented the LOCA isolation signal and provided for testing the LOCA isolation function of the inlet and outlet valves. Prior to performing the test, the test engineer noticed that the control system description, which had been revised to reflect both the LOCA isolation and override signal changes to the LSKs, indicated that the LOCA signal could be overridden for the inlet valves by turning the open/close control switch for the 1CPM\*MOV2A (B) valve to the open position. Since this feature had not been implemented, he initiated startup test exception 1-PT-254-TE-12. Stone & Webster (SWEC) Engineering and Design Coordination Report (E&DCR) C-60,772A was initiated to correct the circuit for the inlet valves.

SWEC revised the ESKs for the inlet valves to implement the LOCA override capability, but as previously stated, SWEC failed to revise the ESKs for the outlet valves. E&DCR C-60,772A provided for modifying the plant as shown on the revised ESKs for the inlet valve LOCA override feature, but did not provide this feature for the controls of the outlet valves. The LOCA override feature was installed on the inlet valves and was successfully tested under test exception 1-PT-254-TE-12.

## Attachment 1

In summary, the following inappropriate actions have been identified:

- a Four ESKs were impacted by the logic change to the LSK. Two ESKs were revised to agree with the LSK, but two ESKs were not.

Preoperational testing prior to initial start up did not test the outlet valve LOCA signal override because the design as reflected in the ESKs did not include this feature.

A root cause evaluation was performed using the root cause analysis techniques of barrier, task and change analysis. Events and causal factors charting was also used to graphically depict the results of the analysis. Review of design and licensing documentation as well as interviews were used as input to this analysis. The results of the root cause analysis are given below.

The electrical elementary diagrams (ESKs) in question were not updated to reflect the changes made in revision 7 of the logic diagram (LSK). In particular, the ESKs for the outlet motor operator valve (MOV) circuits were not changed to provide for overriding the LOCA signal in order to open the valves with a valid LOCA signal present. The reason for this discrepancy is not clear, but appears to have been a human error. The record of change for the LSK shows that the changes to the logic were made for relieving high drywell pressure. It is restated on the second record of change for revision 7 that the change in logic is for "overriding a false LOCA." The mindset at this time was system operation during a loss of offsite power (LOOP). This mindset may have contributed to the ambiguous wording of the control system description. It is possible that the person making the ESK changes used the control system description rather than the LSK itself and therefore made the error in the outlet MOVs circuit. The root cause evaluation also determined the following:

- o It was SWEC practice to change ESKs immediately following changes to LSKs. The lead engineer was responsible for this work. However, in this case the ESKs were not changed until 11 months following the LSK change.
- o SWEC did not follow its work practices and procedures in changing affected ESKs to match the corresponding LSK. The LSK and ESK change review process failed to detect this error.
- o The delay of 11 months between the revision of the LSK and the update of the ESK may have been a factor in the LSK/ESK mismatch. The personnel involved in the changes to the ESK may not have been familiar with the reasons for the LSK changes.
- o Preoperational testing did not test the post-LOCA override feature for the outlet valves so it did not detect the error. The preoperational test was based on the design as reflected in the ESKs. Had the ESK properly reflected the LSK design, there is a high level of confidence that the preoperational testing would have

## Attachment 1

tested the LOCA override feature. This is supported by the re-testing that was performed to clear test exception 1-PT-254-TE-12 for the inlet valves.

In conclusion, it is apparent that if SWEC had followed procedures and work practices, and had implemented the design change properly; the system would have been correctly built and tested. The primary root cause is the failure to properly implement the design change to the outlet valve circuit.

### CORRECTIVE STEPS WHICH HAVE BEEN TAKEN AND THE RESULTS ACHIEVED

When the error was discovered, in accordance with the requirement of the Technical Specifications Section 3.0.3, the hydrogen mixing system was declared inoperable and the plant entered a 6 hour shutdown limiting condition for operation (LCO) action statement at 2125 on 09/18/91.

The short-term corrective action was to revise SOP-0040 to provide operators with a method to bypass the LOCA signal to the outlet valves. This would permit opening of the valves post-LOCA. This method would only be used when required by Emergency Operating Procedure (EOP)-002, "Primary Containment Control." Following the incorporation of this method into the procedures, the LCO was cleared at 0120 hours on 09/19/91.

The long-term corrective action was to modify the wiring to permit the opening of the outlet valves post-LOCA. This was completed during the mid-cycle 4 outage which began in September, 1991. Modification Request (MR) 91-0101 implemented this change. Subsequent testing confirmed that the outlet valves now conform to the design requirements.

### CORRECTIVE STEPS WHICH WILL BE TAKEN TO AVOID FURTHER VIOLATION

Plant modifications are no longer performed under the control of SWEC procedures, but are performed by Design Engineering personnel under procedure ENG-3-006. This procedure requires that all affected documents be revised simultaneously and design changes are verified to be consistent from one drawing type to another.

After the root cause had been determined, GSU immediately began a review of seven systems which were identified to have LOCA override features. The LSKs of these systems were reviewed against the corresponding ESKs to ensure proper design implementation of the LSK. In addition, in order to determine the scope of the problem, GSU performed a design consistency verification of a sample of LSKs versus ESKs. The sample consisted of Division I systems which shared the prominent characteristics of the hydrogen mixing system (i.e. systems infrequently operated or called into service under accident conditions). The results of the design consistency did not identify any LSK versus ESK mismatch that might have an operational impact. However, several minor inconsistencies were discovered.

## Attachment 1

Even though only minor inconsistencies were found, a 100 percent design consistency verification of ESKs and LSKs for safety related systems is being conducted. If errors which could affect system function are found in elementary drawings, GSU will also evaluate the preoperational tests for the system.

Periodic retesting of the hydrogen mixing system including valve manipulation and starting of the fans will be performed as part of the integrated ECCS test to ensure that the hydrogen mixing system will function with a LOCA signal present.

### DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED

Full compliance was achieved with the return to service of the hydrogen mixing system on September 19, 1991. Additional design consistency verifications will be completed by June 30, 1992.

## Attachment 2

### Answer to NRC Letter dated November 26, 1991

#### REFERENCE

Letter from Robert D. Martin to James C. Deddens dated November 26, 1991

#### ANSWER

In the letter transmitting the Notice of Violation 50-458/91-26 the NRC states that "...given the time that had elapsed since this problem was discovered, the NRC would have expected GSU to have been further along in implementing its long term corrective action plan than was discussed at the enforcement conference." GSU's presentation at the enforcement conference focused primary on the system function, the root cause evaluation, and the safety assessment. At that time, the corrective action portion of the presentation did not contain complete information concerning GSU's actions which were dependent upon ongoing reviews. The following information is provided to give you a more complete description of GSU's corrective actions. NRC's enforcement manual (at 4-7) indicates that a licensee's corrective actions are to be considered only after it "has a clear understanding of the scope of the violation".

On September 18, 1991, the condition described in the Notice of Violation was identified by GSU and reported to the NRC. Once identified, GSU took immediate action to correct the condition resulting in the hydrogen mixing system being returned to an operable status in approximately ten hours. Following this initial action, GSU implemented an action plan to permanently correct the concern and identify the root cause. GSU entered a planned outage on September 22, 1991, which lasted until October 8, 1991. Even though considerable resources were dedicated to planned outage activities, GSU also pursued actions to correct the design of the hydrogen mixing valves. This resulted in a permanent modification to the hydrogen mixing valve logic design which will allow these valves to be opened with a LOCA signal present. The valves were subsequently tested to ensure proper operation. Simultaneously, GSU performed a comprehensive root cause evaluation as described in Attachment 1. For corrective actions to be effective a root cause evaluation must be performed prior to implementation of actions. Because this design error occurred approximately six years ago during construction, determination of the cause of the event was difficult. The evaluation included review of numerous design documents and licensing documents as well as interviews with personnel involved throughout the process. In addition to evaluating the design process, an evaluation of the preoperational test program was conducted. This evaluation is discussed in Attachment 1.

The preoperational test program did not discover the condition because the test was conducted to ensure that the design features functioned as reflected in the electrical elementary diagrams. This is consistent with the description of the system preoperational test requirements as stated in USAR Section 14.2.12.1.24 which states that "All trips, permissives, and interlocks function as specified in the system elementary diagrams." Because the design as described in the elementary diagrams did not include a LOCA override for the outlet valves, the preoperational

## Attachment 2

test program could not have been expected to identify the omission. GSU has confidence that the preoperational test program properly tested systems as designed in elementary diagrams. This is supported by the fact that the inlet valves were tested properly. GSU further believes that its actions relative to review of logic and elementary diagrams will identify any additional errors in elementary diagrams. If any additional errors are found which might impact system function, a review of the preoperational test for that system will be conducted to ensure that the system was appropriately tested and will function properly. Based on the above, GSU had decided prior to the enforcement conference that, while the preoperational test did not identify the problem, it was not the direct cause of the problem nor was it a contributing factor. The reason that the preoperational test did not identify the problem was known and no further corrective action with respect to the preoperational test program was determined to be warranted at that time.

In addition to the actions described above, GSU had, prior to the enforcement conference, performed a review of logic and elementary diagrams with LOCA override features. GSU also had initial discussions with the RBS architect/engineer concerning a review of other logic and elementary diagrams. These actions are discussed in Attachment 1. Other actions completed prior to the enforcement conference included preparation of LER 91-17.

Table 1 (attached) gives the approximate dates of actions and events. GSU believes that the corrective actions described above were extensive and were promptly implemented as can be seen in the information in the table. Until GSU reconciled any differences between the LSKs and ESKs, no meaningful action plan regarding preoperational testing based on ESKs could be formulated. To the extent that LSKs and ESKs depict correct and identical logic, it does not matter upon which preoperational testing is based. GSU has confidence in the preoperational testing of systems because our review to date has found no other significant differences between LSKs and ESKs. As described in Attachment 1, correct ESKs resulted in appropriate preoperational testing.

We therefore conclude that GSU's corrective actions are being appropriately formulated and are timely.

Table 1

EVENT	DATE
Condition Discovered	09/18/91
Condition initially resolved by procedure change	09/19/91
Mid-cycle Outage began	09/22/91
Root cause evaluation began	09/23/91
NRC Exit Meeting	09/24/91
Initial root cause determined	09/26/91
Condition permanently resolved by modification	09/27/91
Initial Notification of Enforcement Conference	10/02/91
Initial GSU review of logic and elementary diagrams began	10/04/91
Mid cycle Outage completed	10/08/91
Initial GSU review of logic and elementary diagrams completed	10/18/91
Root cause completed	10/18/91
LER 91-17 Revision 0 issued	10/18/91
Enforcement Conference	10/23/91
SWEC began design verification sample	10/28/91
Notice of Violation issued	11/26/91
SWEC completed design verification sample	11/27/91