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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

In response to a Nuclear Regulatory Commission letter dated February 27, 1985 from Mr. A. Schwencer to Mr. W. J. Cahill, Jr., Gulf States Utilities Company (GSU) provides the requested information concerning TMI Action Item II.K.3.28, "Verify Qualification of Accumulators on Automatic Depressurization System Valves" (Attachment 1). Upon completion of your review, GSU anticipates final acceptance of the attached information to be documented in a supplement to the River Bend Station (RBS) Safety Evaluation Report Section 15.9.4. Where indicated, changes to the RBS Final Safety Analysis Report will be included in a future amendment (Attachment 2).

Sincerely,

J. E. Booker

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

JEB/RJK/je

Attachment

ATTACHMENT 1

1. The 100 day post accident long term capability is achieved by designing the system to meet nuclear safety-related seismic Category I criteria. Post-LOCA air requirements are supplied from the Penetration Valve Leakage Control System (PVLCS) which consists, in part, of two air compressors, two accumulators, and associated piping. Each compressor delivers 50 scfm of air at 120 psig operating pressure to its individual accumulator. The compressors provide nuclear safety-related air to the main steam safety/relief valve system (which includes the ADS valves). All piping is designed and constructed to ASME System III, Class 2. Electrical and control instrumentation is designed to meet IEEE-323 1974 requirements. The components and piping installation are designed to withstand seismic Category I loads. Refer to FSAR Sections 5.2.2.4.1 and 9.3.6.2.1.

2. The ADS utilizes selected SRVs for depressurization of the reactor. Each of the SRVs is equipped with an air accumulator and check valve arrangement. The accumulators on the SRVs utilized for automatic depressurization assure that the valves can be held open following failure of the air supply to the accumulators.

   The accumulators are designed to provide two ADS actuations at 70 percent of drywell design pressure, which is equivalent to 4 to 5 actuations at atmospheric pressure. The ADS valves are designed to operate at 70 percent of drywell design pressure because that is the maximum pressure for which rapid reactor depressurization through the ADS valves is required. The greater drywell design pressures are associated only with the short duration primary system blowdown in the drywell immediately following a large pipe rupture for which ADS operation is not required. For large breaks which result in higher drywell pressure, sufficient reactor depressurization occurs due to the break to preclude the need for ADS. One ADS actuation at 70 percent of drywell design pressure is sufficient to depressurize the reactor and allow inventory makeup by the low pressure ECC systems. However, for conservatism, the accumulators are sized to allow 2 actuations at 70 percent of drywell design pressure. The system is qualified to perform its function for a minimum of 100 days following an accident. Refer to Section 5.2.2.4.1 of the FSAR.

3. River Bend Station design utilizes 60-gal accumulators and an air charging system. The air supply system includes two ASME III Division I, Class 2 air compressors and two non-nuclear safety (NNS) compressors which feed two separate charging systems for the accumulators. Both ASME III compressors are powered from the preferred ac power supply systems and can be powered by on-site power. Each charging system consists of an air dryer and associated piping and valves necessary to provide air to its respective divisional set of accumulators. Each charging system has physical separation in order to protect them from postulated pipe breaks.

The air supply to the ADS valves has been designed such that the failure of any one component does not result in the loss of air supply to more than one nuclear safety-related division of ADS valves. The loss of air supply to one division of ADS valves does not prevent the safe shutdown of the unit.

During normal, plant operation, SRV and ADS accumulators are supplied with air from the non-nuclear safety (NNS) main steam system air compressors, C4A and C4B, as shown on FSAR Figure 10.3-1b. These compressors provide 17 SCFM at 175 psig. Post-LOCA air requirements are supplied from the penetration valve leakage control system (PVLCS).

Air from either source is dried to a dewpoint of -40 F at 140 psig and filtered to a maximum particle size of 1 micron. The NNS air drywell and filters have a Safety Class 2 bypass line and isolation valves to ensure air is provided for the ADS function in the event the dryer/filter become inoperable or plugged. A Safety Class 2 pressure transmitter which activates an annunciator in the main control room is provided downstream of the dryers to alert the operator to a malfunction and allow him to remote manually isolate and bypass the dryer/filter.

Refer to Sections 5.2.2.4.1 and 9.3.6 of the FSAR.

4. An ADS air accumulator subsystem is defined as all the components between (and including) the check valve located on the inlet side of the accumulator and the associated main steam safety relief valve. The allowable leakage rate is 1 SCFH, which is compatible with the emergency core cooling system (ECCS) performance evaluations and assumptions, and the calculations for sizing the ADS air supply system. The air accumulator subsystem is designed to withstand seismic Category I loads and post-accident environments. No operator interface is required for proper short term operation of the subsystem as discussed above. One ADS actuation at 70 percent of drywell design pressure is sufficient to depressurize the reactor and allow inventory makeup by the low pressure ECC systems. However, for conservatism, the accumulators are sized to allow 2 actuations at 70 percent of drywell design pressure.

5. The ADS is designed to meet IEEE-323, 1974 and seismic Category I requirements for piping. Applicable components of the ADS were tested or analyzed as necessary to qualify them for their intended service. Therefore, no increase in leakage is expected, nor additional margin provided.

6. See response to item no. 5 above.

7. The ADS air accumulator subsystem is designed for nuclear safety related service. No credit was taken for non-safety related equipment or instrumentation when establishing the allowable leakage criteria for the ADS air accumulator subsystem.

8. The following is a list of preoperational testing on the safety-related Class 1E ADS accumulator systems:

   1) The system is pressurized and checked for leaks using a soap bubble test.

   2) Containment supply isolation valves are operationally checked and closing times verified to be less than required.

   3) Individual accumulators are pressurized, isolated, and check valve leakage is verified to be less than 1 SCFH.

   4) Each ADS valve is individually cycled open and closed with and without the accumulator isolated.

   5) The accumulator pressure is reduced by 17.5 psig to simulate 70% of design drywell back pressure and each ADS valve is cycled twice with the accumulators isolated.

   6) The ADS air supply system is tested. Charging time for the accumulators is recorded.

   For ADS leak testing, see response to item no. 13 below.

9. The Technical Specification surveillance requirement associated with the ADS accumulator system and backup system verifies that the PVLCS accumulators pressure is greater than 101 psig at least once per 24 hours

   Instrumentation will be calibrated once per 18 months or once per 60 months as recommended by the I&C Supervisor. The recommendation will be based on the type of instrument (i.e., transmitter vs local gage) and function of instrument (i.e., Main Control Room alarm vs. local indication).

10. The components and piping installation are designed to withstand seismic Category I loads. The system consists of nuclear safety related safety class 2 piping. Refer to FSAR Section 5.2.2.4.1 and 9.3.6.2.1 of the FSAR.

11. The ADS accumulators subsystem and the PVLCS are designed to operate under normal conditions, including maintenance and testing. These systems are environmentally qualified for 100 days post accident conditions. Refer to FSAR Sections 5.2.2.4.1 and 9.3.6.

12. The ADS is capable of performing its function during and following an accident while taking no credit for non-safety related equipment or instrumentation. Although non-nuclear safety (NNS) air compressors and air dryers supply air during normal operation, the plant operator can realign the system from the main control room to bypass NNS equipment.

    Refer to FSAR Section 5.2.2.4.1.

13. As stated in the response to item no. 1 above, the ADS is designed to seismic Category I criteria and meets the Class 1E qualification criteria specified in IEEE 323-1974. The post-LOCA air supply is provided by the PVLCS Class 1E safety grade air compressors as discussed in FSAR Section 9.3.6.

    Generic Letter 83-36, "NUREG-0737 Technical Specifications", issued on November 1, 1983 states that, "The staff is currently reviewing information provided by licensees. Changes in the Technical Specification will be determined after our review is complete. No response is required at this time." The RBS Technical Specifications are based on the BWR/6 Standard Technical Specifications. The RBS Technical Specifications require ASME Section XI to be implemented. Under ASME Section XI, the valves in the ADS accumulator subsystem are Category A valves. Category A valves are required to be leak tested at least once every 2 years. Design of the ADS accumulator subsystem results in the entire subsystem being leak tested when the Category A valves are tested. The allowable leakage rate is 1 SCFH per ADS accumulator subsystem. Should leakage rate(s) exceed the allowable, the subsystem(s) will be repaired prior to returning to service.

14. The backup air supply system for the ADS consists of the two ASME III Division I, Class 2 air compressors of the penetration valve leakage control system (PVLCS), as described in the response to Question 3. This system is described in FSAR Section 9.3.6.

ATTACHMENT 2

4. Duration of operability is 2 days at 200°F and 20 psig, following which the valves remain fully open or closed for 97 days, provided air and power supply is available. No power/air supply is required to keep the valve closed.

The ADS utilizes selected SRVs for depressurization of the reactor as described in Section 6.3. Each of the SRVs is equipped with an air accumulator and check valve arrangement. The accumulators on the SRVs utilized for automatic depressurization assure that the valves can be held open following failure of the air supply to the accumulators. The accumulator capacity is sufficient for each ADS valve to provide two actuations against 70 percent of the maximum drywell design pressure.

The acccumulators are designed to provide two ADS actuations at 70 percent of drywell design pressure, which is equivalent to 4 to 5 actuations at atmospheric pressure. The ADS valves are designed to operate at 70 percent of drywell design pressure because that is the maximum pressure for which rapid reactor depressurization through the ADS valves is required. The greater drywell design pressures are associated only with the short duration primary system blowdown in the drywell immediately following a large pipe rupture for which ADS operation is not required. For large breaks which result in higher drywell pressure, sufficient reactor depressurization occurs due to the break to preclude the need for ADS. One ADS actuation at 70 percent of drywell design pressure is sufficient to depressurize the reactor and allow inventory makeup by the low pressure ECC systems. However, for conservatism, the accumulators are sized to allow 2 actuations at 70 percent of drywell design pressure. 3

The River Bend Station design utilizes 60-gal accumulators and an air charging system. The air supply system includes two ASME III Division I, Class 2 air compressors and two non-nuclear safety (NNS) compressors which feed two separate charging systems for the accumulators. Both ASME III compressors are powered from the preferred ac power supply systems and can be powered by on-site power. Each charging system consists of an air dryer and associated piping and valves necessary to provide air to each of the two divisional sets of accumulators. Each charging system has physical separation in order to protect them from postulated pipe breaks. 11

The system is qualified to perform its function for a minimum of 100 days following an accident.

Only two of the ADS valves need to function to meet short-term demands and the functional operability of only one ADS valve can fulfill longer term needs.

3 The air supply to the ADS valves has been designed such that the failure of any one component does not result in the loss of air supply to more than one nuclear safety-related division of ADS valves. The loss of air supply to one division of ADS valves does not prevent the safe shutdown of the unit.

During normal plant operation, SRV and ADS accumulators are supplied with air from the non-nuclear safety (NNS) service air system air compressors as discussed in Section 9.3.1. These compressors provide 17 SCFM at 175 psig. Post-LOCA air requirements are supplied from the penetration valve leakage control system (PVLCS). Refer to Section 9.3.6 for a description of the PVLCS.

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11 Air from either source is dried to a dewpoint of -40°F at 140 psig and filtered to a maximum particle size of 1 micron. The NNS air dryer and filters have a Safety Class 2 bypass line and isolation valves to ensure air is provided for the ADS function in the event the dryer/filter become inoperable or plugged. A Safety Class 2 pressure transmitter which activates an annunciator in the main control room is provided downstream of the dryers to alert the operator to a malfunction and allow him to remote manually isolate and bypass the dryer/filter. Pressure transmitters are also provided on the PVLCS air accumulators as described in Section 9.3.6.

Each SRV discharges steam through a discharge line to a point below the minimum water level in the suppression pool. The SRV discharge lines are classified as Safety Class 3 and Seismic Category I. SRV discharge line piping from the SRV to the suppression pool consists of two parts. The first is attached at one end to the SRV and attached at its other end to a pipe anchor. The main steam piping, including the SRV discharge piping up to and including the first anchor, is analyzed as a complete system. Diameter, length, and
1 routing of the SRV piping are given in Appendix 6A, Table A.6A.4-1 and Fig. A.6A.10-1 and A.6A.10-2.

The second part of the SRV discharge piping extends from the anchor to the suppression pool. Because of the upstream anchor on this part of the line, it is physically decoupled from the main steam header and is therefore analyzed as a separate piping system.

Attachment 1 (cont'd.)

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page 5.2-13a

During normal plant operation, SRV and ADS accumulators are supplied with air from the non-nuclear safety (NNS) main steam system air compressors, C4A and C4B, as shown on FSAR Figure 10.3-1b. These compressors provide 17 SCFM at 175 psig.

4. The MS-PLCS is designed so that effects resulting from a single-active component failure do not affect the integrity or operability of the main steam system or the MSIVs or contribute to an overpressurization of the containment.

5. The MS-PLCS is capable of performing its safety function following a loss of offsite power, coincident with a postulated design-basis LOCA.

6. The MS-PLCS is designed to prevent leakage from the main steam lines, as necessary, to maintain containment integrity for up to ~~30~~ 100 days.

7. The MS-PLCS is manually initiated and is designed to permit actuation within 20 min after a design-basis LOCA. This time period is consistent with loading requirements of the emergency electrical buses, and with reasonable times for operator action.

8. The MS-PLCS, including instrumentation and circuits necessary for the functioning of the system, is designed to standards applicable to an engineered safety feature.

9. The MS-PLCS controls include interlocks to prevent inadvertent operation of the system. In particular, interlocks are provided to prevent damage to the MS-PLCS, or to the main steam system, due to accidental opening of any system isolation valves when the pressure in the connecting main steam piping exceeds MS-PLCS operating pressure. All such controls and interlocks are activated from appropriately designed safety systems or circuits.

10. The MS-PLCS is designed to permit testing of the operability of controls and actuating devices during power operation to the extent practical, and complete testing of system function during plant shutdowns.

11. The MS-PLCS is designed so that: a) thermal stresses and pressures associated with flashing and thermal deformations, under the loading conditions associated with the activated system do not affect the structural integrity or operability of the main steam system or MSIVs; and b) any deformation of isolation valve internals does not induce leakage

of the MSIV beyond the capacity or capability of the MS-PLCS.

12. Equipment is provided (as part of the MS-PLCS) to prevent the release of valve stem packing leakage to the environment from MSIVs outside the containment.

6.7.2 System Description

6.7.2.1 General Description

The source of air for the MS-PLCS is the penetration valve leakage control system (PVLCS) air compressors, one for the outboard system and one for the inboard system. Each air compressor is a nuclear safety-related air supply source for the MS-PLCS, the PVLCS and the main steam safety/relief valve system. Each compressor assembly contains an accumulator which is sized to accommodate the initial post-accident requirements of the three above listed systems with the long term requirements being met with the function of the air compressor. The air compressors are equipped for water cooling and are designed to run ~~continuously~~ for 100 days 30 days after an accident. The design temperature and pressure for the compressor assemblies are 150°F and 200 psig, respectively. Each compressor assembly delivers 60 ~~70~~ scfm of air at an operating pressure of 120 psig. Refer to Section 9.3.6 for a complete description of the PVLCS. | 11

Two independent systems (outboard and inboard) are provided to accomplish the leakage control function. The leakage control barrier is established by pressurizing the isolated volumes in the main steam line between the inboard and outboard isolation valves and the main steam shutoff valves. The pressurized volume eliminates out-leakage through the closed MSIVs and main steam drain lines such that any leakage which does occur is inward from the pressurized volume into the reactor pressure vessel (RPV) or containment. Both systems are connected to the offsite as well as onsite emergency power.

The MS-PLCS is shown in Fig. 6.7-1 and 6.7-2. The outboard system is connected to each of the main steam shutoff valves, drain lines (inboard and outboard MSIV), and outboard MSIV stem packing leak-off lines. The inboard system is connected to the outboard MSIV body (inlet side), and to the inboard MSIV drain lines located outside the containment.

and outboard PVLCSs is functioning properly. The pressure barrier is maintained at a pressure at least 10 percent higher than the peak calculated drywell pressure. Thus, only inleakage of nonradioactive air into the containment is possible past the valves, and no post-LOCA containment atmosphere is discharged through the pressurized valves. The effect on peak containment pressure due to air inleakage is insignificant over a 30-day post-accident period.

9.3.6.2.2 Detailed Description

The inboard and outboard systems are the same, and similar to the MS-PLCS in design and operation.

Each PVLCS consists of the following components as shown on Fig. 6.7-1. |14

Component	Description
Inlet filter	Filters the air coming from the auxiliary building atmosphere, removing all particles larger than 5 microns
Air compressor	Delivers ~~70~~ 60 scfm of air at 120 psig operating pressure. It is equipped for water cooling and runs continuously after an accident, providing a nuclear safety-related air supply for the PVLCS, the MS-PLCS, and the main steam safety/relief valve system. It is sized to accommodate the above systems. The maximum allowable leakage rates for the PVLCS process line valves are listed in Table 9.3-3.
Air accumulator	Stores sufficient air at 120 psig to fill the piping and valve body volumes being sealed. Downstream of the accumulator are two branch lines, one to the MS-PLCS

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9.3.6.2.3 Sequence of Operation

Each process line isolation valve is closed manually utilizing its own isolation switch immediately after it has been ascertained that a LCCA has occurred, providing, of course, that the process line isolation valves are not already closed by their associated automatic isolation functions.

Approximately 20 min thereafter, the PVLCS (both inboard and outboard) is actuated. To actuate the systems, first the injection valves must be opened. Then, the isolation valves must be opened for the three separate injection headers, divided by pressure ranges or process fluid. One injection header contains feedwater; another header contains service and instrument air; the last header contains the remaining process line isolation valves to be sealed. Each PVLCS air compressor may be manually actuated utilizing its individual remote manual initiating switch before opening the injection valves or after opening the isolation valves to prevent cycling of the compressors.

The twin systems are pressurized within 5 min by the air compressors and their associated accumulators. The accumulators are sized so that the initial air requirements for the PVLCS, the MS-PLCS, and main steam safety/relief valve system are met, thereby, allowing the air compressors to be on or off. The air compressors' functions are to charge the accumulators and to provide the long-term air requirement of leakage for the various systems.

The PVLCS air compressors provide sealing air for at least ~~30~~ 100 consecutive days without interruption.

9.3.6.3 Safety Evaluation

9.3.6.3.1 Normal Operation

During normal operation, the injection valves and isolation valves for each system remain closed. Thus, there are no demands from the PVLCS on the accumulators. Downstream of the inboard system injection valve, the piping separates into three injection headers with their own motor-operated isolation valve(s). The injection headers are divided by pressure ranges or process fluid (i.e., the high pressure feedwater is one section, the service and instrument air another, etc). Injection lines lead from the injection headers to the process line valves to be pressurized. Any leakage from the process line valves is prevented from proceeding to the isolation valves by check valves (one or

two per injection line). Higher pressure injection lines have two check valves in series. The high pressure feedwater injection header also has two isolation valves in series. The outboard system is equivalent to the inboard system.

The MS-PLCS injection valves remain closed and do not place any demands on the PVLCS air compressors. However, the main steam safety/relief valves' associated accumulators may draw air from the PVLCS accumulators if their associated SVV compressors are unavailable. Pressure transmitters maintain the PVLCS accumulators at a predetermined set point, at which the accumulators maintain enough air to meet all short-term requirements of the PVLCS, the MS-PLCS, and the main steam safety/relief valve system. An automatic start is provided for the air compressors to recharge the accumulators above the minimum set point as determined by the pressure transmitters.

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9.3.6.3.2 Design Basis Operation

Approximately 20 min after it has been ascertained that a LOCA has occurred, the PVLCS is actuated. The 20-min time period prevents the standby power supplies from being overloaded due to the starting current drawn by the PVLCS air compressors and motor-operated valves, adding to the starting current of other safety-related items. The 20-min time period also serves as sufficient time for the reactor vessel pressure to decay to a pressure at which the PVLCS can function. The air line pressure at the injection point to the process line valves is 1.1 times that of the reactor drywell pressure. In addition, the leakage of fission products during the 20-min period is insignificant with respect to 10CFR100 guidelines.

Upon initiation, the injection valves and isolation valves must be manually opened (remote manual initiating switch). The valves have interlocks that prevent leakage of any process line fluid upstream of the valves (Section 9.3.6.5).

If, 5 min after initiation, high flow or low pressure is detected in one system, that system automatically isolates and the other system provides the seal. High flow and low pressure indicate that the process line valve is stuck open or partially open, or the system no longer maintains system integrity. Low pressure (sensed downstream of the isolation valve) by itself indicates that an injection valve or isolation valve has failed to open, or that the compressor is not operating correctly. The compressor is equipped with suitable instrumentation to detect and annunciate failures.