Attachment II

River Bend Station

Preliminary Equipment Survivability Report

Supplement Two

Gulf States Utilities Company

River Bend Station - Unit 1

August, 1985

Introduction

The previously submitted preliminary equipment survivability report (Ref. 1) was based on the original CLASIX-3 analysis of the pressure and temperature response of the River Bend Station following a hydrogen generation event (Ref. 2). The thermal profiles predicted by CLASIX-3 for the wetwell and intermediate volume were used to determine equipment response to deflagration burns. This analysis determined that no deflagration burns would occur in the intermediate volume although a single burn was forced to occur concurrently in the wetwell, intermediate volume and upper containment to deplete the remaining hydrogen inventory after hydrogen release was completed. The equipment survivability analyses based on this thermal environment indicated that with the exception of the hydrogen igniters located in the wetwell all analyzed equipment was capable of surviving the hydrogen generation event.

Although the intermediate volume thermal environment predicted by CLASIX-3 is consistent with the design of the hydrogen ignition system which is based on maximizing hydrogen burning at low concentration which would occur primarily below the HCU floor, there is a possibility that some burns could occur above the HCU floor. Consequently, at the request of the NRC staff, GSU submitted a supplement to the preliminary equipment survivability report (Ref. 3) which evaluated the thermal response of equipment located in the intermediate volume assuming that the equipment was exposed directly to the burn environment predicted for

the wetwell region below the HCU floor. This was an extremely conservative approach since the CLASIX-3 results are very conservative and the intermediate volume equipment will not be exposed to the wetwell thermal environment.

To provide a more realistic upper bound for the intermediate volume thermal environment, a revised Stuck Open Relief Valve (SORV) CLASIX-3 analysis has been performed (see Attachment I of this submittal). This report evaluates the ability of equipment located in the intermediate volume to survive this thermal environment.

2.0 Thermal Environment

The revised SORV base case CLASIX-3 analysis is presented in Attachment I. This analysis was based on a more detailed nodalization of the intermediate volume and more realistic hydrogen burn parameters for all containment regions except in the wetwell volume. The CLASIX-3 model used in the revised SORV analysis split the previously defined intermediate volume into two separate volumes to provide a better definition of the thermal environment to which the equipment would be exposed. These new volumes were termed the lower intermediate volume (HCU floor to El. 141') and the upper intermediate volume (El. 141 ft to refueling floor). The thermal profiles used in this analysis are shown in figures 1 through 3 for the wetwell, lower intermediate volume and upper intermediate volume respectively. Equipment located in the lower intermediate volume

near the HCU floor will be directly exposed to deflagration burns occurring in this volume. Evaluation of the thermal loading to equipment in the lower intermediate volume due to deflagration burns in the wetwell indicates that the thermal radiation contribution should be minimal compared to the intermediate volume deflagrations. This is based on the physical location of the equipment relative to the wetwell burns. For example, the Rosemont transmitters are effectively shielded from the wetwell burns by the floor plate upon which the panels are mounted and by the HCU floor grating. Since the grating has a blockage function of 0.3 and the view angle is relatively small for these transmitters, the radiative heat flux due to wetwell burns was judged to be of minor importance. Inspection of the lower intermediate volume thermal profiles shows that the flow of hot gases from the wetwell due to burns in the wetwell has been included in this profile.

3.0 Equipment Modeled

The equipment modeled in this analysis are a Rosemont transmitter and a Reliance motor. The HEATING6 models used in this analysis are the same as the models previously submitted (References 1 and 3). Emphasis was placed on these pieces of equipment since these are the only equipment, other than cable, required to survive a hydrogen generation event which are located in the lower intermediate volume. Inspection of the thermal profile for the upper intermediate volume indicates that the maximum temperature

reached in this volume is 320°F, since these temperatures are only slightly higher than the temperature profiles previously analyzed (Reference 1). All equipment located in the upper intermediate volume is expected to survive the hydrogen generation event. Further analysis of the survivability of equipment located in this volume is not judged to be necessary at this time.

4.0 Results/Conclusions

The results of this evaluation are summarized in Table 1 which shows the temperatures reached by the casing and the most thermally limiting sub-component when exposed to the lower intermediate volume deflagration burn environment predicted by CLASIX-3.

For the Rosemont transmitter, the case temperature at the end of the transient was below the equipment qualification temperature. Therefore, the survivability of these transmitters is assured. Although the case temperature of the Reliance motor was slightly above the equipment qualification temperature at the end of the transient, the sensitive component, the motor coil, was well below the qualified temperature.

These results show that the essential equipment located in the lower intermediate volume is capable of surviving the hydrogen generation event.

REFERENCES

1) RBG-21,423 dated July 1, 1985
from Gulf States Utilities (J. E. Booker) to
Nuclear Regulatory Commission (H. R. Denton)

2) RBG-21,218 dated June 7, 1985
from Gulf States Utilities (J. E. Booker) to
Nuclear Regulatory Commission (H. R. Denton)

3) RBG-21,771 dated August 5, 1985
from Gulf States Utilities (J. E. Booker) to
Nuclear Regulatory Commission (H. R. Denton)

Table 1

Summary of Results

Unit	Equipment Qualification Temperature	Predicted Temperature	
		Casing	Sensitive Component
Rosemont Transmitter Model 1154	320°F	311°F	290°F
Reliance Motor on Limitorque Operator	345°F	347°F	311°F

FIGURE 1

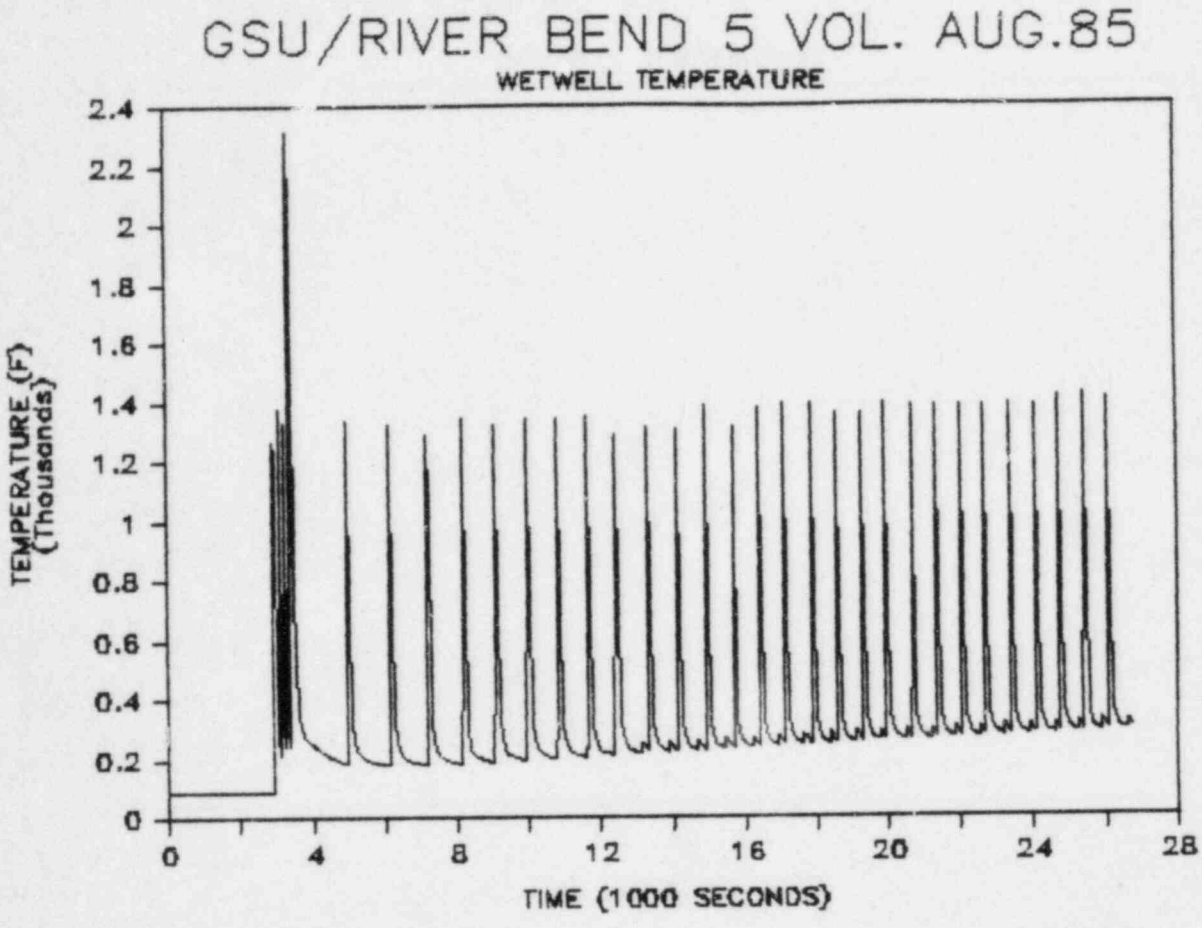

GSU/RIVER BEND 5 VOL. AUG.85
WETWELL TEMPERATURE
TEMPERATURE (F)
(Thousands)
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 2

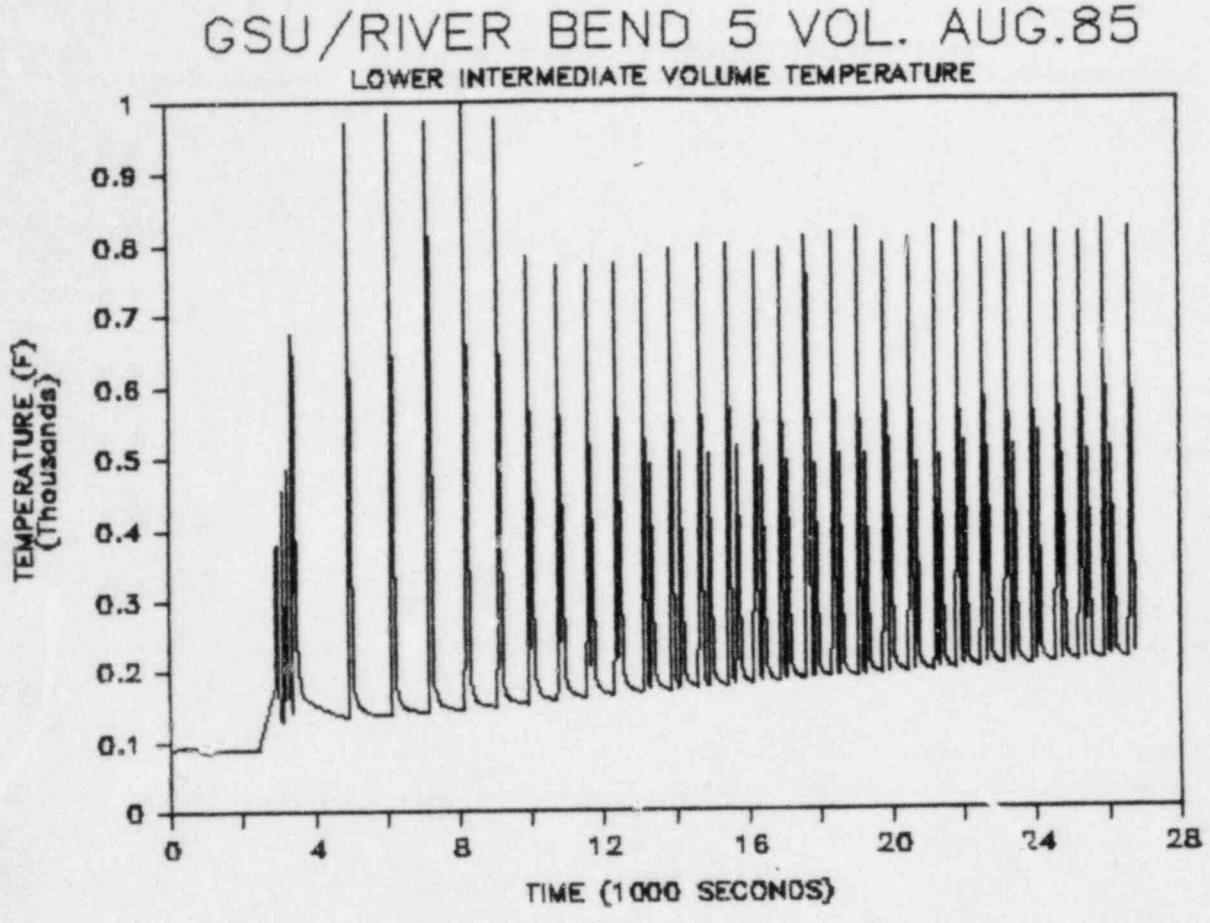
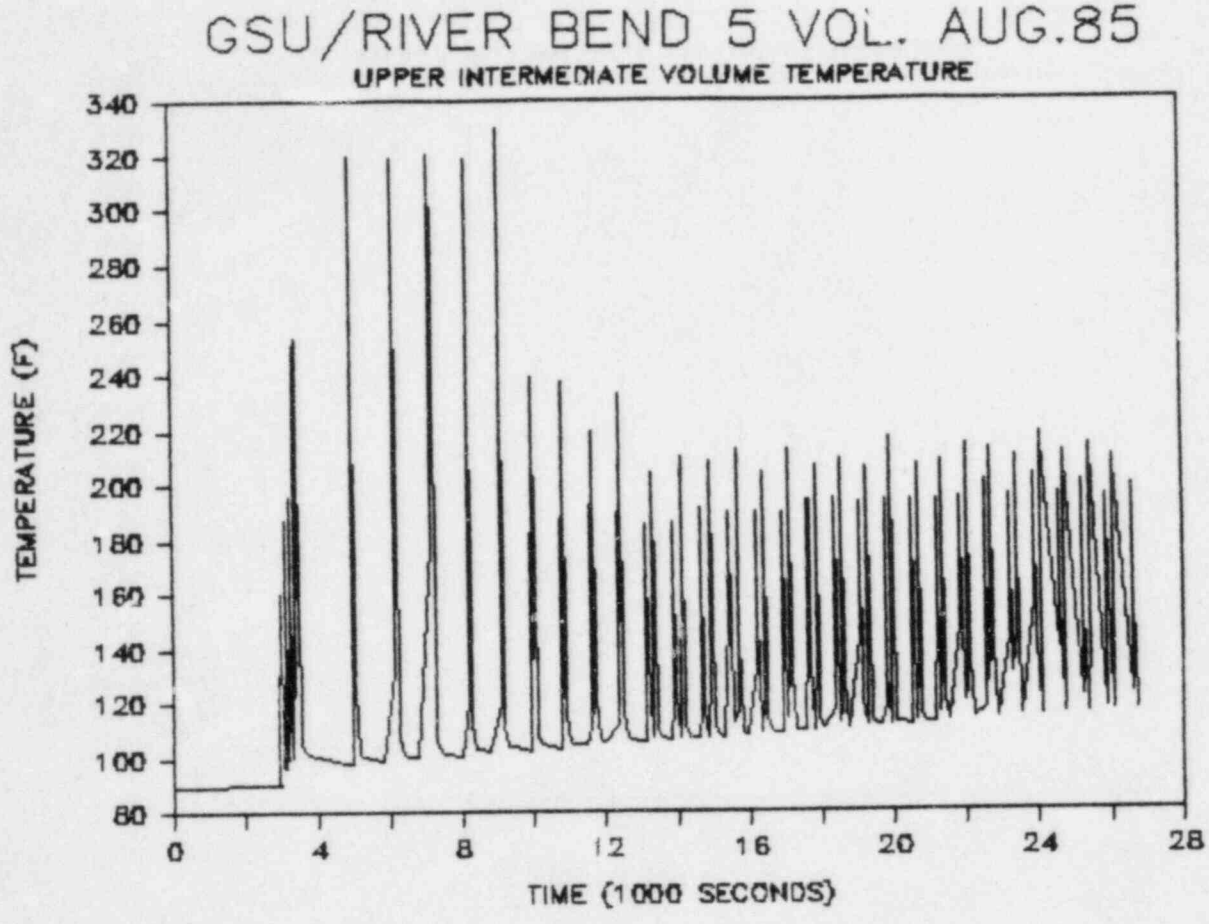

GSU/RIVER BEND 5 VOL. AUG.85
LOWER INTERMEDIATE VOLUME TEMPERATURE
TEMPERATURE (F)
(Thousands)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 3


GSU/RIVER BEND 5 VOL. AUG.85
UPPER INTERMEDIATE VOLUME TEMPERATURE
TEMPERATURE (F)
340
320
300
280
260
240
220
200
180
160
140
120
100
80
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)