ENTERGY

Entergy Operations, Inc.
River Bend Station
5485 U.S. Highway 61
P.O. Box 220
St. Francisville, LA 70775
Tel 504 336 6225
Fax 504 635 5068

James J. Fisicaro
Director
Nuclear Safety

February 13, 1996

U.S. Nuclear Regulatory Commission
Document Control Desk
Mail Stop P1-37
Washington, DC 20555

Subject: River Bend Station - Unit 1
Docket No. 50-458
License No. NPF-47
180-day Response to NRC Generic Letter 95-07 "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves"

File Nos.: G9.5, G9.33.4

RBF1-96-0024
RBG-42477

Gentlemen:

Pursuant to Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," Entergy Operations, Inc. (EOI) herein submits River Bend's required 180-day response. The susceptibility evaluations, valve listings and corrective actions performed to date are summarized in the attachment. The summary report contains a description of the susceptibility evaluations performed to identify valves that are susceptible to pressure locking and thermal binding, the bases or criteria for determining the valves' susceptibility, and results of the susceptibility evaluations. The summary report identifies six valves that were susceptible when performing safety related functions to open. Corrective actions were completed for those valves in that all six were modified during refueling outage (RF-6).

Should you have any questions or require additional information, please contact Mr. T. W. Gates of my staff at (504) 381-4866.

Sincerely,

James J. Fisicaro

JJF/JHM/kvm
attachment

A056
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cc: Mr. David L. Wigginton
U.S. Nuclear Regulatory Commission
11555 OWFN 13-H-2
Rockville, MD 20859

NRC Resident Inspector
P.O. Box 1051
St. Francisville, LA 70775

U.S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011

BEFORE THE

UNITED STATES NUCLEAR REGULATORY COMMISSION

LICENSE NO. NPF-47

DOCKET NO. 50-458

IN THE MATTER OF

GULF STATES UTILITIES COMPANY

CAJUN ELECTRIC POWER COOPERATIVE AND

ENTERGY OPERATIONS, INC.

AFFIRMATION

I, James J. Fisicaro, state that I am Director-Nuclear Safety 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 180-day response to NRC Generic Letter 95-07, Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," that I signed this request as Director-Nuclear Safety, 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.

James J. Fisicaro

STATE OF LOUISIANA
WEST FELICIANA PARISH

SUBSCRIBED AND SWORN TO before me, Notary Public, commissioned in the Parish of East Baton Rouge and qualified in and for the Parish and State above named, this 13th day of February, 1996.

(SEAL)

Jane Russell
Notary Public

My Commission expires with life.

ATTACHMENT

SUMMARY REPORT

1.0 INTRODUCTION

River Bend Station (RBS) evaluated a total of 114 safety related power operated gate valves for susceptibility to valve bonnet pressurization and thermal binding. No power operated safety related solid wedge gate valves, nor any air, hydraulically or manually operated safety related gate valves that have a safety function to open were identified in the screening evaluations.

All plant operating modes were included in the screening evaluations. This encompassed normal station operating procedures (SOPs) and surveillance test procedures (STPs). In addition, the emergency operation procedures (EOPs) and those abnormal operating procedures (AOPs) which are used in transient and accident conditions were reviewed for valves with safety functions to open during performance of plant procedures and that could possibly be susceptible to the failure mechanisms described in Generic Letter 95-07.

Due to the complex nature of the screening scenarios, RBS utilized a "Team" approach to review the scenarios. Expertise in the Design Engineering, System Engineering and Operations Departments ensured an adequate screening evaluation was performed.

2.0 THERMAL BINDING AND BONNET PRESSURIZATION EVALUATION METHODOLOGY

The valves were evaluated utilizing the methodology discussed below.

2.1 Valve Disc Identification

The valve's vendor drawings, supplemented by the vendor manuals, were reviewed to determine whether the valve discs were of solid wedge, flexible wedge, or doubled-disc parallel-seat construction.

2.2 Thermal Binding Evaluation Criteria

Thermal expansion loads for piping are generally not significant and in fact, are not discussed specifically as a failure mechanism in Generic Letter 95-07, SOER 84-7, NUREG-1275 Vol. 9 or NUREG/CP-0137. In addition, no documented industry gate valve failures have been attributed to this failure mechanism in Information Notice 92-26, SER 20-84, SER 77-83 and SER 8-88 or River Bend Station

condition reports. Therefore, a review of RBS gate valves for piping thermal expansion loads was not performed.

Valve thermal expansion loads (stem elongation) may create a closing force which can contribute to thermal binding. This closing force tends to drive the disc more tightly into the seat, and on cooling the thermal contraction load (body contraction) effects may be increased. This phenomena was evaluated concurrently using the criteria defined below.

A. System Temperature: Valves located in systems with operating temperatures of 200°F or less were exempted from consideration. The 200°F was chosen as the dividing point between a hot and cold system based upon past evaluations of thermal binding for the Limerick Generating Station, the Perry Nuclear Power Plant, the Susquehanna Steam Electric Station and the Grand Gulf Nuclear Station. The Institute of Nuclear Power Operations (INPO) confirmed the acceptability of the 200°F dividing line during the Susquehanna evaluation. For most cases, the line temperatures that were used during this evaluation are the service condition values specified in RBS line designation tables supplemented by the GE process diagrams. Design conditions are listed on the valve evaluation sheets for reference only.

B. Disc Configuration: The disc configuration of each gate valve is determined by looking at the appropriate valve drawing.

   Double-disc type gate valves are not susceptible to thermal binding. The wedging mechanism between the discs collapses as the stem rises, allowing the discs to move inward away from the seats. This characteristic of the valve permits the discs to be raised regardless of the system temperatures.

C. Potential for Movement: Power-operated valves that have the power removed from them, or are in some other way disabled or locked in position are not considered for thermal binding since they are not expected to functionally change positions during plant operation. Keylocked valves, however, were included in the evaluations since it is easy to disengage the keylocks and operate the valves. Status of the valves were determined through review of the piping and instrumentation drawings (P&IDs) and SOPs.

D. Valve Function: Thermal binding occurs when valves are closed hot and allowed to cool before being reopened. Plant procedures, system design criteria and system operating procedures were reviewed to determine the valve functions and system operating modes, all of which was summarized on the valve review data sheets in Engineering Report M/C 95-0013. The safety related gate valves that have a safety function to open are so designated on the evaluation sheets. Valves that do not have a safety function to open will not affect design basis plant safe shutdown if they are bound shut.

2.3 Hydraulic Locking Evaluation Criteria

Gate Valve Hydraulic Locking phenomenon was evaluated using the following criteria.

A. Disc Configuration: As stated in the thermal binding discussion above, the disc configuration of each valve is determined by review of the valve's drawings. Solid wedge gate valves are exempted from consideration for hydraulic locking, as it is not possible for the faces of a solid wedge to be pushed in opposite directions against both seating surfaces simultaneously.

B. Bonnet Relief: Valves with an open bonnet drain, a bonnet relief valve or a hole through either one side of the valve bridge or the valve disc are exempted from consideration for hydraulic locking, as any pressure that leaks into the bonnet area will have an escape path to prevent hydraulic locking. The existence of an open bonnet drain path was confirmed by use of the P&IDs and valve drawings.

C. Potential for Movement: Power operated valves that have the power removed, or are in some other way disabled or locked in position are exempted from consideration for pressure locking, since they are not expected to functionally change positions during normal operation. Keylocked valves are included in the evaluations since it is possible to disengage keylocks and operate the valves. Status of the valves was determined through review of the P&IDs and SOPs.

D. Valve Function: Hydraulic locking can occur when a closed flex-wedge or double-disc gate valve is required to open and a differential pressure condition exists between higher pressure fluid in the bonnet cavity and lower pressure in the process line. Plant procedures, system design criteria and system operating instructions were reviewed to determine valve functions. The safety related gate valves that have a safety function to open are so designated on the evaluation sheets in Engineering Report M/C 95-0013. Valves that do not have a safety function to open will not affect design basis plant safe shutdown if they are bound shut.

E. Line Pressure: If the pressure in the piping upstream or downstream of a valve is greater than or equal to the pressure in the valve bonnet, the line pressure will offset the pressure trapped between the faces of the disc and will result in a maximum differential pressure across a single face of the valve disc. For motor-operated valves, this differential pressure was analyzed in the existing Generic Letter 89-10 design basis calculations. The upstream and downstream piping pressures at opening were determined using plant procedures, GE process diagrams, line designation tables and the appropriate Generic Letter 89-10 design basis calculations.

2.4 Boiler Effect Evaluation Criteria

Gate valve bonnet boiler effect phenomenon was evaluated using the following criteria.

A. Gas Systems: Valves which are part of gas systems (including steam) are not considered for liquid entrapment (boiler effect) if their valve stems are oriented above the horizontal. It is highly unlikely that the valve bonnet would contain liquid in above horizontal orientations. Unless the bonnet contains a significant amount of liquid, it is not possible to build up the high pressures in the bonnet that would arise from heating an incompressible fluid.

B. Bonnet Relief: Valves with an open bonnet drain, a bonnet relief valve or a hole through either one side of the valve bridge or the valve disc are exempted from consideration for boiler effect pressure locking, as any pressure that leaks into the bonnet area will have an escape path to prevent pressure locking. The existence of an open bonnet drain path was confirmed by use of the P&IDs and valve drawings.

C. Potential for Movement: Power-operated valves that have the power removed, or are in some other way disabled or locked in position are exempted from consideration for pressure locking, since they are not expected to functionally change positions during plant operation. Keylocked valves are included in the evaluations since it is possible to disengage keylocks and operate the valves. Status of the valves was determined through review of the P&IDs and SOPs.

D. Valve Function: Boiler effect occurs when a valve's bonnet is filled or partially filled with fluid and is heated. The resulting pressure may inhibit the valve from re-opening. Plant procedures, system design criteria and system operating instructions were reviewed to determine the valve functions. The safety related gate valves that have a safety function to open are so designated on the evaluation sheets in Engineering Report M/C 95-0013. Valves that do not have a safety function to open will not affect plant design basis safe shutdown if they are bound shut.

E. Valve Heatup: Valves which have water in their bonnets experience the boiler effect phenomenon only when the trapped water is heated. For this criteria to apply, the valve must be in the closed position when the heat source is applied. The potential heat sources that must be considered for this evaluation are listed below.

- Normal Ambient Conditions: Normal ambient conditions are typically not expected to cause bonnet pressurization since the normal ambient temperature swings are small enough and gradual

enough not to cause binding. If locking were to occur, the locking conditions would become apparent during periodic system surveillance testing and the problem valves would be corrected via the corrective action program. However, there are building areas where the maximum normal ambient temperatures are severe and may cause boiler effect locking. The building areas include 1) inside containment, 2) the steam tunnel and 3) the ECCS pump rooms. Valves located in these building areas were evaluated for normal ambient condition boiler effect. It is assumed that operating equipment in the proximity of the closed valve contributes to the normal ambient conditions.

- Accident Ambient Conditions: Accident ambient conditions potentially impact the trapped bonnet fluid if the ambient conditions elevate the area temperature surrounding a closed valve for a significant period of time (several hours) before the valve must open. Valves which are required to open within minutes of an accident would not be impacted by the elevated ambient conditions and are so designated on the evaluation sheets. Accident ambient conditions are determined from RBS Environmental Design Criteria (215.150) and its associated sources. It is assumed that operating equipment in the proximity of the closed valve contributes to the accident ambient conditions.

- Fluid Temperatures: If the closed valve is located in a stagnant branch of a hot system, there is the potential that the heat will conduct through the fluid and/or the piping. As the distance from the hot piping increases, the heat loss to the atmosphere increases and the potential for bonnet pressurization decreases. Based on thermal gradient calculations for similar nuclear power plant applications, the figure of 20 feet was used as the cutoff, beyond which the heat input to the bonnet was determined insignificant. This 20 foot distance must be outboard of another closed valve, a vertical drop of piping, or a restricting orifice so as not to create convection currents in the fluid.

2.5 Hub Analysis Evaluations

For those valves found to be susceptible to bonnet pressurization due to either hydraulic locking or boiler effect, a "Hub" analysis was performed for those scenarios where bonnet temperatures and pressures could readily be determined. The Hub analysis utilized was the Grand Gulf methodology presented at the NRC public workshop in New Orleans, LA. in February of 1994, see NUREG/CP-0146.

3.0 SUMMARY AND RESULTS

A total of 114 power operated safety related gate valves were evaluated using the criteria established in Section 2.0. No power operated safety related solid wedge gate valves, nor any air, hydraulically or manually operated safety related gate valves that have a safety function to open were identified in the reviews.

Table 1 summarizes the results for each valve evaluated per GL 95-07. For those valves with a safety related-related function to open, there were no valves susceptible to thermal binding, four valves which were susceptible to hydraulic locking and two valves that were susceptible to boiler effect (see these valves as listed below). However, based upon the "Hub" analysis performed for each of the safety related scenarios, all of the valves were found to be capable of overcoming the trapped bonnet pressure. For the motor operated valves (MOVs) as listed below, modifications were completed and fully implemented during the RF6 outage (January-February 1996) to remove the pressure locking failure mechanism specified for each valves, (reference Modification Requests 95-0048 and 95-0049).

Valve	Failure Mechanism
E12-MOVF042C	Hydraulic Locking
E21-MOVF005	Hydraulic Locking
E22-MOVF004	Hydraulic Locking
E22-MOVF015	Boiler Effect
E51-MOVF013	Hydraulic Locking
E51-MOVF031	Boiler Effect

Valves E12-MOVF042A, E12-MOVF042B, E12-MOVF004A and E12-MOVF004B were modified as a result of a previous review to address hydraulic locking. Also, E12-MOVF024A and E12-MOVF024B were changed from gate valves to rotary disc valves to meet Generic Letter 89-10 guideline requirements.

TABLE 1

RIVER BEND STATION
GATE VALVE SUSCEPTIBILITY
TO THERMAL BINDING OR BONNET PRESSURIZATION
EVALUATION SUMMARY

Valve No.	Susceptible to Thermal Binding	Susceptible to Hydraulic Locking	Susceptible to Boiler Effect
B21-MOVF016	YES (NSR)	YES (NSR)	YES (NSR)
B21-MOVF019	YES (NSR)	YES (NSR)	YES (NSR)
B21-MOVF065A/B	YES (NSR)	YES (NSR)	YES (NSR)
B21-MOVF085	YES (NSR)	YES (NSR)	YES (NSR)
B21-MOVF086	YES (NSR)	YES (NSR)	YES (NSR)
B21-MOVF098A/B/C/D	NO	NO	NO
B33-MOVF023A/B	NO	NO	NO
B33-MOVF067A/B	NO	NO	NO
CCP-MOV138	NO	YES (NSR)	NO
CCP-MOV158	NO	YES (NSR)	NO
CCP-MOV159	NO	YES (NSR)	NO
CNS-MOV125	NO	YES (NSR)	NO
CNS-MOV130	NO	YES (NSR)	NO
CPP-MOV104	NO	NO	NO
CPP-MOV105	NO	NO	NO
DFR-MOV146	NO	YES (NSR)	YES (NSR)
E12-MOVF004A/B	NO	NO	NO
E12-MOVF006A/B	YES (NSR)	YES (NSR)	NO
E12-MOVF008	YES (NSR)	YES (NSR)	YES (NSR)
E12-MOVF009	YES (NSR)	YES (NSR)	YES (NSR)
E12-MOVF026A/B	NO	NO	NO
E12-MOVF027A/B	YES (NSR)	YES (NSR)	YES (NSR)
E12-MOVF042A/B	NO	NO	NO
E12-MOVF042C	NO	YES (SR/NSR)	NO
E12-MOVF047A/B	YES (NSR)	YES (NSR)	NO
E12-MOVF049	YES (NSR)	YES (NSR)	YES (NSR)
E12-MOVF064A/B	NO	YES (NSR)	YES (NSR)
E12-MOVF064C	NO	YES (NSR)	NO
E12-MOVF094	NO	NO	YES (NSR)
E12-MOVF096	NO	YES (NSR)	YES (NSR)
E12-MOVF105	NO	YES (NSR)	NO

Susceptibility is noted as applicable to Safety Related (SR) and/or Non-Safety Related (NSR) operations

TABLE 1 (Cont'd)

RIVER BEND STATION
GATE VALVE SUSCEPTIBILITY
TO THERMAL BINDING OR BONNET PRESSURIZATION
EVALUATION SUMMARY

Valve No.	Susceptible to Thermal Binding	Susceptible to Hydraulic Locking	Susceptible to Boiler Effect
E21-MOVF001	NO	YES (NSR)	NO
E21-MOVF005	NO	YES (SR/NSR)	YES (NSR)
E21-MOVF011	NO	YES (NSR)	NO
E22-MOVF001	NO	YES (NSR)	NO
E22-MOVF004	NO	YES (SR/NSR)	NO
E22-MOVF012	NO	YES (NSR)	NO
E22-MOVF015	NO	YES (NSR)	YES (SR)
E51-MOVF010	NO	YES (NSR)	NO
E51-MOVF013	YES (NSR)	YES (SR/NSR)	YES (NSR)
E51-MOVF031	NO	YES (NSR)	YES (SR/NSR)
E51-MOVF059	NO	YES (NSR)	NO
E51-MOVF063	YES (NSR)	NO	NO
E51-MOVF064	YES (NSR)	NO	NO
E51-MOVF068	YES (NSR)	NO	NO
FPW-MOV121	NO	YES (NSR)	NO
FPW-MOV122	NO	YES (NSR)	NO
FWS-MOV7A/B	YES (NSR)	YES (NSR)	NO
G33-MOVF001	YES (NSR)	YES (NSR)	NO
G33-MOVF004	YES (NSR)	YES (NSR)	NO
G33-MOVF028	NO	YES (NSR)	NO
G33-MOVF034	NO	YES (NSR)	NO
G33-MOVF035	NO	NO	NO
G33-MOVF039	YES (NSR)	YES (NSR)	NO
G33-MOVF040	YES (NSR)	YES (NSR)	NO
G33-MOVF046	NO	NO	NO
G33-MOVF053	YES (NSR)	YES (NSR)	NO
G33-MOVF054	YES (NSR)	YES (NSR)	NO
G33-MOVF100	YES (NSR)	YES (NSR)	YES (NSR)
G33-MOVF106	YES (NSR)	YES (NSR)	YES (NSR)
HVN-MOV22A/B	NO	NO	NO
HVN-MOV102	NO	YES (NSR)	NO

Susceptibility is noted as applicable to Safety Related (SR) and/or Non-Safety Related (NSR) operations

TABLE 1 (Cont'd)

RIVER BEND STATION
GATE VALVE SUSCEPTIBILITY
TO THERMAL BINDING OR BONNET PRESSURIZATION
EVALUATION SUMMARY

Valve No.	Susceptible to Thermal Binding	Susceptible to Hydraulic Locking	Susceptible to Boiler Effect
HVN-MOV127	NO	YES (NSR)	NO
HVN-MOV128	NO	YES (NSR)	NO
HVN-MOV129	NO	YES (NSR)	NO
HVN-MOV130	NO	YES (NSR)	NO
IAS-MOV106	NO	NO	NO
IAS-MOV107	NO	NO	NO
SAS-MOV102	NO	NO	NO
SAS-MOV103	NO	NO	NO
SFC-MOV119	NO	YES (NSR)	NO
SFC-MOV120	NO	YES (NSR)	NO
SFC-MOV121	NO	YES (NSR)	NO
SFC-MOV122	NO	YES (NSR)	NO
SFC-MOV139	NO	YES (NSR)	NO
SWP-MOV4A/B	NO	YES (NSR)	NO
SWP-MOV5A/B	NO	YES (NSR)	NO
SWP-MOV73A/B	NO	NO	NO
SWP-MOV74A/B	NO	NO	NO
SWP-MOV81A/B	NO	YES (NSR)	NO
SWP-MOV502A/B	NO	YES (NSR)	NO
SWP-MOV503A/B	NO	YES (NSR)	NO
SWP-MOV504A/B	NO	NO	NO
SWP-MOV507A/B	NO	YES (NSR)	NO
SWP-MOV510A/B	NO	NO	NO
WCS-MOV111	NO	YES (NSR)	NO
WCS-MOV172	NO	YES (NSR)	NO
WCS-MOV173	NO	YES (NSR)	NO
WCS-MOV178	NO	YES (NSR)	NO

Susceptibility is noted as applicable to Safety Related (SR) and/or Non-Safety Related (NSR) operations