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November 8, 1984
RBG- 19,385
File No. G9.5, G9.8.2.6,
G9.19.2

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

Attached is Gulf States Utilities Company's (GSU) revised response (Attachment 1) to the Staff Position regarding the River Bend Station (RBS) Drywell/Containment Purge System transmitted to Mr. W. J. Cahill from Mr. A Schwencer on January 23, 1984. This transmittal supersedes GSU's letter from Mr. J. E. Booker to Mr. H. R. Denton dated March 13, 1984 and reflects discussions held with the Staff on April 3, 1984.

In addition, GSU's position as stated herein represents the response to the Safety Evaluation Report (SER) Confirmatory Item #18 - Containment Purge Valves (SER Section 6.2.4.3, pg. 6-29).

Attachment 2 contains revised text of the Final Safety Analysis Report (FSAR) to support statements in Attachment 1 and in combination with Attachments 3 and 4 address the Staff's Request for Additional Information on Purge and Vent Valve Operability transmitted to Mr. W.J. Cahill from Mr. A. Schwencer on March 15, 1982. The revisions contained in Attachment 2 will be included in a future FSAR Amendment.

Sincerely,

J. E. Booker

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

JEB/WJR/JWL/je

Attachments (4)

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1. STAFF POSITION

Continuous containment purging through large diameter valves will not be allowed. We will require the applicant to develop appropriate interim guidelines that will establish provisions for a reduction in the use of the containment purge system. These guidelines will consider limitations on airborne activity levels to satisfy the as low as reasonably achievable (ALARA) levels and overall containment air quality in determining when use of the purge system is not needed. The interim guidelines shall be furnished to the NRC staff six months before the initial fuel load data.

RESPONSE

GSU has performed an analysis to estimate the number of hours per year that containment purge will be required for containment radiation purposes. This analysis is based on GE Document No. 22A5718, Revision 1, "Mark III Containment Dose Reduction Study", dated March 11, 1980, using design basis main steam and coolant source terms. The buildup of airborne activity in the containment is assumed to be interrupted every 18 months for a refueling outage. The basic criteria used in this analysis was to maintain airborne activities below 25 percent maximum permissible concentration (MPC) during normal operation. Using the normal containment purge rate of 7,000 cfm, the results of the analysis indicated that a normal containment purge usage of 7,300 hours per year is required to limit the airborne activity to 23 percent MPC. This analysis has been reflected in the proposed RBS Technical Specifications submitted July 17, 1984 (RBG-18,233).

2. STAFF POSITION

The applicant shall commit to implement a data collection effort to justify the need for containment purging. Before startup after the first regularly scheduled refueling outage, the applicant shall use the results from the above program (based on containment purge system (CPS) operating experience information) to evaluate the plant's need for purging. A summary of the evaluation shall be provided to the NRC staff before the plant returns to operation.

RESPONSE

GSU will implement a data collection program, during the first fuel cycle, to collect and evaluate RBS containment purge operating experience information. An evaluation of this information will be made to determine if personnel exposure can be reduced, if airborne concentrations were maintained less than 25% of the maximum permissible concentration as specified in 10CFR20, and if changes to the interim purge guidelines are warranted.

GSU is aware that data gathered during the first fuel cycle may not necessarily be indicative of dynamic plant conditions and will consider future plant usage in evaluation of the interim guidelines. Evaluation of the interim guidelines will include any applicable Mark III purge experience.

3. STAFF POSITION

The applicant shall commit to develop a containment access management program so that access time requirements will be minimized as appropriate. Considerations of the total spectrum of activities to be performed, as well as when and how those activities can be accomplished, will be included. A description of this program shall be furnished to the NRC staff six months prior to the initial fuel load date.

RESPONSE

GSU has developed a containment access management program (CAMP) to minimize personnel access and residence time in containment.

The primary objective of the CAMP for River Bend Station is to control and evaluate containment access based on plant specific operational experience. In order to control and evaluate containment access, the CAMP will consist of the following activities:

1. Procedures to control containment access
2. Collection of access data during first fuel cycle
3. Evaluation of access data
4. Recommendations based on data evaluation

Control of containment access will be by procedure which establishes criteria to be met prior to entry, coordinates the entry among the various site groups (i.e. Operations, Security, Maintenance) and directs the collection of access data:

1. When entries are made
2. Purpose of each entry
3. Duration of each entry
4. Number of personnel required for each entry

Access data will be evaluated at the end of the first fuel cycle to determine if regularly scheduled containment entries are being consolidated to the greatest extent possible and if equipment performance indicates that the frequency of operational checks and routine surveillances can be reduced based on the data evaluation. Recommendations will be made by the ALARA Committee to Operations and Maintenance with regard to frequency and scheduling of operational checks and routine surveillances.

4. STAFF POSITION

Purging of the containment shall be accomplished by use of a low-volume purge system, i.e., purge valve size shall not exceed 8" for Operating Modes 1, 2, and 3 (i.e., power operation, start up and hot shutdown). However, to avoid delays in critical path testing of the purge system and the resultant impact on fuel load schedules, it is proposed that the existing system be used until it is determined, based on Items 1-3 above, when purging is needed and the line size to accomplish this. The applicant shall also commit to submit for staff review all available data and proposed programs that demonstrate the reliability of the 36-inch diameter valve utilized at River Bend Station six months prior to fuel load.

RESPONSE

Based on GSU's stated position on Items 1-3 above, GSU is using the existing system equipment for limited purge in accordance with the interim guidelines. Based on the results and evaluation of the containment purge operational data gathering program in Item 2, the purge guidelines for the first fuel cycle will be evaluated and a report submitted to the NRC.

Enclosed are the Posi-Seal International, Inc., report (see Attachment 4) supplemental technical justification (see Attachment 3) and an evaluation of NRC Branch Technical Position (BTP) CSB 6-4, outlined in table form (see Attachment 2). In conjunction with the enclosed documentation, which outlines the considerations developed for showing valve reliability, GSU will add actuator limit stops restricting the valves to a 65-deg opening and change the bolting material on valve 1HVR*AOV123 to SA354GRBD. The restriction was developed in the LOCA and seismic analysis (Attachment 4) based on flow rates developed with a conservative 9-psi pressure drop across the valves. GSU is implementing the Posi-Seal recommendations for all valves, even though our estimated dP will be 3 psi with significantly lower aerodynamic torques. This is addressed in the technical justification. The bolts are being changed to ensure that valve 1HVR*AOV123 is not overstressed during seismic and LOCA events.

5. STAFF POSITION

Purge/vent valves that are to be used during Operating Modes 1 through 3 shall meet all staff requirements set forth in Branch Technical Position 6-4.

RESPONSE

GSU will comply with the intent of BTP 6-4 with the following clarifications:

1.(a) Comply

1.(b) The current number of primary containment/drywell purge supply and exhaust lines are limited to one supply and one exhaust line.

1.(c) The current design utilizes 36 inch containment isolation valves and 24 inch drywell isolation valves for the primary containment/drywell purge supply and exhaust lines.

1.(d-g) Comply

2. Comply

3. Recirculation of containment atmosphere is accomplished through an external purge filter.

4. Comply

5.(a-d) Comply

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

GSU is currently studying the need, availability and design of the drywell purge system in light of the Staff's recommendations and will respond by December 14, 1984.

7. STAFF POSITION

If purging (either drywell or containment) is through the SGTS, requirements 5b of Branch Technical Position 6-4 should be met, otherwise, the following restrictions should be implemented.

a. Whenever the purge system is in use during Operating Modes 1, 2, and 3, only one of the two SGTS trains shall be used, and

b. Both SGTS trains are determined to be operable whenever the purge system is in use.

RESPONSE

Normal primary containment purging (7000 cfm) in Operating Modes 1, 2 and 3 will be through the containment purge exhaust filter; however, one standby gas treatment system (SGTS) subsystem may be in the purge flow path provided that both SGTS subsystems are operable. The two SGTS trains will not be used in the fast purge mode (25,000 cfm) in Operating Modes 1, 2 or 3.

8. STAFF POSITION

The hydrogen mixing system shall not be opened during Operating Modes 1 through 3 for drywell pressure control or airborne activity level reduction since the valves on this system receive no LOCA isolation signal.

RESPONSE

The hydrogen mixing system valves for the drywell close on a LOCA signal. This signal can be overridden by the operator upon verifying that an actual LOCA does not exist (see revised FSAR Section 6.2.5.2.1 contained in Attachment 2.) In addition, the hydrogen mixing system valves are environmentally qualified; therefore, one inlet line or one exhaust line may be opened for drywell pressure control provided that the primary containment/drywell purge valves are closed. The potential for drywell bypass with the 6 inch hydrogen mixing system inlet valve open is 0.20 sq.ft. which is bounded by the analyzed allowable bypass for the entire spectrum of breaks for RBS. Based on acceptable containment pressurization consequences under all break conditions with one hydrogen mixing line path open, GSU may elect to utilize this path for drywell pressure control with no limitations on total time for venting in a year. While venting the drywell using the hydrogen mixing system in Modes 1, 2 or 3, the primary containment/drywell purge system will not be operated.

9. STAFF POSITION

The purging system (drywell and/or containment) shall not be utilized for temperature/humidity control during Operating Modes 1, 2 and 3.

RESPONSE

The primary containment/drywell purge system will not be utilized for temperature/humidity control during Operating Modes 1, 2 and 3.

Attachment 2

FSAR REVISIONS INCLUDING A SUMMARY EVALUATION OF CONTAINMENT PURGE VALVES AGAINST NRC BRANCH TECHNICAL POSITION CSB 6-4

Note: These revisions will be included in the FSAR in a future amendment.

intent of the technical position requirement for leakage rate testing. The system complies with this technical position for testing the availability of the valve isolation function. Leak tightness and testing in accordance with 10CFR50, Appendix J, are considered to satisfy the intent of the branch technical position requirement for leakage rate testing.

(4) BTP CSB 6-4 Position B.5.c: The ECCS back pressure requirement is not applicable to BWR containment.

INSERT →

6. Containment Hydrogen Purge

The Containment Hydrogen Purge System complies with all applicable portions of NUREG-0737, Item II.E.4.2, except: 11

a. Positions 1 and 3:

Manually operated containment isolation valves in the nonessential penetrations listed below are closed during normal, shutdown, and postaccident operation.

Penetration	Title	Valve No.
1KJB*Z31	Containment Hydrogen Purge Supply Line	1CPP*SOV140
1KJB*Z33	Containment Hydrogen Purge Return Line	1CPP*MOV104 1CPP*MOV105

For these motor-operated and solenoid-operated valves, administrative control includes mechanical devices to seal or lock the valve closed or to prevent power from being supplied to the valve operator. Valve position and locking devices are checked each time the containment is secured. In addition, the seal or lock is verified intact at least

Insert (p.6.2-74k)

Demonstration of the operability of the containment purge valves and their ability to close during a design basis accident is summarized in Table 6.2-52. A detailed report has been submitted to NRC under separate cover.(Ref. 27) The report verifies that the valve actuator's torque capability has sufficient margin to overcome the torques and forces that resist closure when stroking from the initial open position to full seated in the time limit specified following a design basis LOCA.

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 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 ft^2) 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 for Page 6.2-80

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

24. Regulatory Guide 1.141, Containment Isolation Provisions for Fluid Systems, April 1978.

25. Regulatory Guide 1.11, Instrument Lines Penetrating Primary Containment, March 10, 1971; supplement, February 17, 1972. 11

26. BWR Owners' Group, NUREG 0578, Implementation Analyses and Positions for Plan-Unique Submittals NEDO-24782, BONED006 Class I, August 1980.

27. Transmittal letter from J.E. Booker to H.R. Denton dated November 8, 1984 (RBG-19,385); Docket No. 50-458.

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).
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.
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).
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,

	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 Referenced 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. Doubling of this torque did not exceed the available actuator closing torque thus indicating that the valves would close.
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.
9. Seismic and stress loading	Valves were seismically analyzed and analyzed 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.
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).

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.

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)

Attachment 3

SUPPLEMENTAL TECHNICAL JUSTIFICATION

Estimate of Required Torque for
Closure of Posi-Seal Actuators
With a 3 psi Differential Pressure

1. Assumptions:

   a. Bearing, packing and seal torques will remain the same as calculated for the 9 psi pressure differential

   b. Compressibility effects at dP of 3 psi are small

   c. Nonsymetric approach flow due to bends and elbows will double the flow torque (reference a).

2. Method:

Torque due to flow is a function of valve construction, disk angle, fluid density and velocity and Mach number for compressible flow. Considering a dP of 3 psi the compressibility effects will be small thus flow torque will be a function of density and velocity for the same disk angle. Assuming the densities are approximately the same for the 9 psid and 3 psid conditions, then torque is proportional to velocity squared which in turn is proportional to the pressure drop access the duct. For conservatism, the flow torque at 3 psid will be multiplied by 2 to account for non-symetric flow approach and the seal torque which occurs at the no flow condition will be added to the bearing, packing and flow torques for calculating required actuator torque for closure.

From Appendix B of reference b (values in IN-LBf)

Valve	Flow torque 9 psid	Flow torque 3 psid	Bearing torque	Packing torque	Seal torque	Torque Required for closure at 3 psid
AOV 123	3548	2400	1766	1663	10,452	16,281
AOV 128	3419	2300	1766	1663	10,452	16,181
AOV 165	3415	2300	1766	1663	17,420	23,149
AOV 166	3415	2300	1766	1663	17,420	23,149

Reference: a) Attachment #4 to NRC letter 12/21/82
b) Posi-Seal Report 10837SL-001

Attachment 4

PURGE VALVE QUALIFICATION REPORT