

October 19, 2000

Mr. William A. Eaton
Vice President, Operations GGNS
Entergy Operations, Inc.
P. O. Box 756
Port Gibson, MS 39150

SUBJECT: GRAND GULF NUCLEAR STATION, UNIT 1 - COMPLETION OF LICENSING ACTION FOR GENERIC LETTER 95-07, "PRESSURE LOCKING AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES," (TAC NO. M93467)

Dear Mr. Eaton:

On August 17, 1995, the Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 95-07 to request that licensees take actions to ensure those safety-related power-operated gate valves that are susceptible to pressure locking or thermal binding are capable of performing their safety functions.

The NRC staff has reviewed your response to GL 95-07 for Grand Gulf Nuclear Station (GGNS), including supplemental submittals in response to the staff's formal requests for additional information, and finds that you have adequately addressed the actions requested in GL 95-07, as discussed in the enclosed safety evaluation (SE). The staff considers GL 95-07 to be closed for GGNS, and the enclosed SE completes the staff's efforts on TAC No. M93467.

Sincerely,

/RA/

S. Patrick Sekerak, Project Manager
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-416

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
LICENSEE RESPONSE TO GENERIC LETTER 95-07, "PRESSURE LOCKING
AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES"
GRAND GULF NUCLEAR STATION
DOCKET NUMBER 50-416

1.0 INTRODUCTION

Pressure locking and thermal binding represent potential common-cause failure mechanisms that can render redundant safety systems incapable of performing their safety functions. The identification of susceptible valves and the determination of when the phenomena might occur require a thorough knowledge of components, systems, and plant operations. Pressure locking occurs in flexible-wedge and double-disk gate valves when fluid becomes pressurized inside the valve bonnet and the actuator is not capable of overcoming the additional thrust requirements resulting from the differential pressure created across both valve disks by the pressurized fluid in the valve bonnet. Thermal binding is generally associated with a wedge gate valve that is closed while the system is hot and then is allowed to cool before an attempt is made to open the valve.

Pressure locking or thermal binding occurs as a result of the valve design characteristics (wedge and valve body configuration, flexibility, and material thermal coefficients) when the valve is subjected to specific pressures and temperatures during various modes of plant operation. Operating experience indicates that these situations were not always considered in many plants as part of the design basis for valves.

2.0 REGULATORY REQUIREMENTS

Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR) (Appendix A, General Design Criteria 1 and 4) and plant licensing safety analyses require or commit (or both) that licensees design and test safety-related components and systems to provide adequate assurance that those systems can perform their safety functions. Other individual criteria in Appendix A to 10 CFR Part 50 apply to specific systems. In accordance with those regulations and licensing commitments, and under the additional provisions of 10 CFR Part 50 (Appendix B, Criterion XVI), licensees are expected to act to ensure that safety-related power-operated gate valves susceptible to pressure locking or thermal binding are capable of performing their required safety functions.

ENCLOSURE

On August 17, 1995, the Nuclear Regulatory Commission (NRC or the Commission) issued Generic Letter (GL) 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," to request that licensees take certain actions to ensure those safety-related power-operated gate valves that are susceptible to pressure locking or thermal binding are capable of performing their safety functions within the current licensing bases of the facility. GL 95-07 requested that each licensee, within 180 days of the date of issuance of the generic letter, (1) evaluate the operational configurations of safety-related power-operated gate valves in its plant to identify valves that are susceptible to pressure locking or thermal binding, and (2) perform further analyses and take needed corrective actions (or justify longer schedules) to ensure that the susceptible valves identified in (1) above are capable of performing their intended safety functions under all modes of plant operation, including test configurations. In addition, GL 95-07 requested that licensees, within 180 days of the date of issuance of the generic letter, provide to the NRC a summary description of (1) the susceptibility evaluation used to determine that valves are or are not susceptible to pressure locking or thermal binding; (2) the results of the susceptibility evaluation, including a listing of the susceptible valves identified; and (3) the corrective actions, or other dispositioning, for the valves identified as susceptible to pressure locking or thermal binding. The NRC issued GL 95-07 as a "compliance backfit" pursuant to 10 CFR 50.109(a)(4)(i) because modification may be necessary to bring facilities into compliance with the rules of the Commission referenced above.

In a letter dated February 13, 1996, Entergy Operations, Inc. (the licensee), submitted its 180-day response to GL 95-07 for Grand Gulf Nuclear Station (GGNS). The NRC staff reviewed the licensee's submittal and requested additional information in a letter dated May 29, 1996. In a letter dated June 28, 1996, the licensee provided the additional information. The NRC staff requested additional information in a letter dated May 1, 1999, and the licensee provided the additional information in a letter dated June 30, 1997. In letters dated May 4 and July 26, 1999, the licensee provided valve test results. In a letter dated May 17, 2000, the licensee supplemented its dated February 13 and June 28, 1996, and June 30, 1997, letters.

3.0 STAFF EVALUATION

3.1 Scope of Licensee's Review

GL 95-07 requested that licensees evaluate the operational configurations of safety-related power-operated gate valves in their plants to identify valves that are susceptible to pressure locking or thermal binding. The licensees' letters dated February 13 and June 28, 1996, and June 30, 1997, describe the scope of valves evaluated in response to GL 95-07. The NRC staff has reviewed the scope of the licensee's susceptibility evaluation performed in response to GL 95-07 and found it complete and acceptable.

Normally open, safety-related power-operated gate valves which are closed for test or surveillance but must return to the open position were evaluated within the scope of GL 95-07, except in the instances when the system/train is declared inoperable in accordance with technical specifications. The criteria for determining the scope of power-operated valves for GL 95-07 are consistent with the staff's acceptance of the scope of motor-operated valves associated with GL 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," and GL 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves."

3.2 Corrective Actions

GL 95-07 requested that licensees, within 180 days, perform further analyses as appropriate, and take appropriate corrective actions (or justify longer schedules), to ensure that the susceptible valves identified are capable of performing their intended safety function under all modes of plant operation, including test configurations. The licensee's submittals discussed corrective actions to address potential pressure-locking and thermal-binding problems. The staff's evaluation of the licensee's actions is discussed in the following paragraphs.

3.2.1 The licensee stated that the following valves were modified to eliminate the potential for pressure locking:

E12F004A	Residual Heat Removal (RHR) Pump A Suction from Suppression Pool
E12F004B	RHR Pump B Suction from Suppression Pool
E12F004C	RHR Pump C Suction from Suppression Pool
E12F024A	RHR A Test Return to Suppression Pool
E12F024B	RHR B Test Return to Suppression Pool
E12F042A	RHR A Injection
E12F042B	RHR B Injection
E12F042C	RHR C Injection
E12F064A	RHR A Minimum Flow Valve
E12F064B	RHR B Minimum Flow Valve
E21F005	Low Pressure Core Spray Injection
E22F004	High Pressure Core Spray (HPCS) Injection
E22F015	HPCS Pump Suction from Suppression Pool
E51F013	Reactor Core Isolation Cooling (RCIC) Injection Shutoff
E51F031	RCIC Pump Suction from Suppression Pool

The staff finds that physical modification to valves susceptible to pressure locking is an appropriate corrective action to ensure operability of the valves and is thus acceptable.

3.2.2 In its letter dated May 17, 2000, the licensee stated that it plans to use a thrust-prediction methodology developed by Commonwealth Edison Company (ComEd) to demonstrate that the following valves are capable of opening during pressure-locking conditions:

E12F028A/B	Containment Spray
E12F064C	RHR C Minimum Flow
P41F064A	Station Service Water (SSW) to Control Room Air Conditioner (AC) A
P41F064B	SSW Supply to Control Room AC and Emergency Safety Feature (ESF) Room Coolers B
P41F081A	SSW Outlet From Control Room AC A
P41F081B	SSW Return From Control Room AC B and ESF Room Coolers B
P41F237	SSW Inlet to ESF Room Coolers A
P41F238	SSW Outlet From ESF Room Coolers A

The licensee committed to re-evaluate and complete the calculations for these valves using the ComEd methodology by May 2001 and complete any modifications to achieve an acceptable margin or eliminate the potential for pressure locking, if required, by the

end of the refueling outage scheduled for the fall of 2002. Any valve operability concerns that might be identified in the future will be processed in accordance with established regulatory requirements and plant-specific commitments.

On April 9, 1997, the staff held a public meeting to discuss the technical adequacy of the ComEd pressure-locking thrust prediction methodology and its generic use by licensees in their submittals responding to GL 95-07. The minutes of the public meeting were issued on April 25, 1997. At the public meeting, ComEd recommended that, when using its methodology, minimum margins should be applied between calculated pressure-locking thrust and actuator capability. These margins, along with diagnostic equipment accuracy and methodology limitations, are defined in a letter from ComEd to the NRC dated May 29, 1998. ComEd indicated that its methodology may be revised in the future to refine the margins. NRC considers the use of the ComEd pressure locking methodology acceptable, provided these margins (or revised margins), diagnostic equipment accuracy specifications, and methodology limitations are incorporated into the pressure-locking calculations. The staff considers that calculations that are used to demonstrate that valves can overcome pressure locking are required to meet the requirements of 10 CFR Part 50, Appendix B, Quality Assurance Criteria for Nuclear Power Plants, and therefore, controls are required to be in place to ensure that any industry pressure-locking thrust prediction methodology requirements and revisions are properly implemented. Under this condition, the staff finds that the ComEd methodology provides a technically sound basis for ensuring that valves susceptible to pressure locking are capable of performing their intended safety-related function.

The licensee stated that it is currently using its thrust-prediction methodology (Entergy Hub Method) to demonstrate that these valves are capable of opening during pressure-locking conditions. The NRC staff considers use of the Entergy Hub Method an acceptable short-term corrective action to demonstrate that the valves are capable of operating during pressure-locking conditions.

- 3.2.3 The licensee stated that all flexible and solid wedge gate valves in the scope of GL 95-07 were evaluated for thermal binding. When evaluating whether valves were susceptible to thermal binding, the licensee assumed that thermal binding would not occur below specific temperature thresholds. The screening criteria used by the licensee appear to provide a reasonable approach to identify those valves that might be susceptible to thermal binding. Until more definitive industry criteria are developed, the staff concludes that the licensee's actions to address thermal binding of gate valves are acceptable.

4.0 CONCLUSION

On the basis of this evaluation, the NRC staff finds that the licensee has performed appropriate evaluations of the operational configurations of safety-related power-operated gate valves to identify valves at GGNS, that are susceptible to pressure locking or thermal binding. In addition, the NRC staff finds that the licensee has taken, or is scheduled to take, the appropriate corrective actions to ensure that valves are capable of performing their intended safety functions. Therefore, the staff concludes that the licensee has adequately addressed the requested actions discussed in GL 95-07.

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Date: October 19, 2000

Grand Gulf Nuclear Station

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