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January 31, 1985
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File No. G9.5
G9.8.2.6

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 the Gulf States Utilities Company (GSU) final response to Safety Evaluation Report (SER) Confirmatory Item #18 - Containment Purge Valves (SER Section 6.2.4.3, Pg. 6-29). The letter from J. E. Booker (GSU) to H. R. Denton (Nuclear Regulatory Commission - NRC) dated November 8, 1984 provided a partial response to SER Confirmatory Item #18. The response provided in Enclosure 1 addresses Staff Position No. 6 regarding the operation of the Drywell Purge System.

The revised pages from the Final Safety Analysis Report (FSAR) contained in Enclosure 2 are updates from the 11/8/84 letter and have been included to completely address this confirmatory item. All FSAR pages included in Enclosure 2 supercede their respective pages of the 11/8/84 letter and will be incorporated into the next amendment.

Sincerely,
Eddie R Grant
for J. E. Booker
Manager-Engineering,
Nuclear Fuels & Licensing
River Bend Nuclear Group

JEB/WJR/ERG/JWL/kt
Enclosure

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6. STAFF POSITION

The drywell supply and exhaust isolation valves shall be normally closed during Modes 1 through 3 except:

a. To accommodate drywell pressure control or reduce drywell activity levels in Operating Mode 3, the applicant shall limit use of the drywell purge system to 90 hours per year (cumulative) for Operating Mode 3.

b. To accommodate the need for drywell pressure control during Operating Modes 1 and 2.

   (1) Either the exhaust or supply lines of the drywell purge system may be opened, but both lines shall not be opened at the same time.

   (2) While venting the drywell, the containment shall not be vented or purged, and

   (3) The total time of venting the drywell shall be limited to five hours per year (cumulative) for Operating Modes 1 and 2. This restriction will be withdrawn upon receipt and NRC approval of analyses to demonstrate acceptable consequences on the containment structure and the enclosed equipment following onset of the most limiting primary system break during use of the drywell purge system.

RESPONSE

Gulf States Utilities (GSU) has carefully reviewed the design and operational characteristics of River Bend Station's (RBS) Drywell Purge System and proposes the following to control drywell pressure and reduce drywell activity levels in Operating Mode 3:

> The use of the drywell purge system shall be limited to 90 hours per year (cumulative) in Operating Mode 3.

GSU further proposes the following to control drywell pressure in Operating Modes 1 and 2:

> The total time of venting the drywell shall be limited to five hours per year (cumulative) for Operating Modes 1 and 2.

This drywell venting shall consist of:

a) A prerequisite of operating the containment purge system such that the purge exhaust fan is drawing air from the containment through the purge system charcoal filter. The purge supply is also providing makeup air to the containment, and

b) The drywell venting operation performed via station operating procedures. A dedicated operator shall open one division of supply and exhaust drywell isolation valves and without delay open the other division of supply and exhaust drywell isolation valves. Once the second division is indicated as full open, the dedicated operator shall, again without delay, begin to close at least one division of the drywell isolation valves. The dedicated operator shall not attend to any other responsibilities from the time he begins opening drywell purge isolation valves until he has indication that all four drywell isolation valves have closed.

GSU has developed this procedure pursuant to following bases and justifications:

1) This operation is not expected to result in an open drywell vent path in excess of two minutes per venting operation.

2) Drywell purging operations will be performed by a qualified, dedicated operator following a station operating procedure. This operation will be logged accordingly such that detailed records are maintained.

3) The operation of the drywell purge system will be evaluated following the first cycle of operation and a report regarding future operation will be submitted to the NRC prior to startup of the second cycle.

4) The design of the drywell purge system supply and exhaust lines includes an interlock requiring coupled operation. This interlock was provided to prevent a negative pressure in the drywell beyond the design basis.

5) As a result of the restrictions placed on the containment purge system, it is undesirable to purge the drywell to the containment. Such operation would significantly increase the radioactivity in the containment and require additional containment purge time to maintain the containment below 25 percent maximum permissible concentration (MPC). This is not consistent with Staff Position No. 1 which requested minimization of containment purging.

6) A drywell to containment purge would require additional health physics monitoring and therefore lead to additional personnel dose. This not consistent with estabished ALARA policies.

With these conclusions in mind, GSU proposes to utilize the drywell purge system as designed; while restricting such operation to 90 hours per year (cumulative) in Operating Mode 3, to accomodate the need for drywell pressure control or reduce drywell activity levels, and 5 hours per year (cumulative) in Operating Modes 1 and 2, to accomodate the need for drywell pressure control.

ENCLOSURE 2

The following summary addresses those FSAR revisions contained within this Enclosure.

- o Page 6.2-80 has been revised as a result of the recently completed RBS Environmental Qualification Program.

- o Page 6.2-87 has been added to provide the same additions as those on Page 6.2-80, Insert 1.

- o Table 6.2-52 has been revised in several areas.

  - All references at the end of the Table have been removed because Ref. 27 at the end of Section 6.2 adequately addresses docketed information

  - The changes to Items 7, 9 and 13 were made for consistency with the above discussion

    - Item 10 is an update
    - Item 13 is a clarification

  - Reference 1 has been changed to Reference 27 since Reference 27 contained the Posi-Seal International, Inc. report as Attachment 4

- o Page 9.4-58 has been added for cross-reference.

3.5 volume percent. Thus, the hydrogen mixing system is capable of removing hydrogen at a rate of 2.2 times the generation rate.

Initiation of the hydrogen mixing system requires an operator first to energize an inlet valve in the line connecting the drywell and containment. Opening of the valve equalizes drywell and containment pressures if they are different. An interlock is provided to prevent opening of the outlet valves before the inlet valves are fully opened. The operator then manually opens the outlet valves
Insert 3 and, with the valves in their fully opened position, starts the hydrogen mixing fan (Fig. 7.3-8). There is no limitation on the initiation of hydrogen mixing system due to pressure differentials between the drywell and containment.

Using extremely conservative assumptions, hydrogen mixing system initiation is not required until at least 3 hr following the LOCA. An alarm is sounded in the main control room when hydrogen concentration at any of the four drywell sample points is determined by the analyzer to be greater than or equal to 3.5 volume percent. This alarm signals the
INSERT 1 operator to manually initiate the hydrogen mixing system. The requirement for manual operation ensures that spurious signals do not prematurely actuate the system and, therefore, do not result in inadvertent steam bypass leakage from the drywell to the primary containment. The valve interlock previously described ensures that a single operator error does not result in initiation of the hydrogen mixing fans. Although a single operator error could result in the opening of one 6 in hydrogen mixing system inlet path, the allowable steam bypass leakage capacity for the River Bend Station drywell ($A/\sqrt{k}$ = 1.0 ft²) exceeds the
INSERT 2 bypass leakage capacity of this leakage path as discussed in Section 6.2.1.1.3.4.

Drywell and containment conditions of pressure, temperature, and hydrogen concentration are continuously monitored and are available to the main control room operators.

6.2.5.2.2 Hydrogen Recombiner System

The long-term control of hydrogen below the 4 percent by volume flammable limit is achieved by means of thermal hydrogen recombiners located in the primary containment. The hydrogen recombiner system is fully redundant and consists of two 100 percent capacity hydrogen recombiners.

Insert 1 for page 6.2-80

The hydrogen mixing system valves close on a LOCA signal which can be overridden by the operator upon verifying that an actual LOCA does not exist.

Insert 2 of page 6.2-80

(A/ $\sqrt{k}$ = 0.2 sq.ft.0

Insert 3 for page 6.2-80

The limitation on the initiation of the Hydrogen Mixing System due to pressure differentials between the drywell and containment is 3 psid because of the hydrogen mixing valve design. These valves will operate (i.e. open against a 3 psid pressure differential) for up to 180 day after an accident.

controls, instrumentation, fans, recombiners, piping, and valves. System reference characteristics, such as pressure differentials and flow rates, are documented during the preoperational tests and are used as base points for measurements in subsequent operational tests.

During normal operation, the hydrogen mixing system fans, piping, recombiners, valves, instrumentation, wiring, and other components outside the drywell can be inspected visually at any time.

6.2.5.5 Instrumentation Requirements

6.2.5.5.1 Hydrogen Mixing System

Control switches are provided in the main control room for manually opening and closing the hydrogen mixing inlet and outlet valves. Interlocks prevent the outlet valves from opening unless the associated inlet valves are fully open.

Insert

The Hydrogen Mixing System valves close on a LOCA signal which can be overridden by the operator upon verifying that an actual LOCA does not exist.

Control switches are provided in the main control room for manually starting and stopping the hydrogen mixing fans. Interlocks prevent the fans from running unless the associated inlet and outlet valves are fully open. Hydrogen mixing system inoperative alarms are provided in the main control room.

6.2.5.5.2 Hydrogen Recombiner System

Pushbutton controls are provided in the main control room for operation of the hydrogen recombiner feeder breakers.

On-off control switches and raise-lower potentiometers are provided in the main control room to operate the hydrogen recombiner electric heaters. Wattmeters and temperature indicators are provided in the main control room for monitoring the power to the heaters and the temperature of the gas stream. Hydrogen recombiner system inoperative alarms and breaker auto-trip alarms are provided in the main control room.

6.2.5.5.3 Containment Hydrogen Purge System

Local control switches and pushbutton controls are provided for manual operation of the containment hydrogen purge fan and associated discharge valve, respectively. Local pushbutton controls are also provided for the containment hydrogen purge discharge valve to annulus.

TABLE 6.2-52

SUMMARY OF CONTAINMENT PURGE VALVE OPERABILITY DEMONSTRATION

Consideration	RBS Analysis	
1. Valve closure rate vs time	Valve closure is within 3 seconds. This is ensured in Reference 1. The 3-second closure ensures worst-case differential pressure of 3 psi or less (see Item 2).	27
2. Flow direction through valve and dP across the valve	Flow direction evaluation in Reference 1. 1HVR*AOV165 and 166 are in preferred direction for closure, and 1HVR*AOV123 and 128 are in nonpreferred direction. The maximum differential pressure is less than 3 psi based on various accidents outlined on FSAR Figures 6.2-4 through 6.2-7. Isolation occurs based on drywell pressure. See Logic Description, FSAR Figure 7.3-9, sheet 14.	27
3. Single valve closure vs simultaneous valve closure	In performing the LOCA analysis, it was assumed that the valves close individually. This assumption is considered more conservative because if both valves closed simultaneously, the resistance in the system would be greater, and consequently, the flow and the aerodynamic torque would be less.	
4. Containment backpressure effect on closing torque margins of the air-operated valves, which vent pilot air inside containment	The backpressure effect on venting pilot air to the containment is conservatively addressed in Reference 1 (i.e., assumed 9 psi containment backpressure).	27
5. Adequacy of accumulator	Accumulator not required. Valves close by spring force on release of air from operator.	
6. Adequacy of torque-limiting devices	No torque-limiting devices are required because of the valve design.	
7. Effect of upstream and downstream piping system	The effect of the piping system was addressed in Reference 1. Only one valve, 1HVR*AOV123,	27

required that the effects of an elbow be addressed. An investigation by Posi-Seal could not develop conclusive results about the effects of elbows on the flow stream. For this reason Posi-Seal made estimates about effects on the flow stream through the bend and added this to the LOCA-developed torques through a straight run of pipe. Posi-Seal's analysis, outlined in Reference 1, indicated that the valve actuator would develop enough torque to close the valve. After reviewing the effects of a 3 psi pressure differential across the valve, the LOCA-developed torque was doubled through a straight run of pipe in accordance with the NRC concern outlined in ~~Enclosure 4 of Reference 3~~ Attachment 4 to the letter from A. Schwencer (NRC) to W.J. Cahill (GSU) dated December 21, 1982 (GSU Letter No. RBC-21495). Doubling of this torque did not exceed the available actuator closing torque thus indicating that the valves would close. 27

8. **Effects of butterfly valve disc and shaft orientation on valve operation**

   The effect of the valves' disc and shaft orientations was addressed in Reference 1. The analysis, assuming a 9 psi pressure drop across the valves, indicated that valve 1HVR*AOV123 be restricted at 65 deg open. To be conservative, all four valves will be restricted to 65 deg open. When restricted to this size opening, and considering the valve design, flow will tend to close the valve. 27

9. **Seismic and stress loading**, solenoids, and limit switches

   Valves were seismically analyzed and ~~analyzed~~ Qualified for stress conditions developed by a LOCA in the Reference 1 report. The report, in combination with the Posi-Seal seismic report (Reference 2) and SWEC supplemental calculation No. SQE 2005, qualifies the valve for all seismic and dynamic loading conditions. The NAMCO EA-740 Qualification Report No. QTR111

	(Reference 4) and SWEC supplemental calculation No. SQE 2008 address the dynamic loading conditions for the limit switches. The ASCO HV206-832-6F solenoids are qualified for seismic and dynamic loading conditions by Report No. AQR 67368 (Reference 3) and SWEC supplemental Calculation No. SQE 2042.
10. Effects of environmental conditions on valves (i.e., radiation temperatures, containment sprays, etc)	The environmental qualification program will qualify the valves and their limit switch and solenoid attachments to a qualified life. Preliminary analysis indicates that each valve assembly (including attachments) is qualified for a maximum of 1.76 years. This analysis indicates that the solenoids must be changed every 1.76 years. Valves 1HVR*AOV165 and 166 have a qualified life of 17.9 years and valves 1HVR*AOV123 and 128 a qualified life of 26.9 years. DELETE AND REPLACE WITH INSERT
11. Seal integrity after closure of valves, including environmental effects	Valves were pressure leak-tested by the vendor to a minimum of 75 psig using the halogen diode detector method outlined in accordance with ASM Section V, Article 10, Paragraph T-1040. During plant operation, the valves will be subject to the integrated leak rate test in accordance with 10CFR50, Appendix J. At least once every 92 days, the seals will be tested to demonstrate their integrity in accordance with Technical Specifications Section 4.6.1.8.2. The seals were evaluated under the environmental mechanical equipment qualification program, resulting in 40-year qualified life.
12. Debris screens	Debris screens have been installed in accordance with NRC requests in Branch Technical Position CSB 6-4 (see FSAR Section 9.4.6.2.5).

Insert for Table 6.2-52, Item 10

The RBS Environmental Qualification Program demonstrates qualification of the valves, actuators and limit switches for 40 years. The solenoids on valves 1HVR*AOV123 and 128 are qualified for 4.1 years and solenoids for valves 1HVR*AOV165 and 166 for 2.5 years.

13. Scope of operational and leak tests performed on valves	Valves have been hydrostatically tested by the seller for adherence to requirements of Paragraph NC 6000, Code Class 2, ASME III. The valves have been leak tested to requirements outlined in Item 11 of this table. The valves have been cycled by the seller to indicate that they open against a maximum differential pressure of 15 psi. Valve 1HVR*AOV128 has been tested for operability with a simulated static load of 3.0 g placed on the valve. The test was outlined in the Posi-Seal Static Operability Report (Reference 5), qualifying valves 1HVR*AOV123, 128, 165, and 166. During plant operation, the valves seals will be demonstrated operable every 92 days in accordance with Technical Specification Section 4.6.1.8.2. In accordance with Reference 1, hydrodynamic testing was performed by Posi-Seal on valves up to 14 inches. The hydrodynamic testing, in combination with the analysis outlined in Reference 1, developed aerodynamic torque coefficients for the subject valves. The results of this combination of testing and analysis was applied to RBS's design conditions to verify that valves 1HVR*AOV123, 128, 165, and 166 will isolate the containment during the postulated LOCA.

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Insert for Tabel 6.2-52, Item 13

Hydrodynamic testing was performed by Posi-Seal International, Inc. on valves up to 14 inches in diameter. An analysis was also performed to demonstrate that the hydrodynamic test data can be applied to develop aerodynamic torque coefficients for the subject valves. The applicability is attributed to the low mach number and a flow compressibility factor approaching unity. The results of this combination of testing and analysis was applied to RBS's design conditions to verify that valves 1HVR*AOV123, 128, 165, and 168 will isolate the containment during the postulated LOCA.

References

1. Posi-Seal International, Inc., Seismic and LOCA Report No. 10837SL-001 (SWEC File No. 4228.241-092-016)

2. Posi-Seal Seismic Report (SWEC File No. 4228.241-092-004)

3. ASCO Qualification Report No. AQR67368 (SWEC File No. 6228.241-092-010B).

4. NAMCO Qualification Report for EA740 Limit Switches No. QTR111 (SWEC File No. 6228.241-092-008)

5. Posi-Seal Static Operability Qualification Report No. 10837ST-001 (SWEC File No. 4228.241-092-011)

are designed to Seismic Category I requirements. The motors and controls are supplied with power from their respective independent standby emergency power sources.

9.4.6.2.5 Containment and Drywell Purge System

The containment and drywell purge system is designed either
to continuously purge the containment or to recirculate air
during periods of testing. The system has the capability of
being operated at two different capacities. The normal
system operating capacity is 7,000 cfm. During normal
operation, only the containment is purged in order to
maintain the radionuclide concentrations at less than
25 percent of maximum permissible concentration as given in
10CFR20, paragraph 20.203.d(1)(ii) and Appendix B, Table I,
2 Column 1. The use of recirculation only is not adequate to
maintain containment levels below those designated for an
airborne radioactivity area. The drywell purge system is
provided to reduce drywell airborne levels during shutdown
and refueling outages, not during normal operations. A
second manually actuated system with a capacity of
15 12,500 cfm is provided to operate in the event of a
mechanical failure of the normal operating system. This
system discharges filtered outside air into the containment
and/or drywell and exhausts it through the SGTS
(Section 6.5.1) to the atmosphere.

The containment/drywell purge system consists of an intake structure, air filter, purge supply fans, supply and exhaust distribution ductwork, charcoal filtration unit, exhaust fans, isolation valves, associated controls, and radiation monitoring systems. The fresh air is drawn through an intake structure located on the roof of the auxiliary building. The auxiliary building is a tornado-proof structure, and the air intake is covered by a tornado-proof enclosure.

Insert

Seismic Category I debris screens are located a minimum of
one pipe diameter away from the inner side of each inboard
containment purge isolation valve. The screens are
11 constructed from 3/16-in-thick stainless steel bar, with a
nominal opening of 2 in x 1 3/16 in. The debris screens are
designed to withstand the LOCA differential pressure. The
piping between the screens and the isolation valves is also
Seismic Category I.

Outdoor filtered air is distributed to the general areas of the containment and drywell. The purge air is exhausted

Qualification of the 36 in purge valves is outlined in Section 6.2.4.3.7.2 and Table 6.2-52.