



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

LICENSEE RESPONSE TO GENERIC LETTER 95-07

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NUMBER 50-382

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 Part 50) (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.

On August 17, 1995, the Nuclear Regulatory Commission (NRC) 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 that safety-related power-operated gate valves that are susceptible to pressure locking or thermal binding are capable of

ENCLOSURE

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 configuration. 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 or EOI) submitted its 180-day response to GL 95-07 for Waterford Steam Electric Station, Unit 3. The NRC staff reviewed the licensee's submittal and requested additional information by letter dated June 24, 1996. The licensee provided the additional information by letter dated August 1, 1996, and supplemented their 180-day response in a letter dated June 17, 1999.

3.0 STAFF EVALUATION

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 licensee's letters dated February 13 and August 1, 1996, and June 17, 1999, described 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.

Technical Specifications (TSs) require the safety injection tanks' outlet isolation valves, SI-331A/B and SI-332A/B, be open in MODES 1, 2, and 3. The TSs state that in MODE 4 with the pressurizer pressure less than 392 psia, the safety injection tanks may be isolated. The NRC staff considers that valves SI-331A/B and SI-332A/B are not required to be reopened after being shut in MODE 4 provided that pressurizer pressure is less than 392 psia. Therefore, these valves are not required to be in the scope of GL 95-07 because they are normally open and their safety position is open. This safety position classification is consistent with the Waterford Inservice Test Program which states that the valves' safety position is passive open. The GL 95-07 submittal dated February 13, 1996, for Waterford 3 Steam Electric Station stated that a pressure locking thrust prediction methodology developed by EOI was used to demonstrate that valves SI-331A/B and SI-332A/B are capable of opening during pressure-locking conditions. The NRC staff finds that it is not necessary to rely on the EOI methodology since these valves are not required to be in the scope of GL 95-07. This Safety Evaluation does not approve the use of the EOI methodology as an acceptable method to demonstrate that valves are capable of operating during pressure-locking conditions.

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. No valves were identified as susceptible to pressure locking or thermal binding when closed for testing. The staff finds the criteria for determining the scope of power-operated valves for GL 95-07 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."

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 configuration. The licensee's submittals discussed proposed 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:

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

CS-125A/B	Containment Spray Header Isolation
SI-125A/B	Shutdown Cooling Heat Exchanger Inlet
SI-412A/B	Shutdown Cooling Heat Exchanger Outlet

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.

- b. 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. Operating conditions for the shutdown cooling hot leg suction valves SI-401A/B, SI-405A/B, and SI-407A/B, exceed these temperature thresholds. The licensee stated that specific operational history demonstrated that the valves are not susceptible to thermal binding. 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 the Waterford Steam Electric Station, Unit 3, that are susceptible to pressure locking or thermal binding. In addition, the NRC staff finds that the licensee has taken appropriate corrective actions to ensure that these 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: December 28, 1999