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U.S. Nuclear Regulatory Commission
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Subject: River Bend Station - Unit I
Docket No. 50-458
License No. NPF-47
Response to NRC Generic Letter 96-06

File Nos.: G9.5, G9.33.4

RBF1-97-0027
RBG-43665

Ladies and Gentlemen:

Pursuant Generic Letter (GL) 96-06, River Bend Station (RBS) herein provides the attached information which represents completion of requested actions as committed in our 30-day response dated October 30, 1996.

GL 96-06 was submitted to licensees to provide notification of safety-significant issues that could affect containment integrity and equipment operability during certain accident conditions. Addressees were requested to determine:

(1) if containment air cooler cooling water systems are susceptible to either waterhammer or two-phase flow conditions during postulated accident conditions;

(2) if piping systems that penetrate the containment are susceptible to thermal expansion of fluid so that overpressurization of piping could occur.

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The attachments provide a summary of the RBS reviews as required by GL 96-06 and includes a summary of actions taken to evaluate the postulated conditions, conclusions that were reached relative to susceptibility for these phenomena, and as necessary, the basis for continued operability.

Attachment A contains the results of an engineering evaluation of containment air cooler cooling water systems for susceptibility to water hammer or two phase flow. The evaluation concluded that the RBS systems are not found to be susceptible to waterhammer or two phase flow scenarios as described in the GL and continue to remain operable. Provisions for these phenomena were addressed in the original RBS design and are adequate to prevent any detrimental effects due to water hammer or two phase flow conditions.

Attachment B contains the results of an engineering evaluation of containment penetrations that could be susceptible to overpressurization due to thermal expansion of process fluid. In performing the review, RBS noted one containment and eight drywell penetrations that were potentially susceptible to overpressurization. In accordance with GL 91-18, this potential condition was documented within the RBS corrective action program and a prompt operability determination was performed for each affected penetration. The determinations demonstrated that the postulated conditions would not jeopardize the ability of the drywell or containment to perform their intended safety functions.

Subsequent to the operability determinations, the postulated conditions were evaluated for potential reportability requirements. The reportability determination is based on our conclusion that the condition is not "outside the design basis of the plant" as it relates to fission product barriers. For the conditions evaluated, the affected penetrations retain their ability to perform their intended safety function and are not considered reportable pursuant 10CFR 50.72.

The potential for overpressurization of the piping associated with these nine penetrations has been included in the RBS Corrective Action Program. Any necessary corrective actions will be implemented in accordance with the RBS corrective action program guidelines.

If you have any questions or require additional information, please contact Rick McAdams at (504) 336-6224.

RJK\RMM\kvm

cc:

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BEFORE THE

UNITED STATES NUCLEAR REGULATORY COMMISSION

LICENSE NO. NPF-47

DOCKET NO. 50-458

IN THE MATTER OF

ENTERGY GULF STATES, INC

CAJUN ELECTRIC POWER COOPERATIVE AND

ENTERGY OPERATIONS, INC.

AFFIRMATION

I, Rick J. King, state that I am Director - Nuclear Safety & Regulatory Affairs of Entergy Operations, Inc., at River Bend Station; that on behalf of Entergy Operations, Inc., I am authorized by Entergy Operations, Inc., to sign and file with the Nuclear Regulatory Commission, this response to NRC Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions;" that I signed this letter as Director - Nuclear Safety & Regulatory Affairs at River Bend Station of Entergy Operations, Inc.; and that the statements made and the matters set forth therein are true and correct to the best of my knowledge, information, and belief.

Rick J. King
Rick J. King

STATE OF LOUISIANA
PARISH OF WEST FELICIANA

SUBSCRIBED AND SWORN TO before me, a Notary Public, commissioned in and for the Parish and State above named, this 28th day of January, 1997.

(SEAL)

Claudia F. Hurst
Claudia F. Hurst
Notary Public

My commission expires with life

ATTACHMENT A

Evaluation Summary for Susceptibility of Occurrence for Containment Air Cooler Cooling Water System Waterhammer or Two-Phase Flow Conditions During Postulated Accident Conditions

Generic Letter (GL) 96-06 identified the potential for flashing of the water in containment air cooler tubes during a design basis LOCA with a concurrent loss of offsite power (LOOP) or with a delayed sequencing of the equipment, which resulted in a waterhammer event. In addition, the GL indicates that the potential exists that heat removal assumptions for design basis accident conditions may be based on single phase flow conditions when two-phase flow could be experienced.

The River Bend Station (RBS) containment air coolers are part of the containment ventilation system. The containment air recirculation cooling system consists of three 50% capacity containment coolers, ductwork, dampers and controls. During normal plant operation and during a LOOP, two 50% capacity coolers operate with the third containment cooler as a standby to maintain design ambient conditions and to remove heat generated within the containment. During normal plant operation, the cooling water to the containment air coolers is provided from the ventilation chilled water system. Following design basis accidents, only one 50% cooler is required to operate with the second containment air cooler on standby.

During a design basis accident without a LOOP, normal service water cools the containment unit coolers unless standby service water (SSW) is initiated due to low normal service water pressure. During the transition from ventilation chilled water to normal service water, system pressure is maintained in the unit coolers by isolating the chilled water via the associated containment isolation motor operated valves. Cooling water flow from normal service water is established by automatic opening of the supply and return valves to the unit coolers. Should normal service water pressure drop, the SSW pumps will start automatically, supplying the unit coolers prior to significant pressure degradation in the containment unit coolers.

Waterhammer and subsequent transient effects were analyzed in the original design of the SSW system and as a result, the system includes adequate features to minimize and mitigate waterhammer occurrences. During postulated design basis accidents concurrent with LOOP, the cooling water to the containment air coolers is directly switched to the SSW system. This sequence can result in the potential for column separation due to elevation differences. As a result, the applicable portions of safety-related SSW system piping have been analyzed for waterhammer. The system design includes automatically actuated vacuum release valves for those locations where this potential exists. In addition, inside containment, the instrument air system supplies air to safety related accumulator tanks which inject air into the SSW system piping to maintain system pressure and mitigate low pressure column separation conditions.

During design basis accidents concurrent with LOOP, the diesel generators are automatically started. The standby service water pumps are loaded on the diesel generators, with two pumps loaded in 40 seconds, and the final two pumps loaded in 70 seconds. The containment unit cooler fans are loaded on the diesel generator in 10 minutes and 10 seconds. Furthermore, the RBS USAR does not credit containment cooling via a containment unit cooler until 30 minutes post-LOCA. Therefore, the flow of cooling water to the containment unit coolers is established well before starting the containment air cooler fans. This allows adequate time for any air accumulated in the SSW system piping to be flushed from the system. Therefore, before the unit cooler fans are required to perform their safety function, the unit coolers and connecting piping are water solid preventing any impact on heat transfer from a two-phase flow condition.

The service water supply and return piping to the non-safety related drywell coolers is isolated following postulated design bases accidents. The service water piping inside the drywell is exposed to the higher LOCA and main steam line break temperatures and is provided with overpressure protection. Because of the automatic isolation of the drywell, the drywell environment will not impact the piping in the containment building.

Conclusions:

The potential for waterhammer in the containment unit cooler system was addressed during the system's original design. The original design provisions, in conjunction with establishing flow to the containment unit coolers approximately nine minutes prior to fan cooler start ensures the unit coolers and connecting piping are water solid and can properly operate in a design basis event and satisfy the associated heat removal assumptions.

The evaluation for the potential for waterhammer and/or two-phase flow effects on the containment unit coolers concluded that the current system design adequately addresses these phenomena. No additional actions or operability issues related to these effects as described in GL 96-06 are required.

ATTACHMENT B

Evaluation for Susceptibility of Containment Penetration Piping Overpressurization Due to Thermal Expansion of Fluid

An evaluation of the River Bend Station (RBS) containment and drywell mechanical penetrations was performed utilizing criteria developed by the Entergy Mechanical Systems Peer Group for Entergy sites in support of the response to Generic Letter (GL) 96-06.

Screening Criteria

A penetration piping system, including any connected heat exchangers, was considered to be "potentially susceptible" if it met all of the following four criteria:

A) The penetration must be full of liquid at the time of the accident. Pipes containing air, gas, or steam were excluded.

B) The liquid contained in the penetration piping must be at a lower temperature than the surrounding environment during operational or accident situations. Piping that contains water at or near reactor pressure vessel (RPV) or steam generator (SG) temperatures, such as feedwater, letdown, blowdown or reactor water cleanup (RWCU), would actually have initial fluid temperatures higher than those expected during an accident.

C) The penetration must be isolated during an event (i.e., plant heatup or accident) that could cause a significant heat transfer to the fluid between the isolation valves. The valve arrangement used for penetration isolation must restrict flow out in both directions. If the inboard isolation valve is a check valve or a certain type and orientation of solenoid valve (with a mechanism for pressure relief in the connecting piping), the penetration may possibly be excluded. This exclusion would also include piping open to the suppression pool, SG, RPV, or containment air space.

    In order to be excluded, the extended piping system available for fluid expansion inside containment must not constitute a closed system, so that the fluid volume can expand and prevent damage to the containment isolation portion of the piping penetration.

    Additionally, another closed valve further down the line inside containment must not prevent expansion of the fluid volume in the penetration, thereby isolating a penetration with an expected available leak path (i.e., check valve).

D) The potentially susceptible penetration will not have any pressure relief valves (with sufficient capacity and setpoint) or other method of overpressure protection (such as a check valve in parallel with the main inboard valve) between the isolation valves.

A penetration will additionally be considered "potentially susceptible" if it meets any one of the following two criteria:

The penetration will be considered potentially susceptible if a worst case single failure would cause isolation, heatup, and overpressurization of a normally open low temperature fluid filled penetration.

A penetration will be considered potentially susceptible if trapped pressure can prevent safety-related isolation valves from opening when required to mitigate an accident (i.e., pressure locking). Reference GL 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves."

A "potentially susceptible" penetration may be eliminated from concern if qualified calculations or analyses demonstrate that the penetration piping system, which includes the valves, remains within its design basis (i.e., meets ASME Code allowable stresses for faulted conditions).

Penetrations that do not meet their design basis requirements would be considered "susceptible," and have a basis for operability established in accordance with Generic Letter 91-18 guidance.

Evaluation

At River Bend Station, 108 containment penetrations and 208 drywell penetrations were evaluated in accordance with the screening criteria. Of the total 316 penetrations, nine were considered "potentially susceptible." One is classified as a containment penetration and eight are classified as drywell penetrations. The subsequent penetration evaluation results are:

1. **Containment Penetration KJB-Z41 - "Fire Protection Header to Containment Hose Racks"**

This penetration is normally open and equipped with a motor operated outboard containment isolation valve, FPW-MOV121, and an inboard containment isolation check valve, FPW-V263.

Function

The inboard isolation check valve is welded directly to the containment penetration and the associated piping supplies ten fire protection hose racks. The piping within containment is ANSI B31.1 (non-safety related), with the transition to ASME III,

Class 2 at the penetration valve. The normal operating temperature of the process fluid is less than the maximum accident containment atmospheric temperature and there are no relief valves or other typical methods of overpressure protection on the piping. Therefore, isolation of this penetration subsequent to a LOCA could result in the potential for overpressurization of the associated piping.

Consequences/Operability

A review concluded that system pressure would be relieved via two bourdon tube type pressure indicators. When these indicators are overpressurized the bourdon tube within the gauge case ruptures and pressure is relieved through a relief port on the instrument case. The rupture pressure of these indicators results in a pipe stress well within ASME/ANSI code allowable stress limits. Therefore, as a basis for operability, the rupture of the pressure indicators will provide pressure relief prior to exceeding piping stress allowables.

The associated containment penetration piping is not subjected to the thermal overpressurization because the inboard containment isolation valve is welded directly to the piping at the containment penetration. Should leakage of the inboard isolation check valve occur such that the penetration is subjected to an increase in pressure, the maximum pressure the penetration could experience is the same as that of the fire protection piping within containment. Due to the cooler temperature of the fluid in the penetration piping, it is expected that the pressure increase in the penetration piping due to valve leakage would be significantly less than that experienced by the piping within containment. As the stress allowable for the penetration is the same or greater than that of the piping within containment, the penetration piping is well within its ASME code allowable stress limits in the event check valve leakage occurs.

The fire protection piping is not utilized in response to a postulated LOCA and is isolated on a LOCA signal. Loss of pressure or inventory in the piping resulting from pressure indicator failure has no adverse impact on equipment required to mitigate a design basis event. The fire protection system is not affected by potential overpressurization in any scenario where it is required to operate. Therefore, based on the pressure relief capability provided by the fire protection piping pressure instrumentation failure in conjunction with the configuration of the associated containment penetration piping, containment integrity will not be compromised by the postulated overpressurization. Because the penetration and fire protection system piping are capable of performing their intended design functions and postulated piping stresses are within ASME code allowables, both the penetration and the fire protection system piping are considered operable.

2. **Drywell Penetrations DRB-Z152 through Z159 - "Hydraulic Fluid Supply and Return Lines to Reactor Recirculation Flow Control Valves"**

The screening criteria identified eight similar drywell penetrations that required additional engineering evaluation. These penetrations contain piping that range from 0.5 to 1.0 inches in diameter. Each is equipped with a single outboard motor operated drywell isolation valve which automatically closes on a LOCA signal. The piping inside the drywell, from the penetration to the recirculation system valve actuator, is non-safety related and designed in accordance with ANSI B31.1. The recirculation system valve actuators are also non-safety related.

Function

As previously stated, the hydraulic lines are isolated during a LOCA and the drywell piping is not equipped with overpressure protection. It is anticipated that the pressure resulting from thermal expansion of the hydraulic fluid in the piping would result in failure of the piston seals in the valve actuator prior to failure of the piping. However, as a conservative approach, containment operability was evaluated based on the assumed failure of the drywell penetration piping.

Consequences/Operability

It has been conservatively postulated that this piping would fail in such a manner to allow leakage to pass from the drywell into the containment. The drywell bypass leakage due to a failure of all 8 penetration pipes, in addition to the current measured drywell bypass leakage at the most recent surveillance test, is well within the Technical Specification surveillance acceptance criteria of 0.1 square feet. This is 10% of the actual design basis value of 1.0 square foot. Furthermore, the subject piping is supported and restrained such that failure of this piping will not compromise any safety related piping or equipment in the drywell.

In conclusion, a failure of this piping or the associated penetrations will not result in the failure or loss of a safety related component used to mitigate an accident. In the unlikely event that the postulated piping failure compromises isolation of the penetration, the total drywell bypass leakage is well within the 0.1 square feet established as the Technical Specification surveillance acceptance criteria and design basis requirements. Therefore, drywell operability is maintained.

Conclusions

The evaluation for potential overpressuization of containment penetrations due to thermal expansion subsequent to a LOCA identified nine penetrations requiring engineering evaluation. Other penetrations were reviewed and determined not to be susceptible. For the nine penetrations evaluated, evaluations concluded that containment and drywell operability was maintained with no impact on any safety function.

Corrective actions will be addressed in accordance with the RBS Corrective Action Program.