GULF STATES UTILITIES COMPANY
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AREA CODE 713 838-6631

June 25, 1984
RBG- 18,089
File No. G9.5

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Denton:

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

Enclosed is Gulf States Utilities Company's (GSU) response to the staff request for additional information concerning the River Bend Station combustible gas control system transmitted to W. J. Cahill from Mr. A. Schwencer on April 5, 1984. GSU recognizes the staff concern that the hydrogen control issue (for degraded core accidents) be resolved for the River Bend Station prior to operation above 5% full power with an acceptable interim system, if not the final resolution.

The River Bend Station plant unique characteristics will be fully addressed in the Hydrogen Control Owners Group (HCOG) test program. Therefore, results of these tests will give an accurate post degraded core accident thermal environment for the River Bend Station.

Efforts are currently underway to address the survivability of essential equipment following a postulated degraded core event. This effort will continue throughout the HCOG test program and includes the evaluation of all feasible alternatives which are available to assure equipment survivability. Based on this evaluation, GSU will select suitable equipment protection measures appropriate for the equipment location and the degraded core thermal environment.

Sincerely,

J. E. Booker

J. E. Booker
Manager-Engineering,
Nuclear Fuels & Licensing
River Bend Nuclear Group

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Response to Request for
Additional Information
Combustible Gas Control

1. Provide the ultimate capacity in terms of psig of the containment shell for the negative (reverse) pressure. The structural region or item which limits the pressure retaining capability should be identified as well as the particular failure mechanism.

   Response:

   The calculated ultimate static, negative (reverse) pressure capability of the steel containment shell is -4.82 psid. This value is determined from the containment vessel cylinder buckling strength, based on ASME Code Case N-284.

   The ultimate negative pressure capacity of other components of the containment including the equipment hatch, personnel airlocks, fuel transfer tube enclosure, CRD removal tube enclosure, and piping penetrations and bellows were also evaluated. The limiting ultimate negative pressure capacity of these components is -46 psid for the containment personnel airlock.

   Based on this evaluation, the containment ultimate negative (reverse) pressure capability is limited by the capacity of the steel containment shell which is -4.82 psid.

2. Provide the ultimate capacity in terms of psig of the drywell pressure retaining boundary for negative pressure and also provide the effect on the drywell including the steel head of the water in the refueling pool if the refueling pool is filled with water during operation. The structural region or item which limits the pressure retaining capability should be identified as well as the particular failure mechanism.

   Response:

   The drywell, which includes the drywell wall, combination equipment hatch and personnel door assembly, personnel air lock, CRD removal tube enclosure, piping penetrations and drywell head is designed for a negative pressure differential, including the effect of water in the refueling pool, of -20 psid (Ref. FSAR Sec. 6.2.1.1.1).

   The River Bend specific CLASIX-2 analysis which is underway at this time will be reviewed to determine if the negative pressure produced by hydrogen burns exceeds the drywell design negative pressure capacity.

   If this review indicates that the pressure differential produced by hydrogen burns exceeds the design capability, the ultimate negative pressure capacity will be evaluated and submitted.

3. Provide the maximum calculated negative containment pressure which would result from complete combustion of an amount of hydrogen corresponding to a 75% metal-water reaction (oxygen depletion) and the subsequent cooling of the containment atmosphere. Include a description of the analytical model and justify the assignments used to determine the internal containment pressure response, e.g., by addressing the conservatism with respect to plant-specific applications. It is anticipated that, in most cases, the calculated containment negative pressure differential would exceed the design value. Therefore, you may elect to demonstrate that:

   a. The calculated external containment pressure capability value, which should be calculated and provided for River Bend Station, bounds the above transient, which is determined to be the most limiting pressure differential. Thus, the containment has the capability to withstand the most severe external pressure that might result following a hydrogen combustion event.

   b. Alternatively, provide a description of the design provision regarding automatic and manual means for relieving reverse pressure differentials, e.g., by use of vacuum breakers. The discussion should include the operating procedure concerning monitoring of containment pressure, and operator actions to relieve pressure differentials following onset of an accident. In addition:

      1) The system that is relied on to relieve reverse pressure differentials must be shown to survive the consequences of burning the hydrogen generated from a 75% metal-water reaction.

      2) An analysis should be included to show the effectiveness of this system when considering the above stated assumptions.

Response:

The maximum calculated negative containment pressure resulting from complete combustion of an amount of hydrogen corresponding to a 75% metal-water reaction (oxygen depletion) and the subsequent cooldown of the containment atmosphere assumed that the limiting condition was complete depletion (i.e., 0 v/o oxygen remaining) of all available oxygen within the containment. This depletion of oxygen results in reducing the non-condensibles within the containment by 21%. The calculation also assumed that the containment was cooled to the original (pre-accident) temperature of 90°F. The calculation conservatively assumed zero relative humidity prior to the hydrogen burn event to maximum the oxygen depletion. The assumptions of zero relatively humidity after the event was also assumed to maximize the containment negative pressure. Additional conservatisms included the assumption that there was no additional positive pressure contribution due to either excess hydrogen or steam remaining in the containment.

The maximum calculated negative pressure was found to be -3.1 psig. Since this maximum negative pressure is less than the ultimate containment negative pressure capability of -4.82 psid, Part b of Question 3 will not be addressed.