



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RESPONSE TO GENERIC LETTER 95-07, "PRESSURE LOCKING

AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES"

CONSUMERS ENERGY COMPANY

PALISADES PLANT

DOCKET NUMBER 50-255

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

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 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 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 of February 13, 1996, Consumers Energy Company¹ submitted its 180-day response to GL 95-07 for the Palisades Plant. The NRC staff reviewed the licensee's submittal and requested additional information in a letter dated June 21, 1996. In a letter of July 22, 1996, the licensee provided the additional information. In a letter of July 1, 1997, the licensee revised several commitments made in its 180-day response. In a letter of February 23, 1998, the licensee supplemented its GL 95-07 180-day response.

3.0 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 Consumers Energy Company's letters of February 13 and July 22, 1996, July 1, 1997, and February 23, 1998, 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.

The licensee did not include the shutdown cooling valves, CV-3055, MO-3190, MO-3199, MO-3015, and MO-3016, in the scope of GL 95-07 because these valves are used during plant conditions below Hot Shutdown. The licensing bases for the Palisades Plant is Hot Shutdown. 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."

¹ Prior to July 1997 Consumers Energy Company was known as Consumers Power Company.

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 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 pressurizer power-operated relief valves' (PORV) block valves, MO-1042A and MO-1043A, were modified to eliminate the potential for pressure locking. 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 the high pressure safety injection sub-cooling valves, CV-3070 and CV-3071, will be modified to eliminate the potential for pressure locking during the 1998 refueling outage. The licensee stated that as short-term corrective action, the valves are cycled following evolutions that could potentially create a pressure-locking condition. The staff finds that this provides assurance that pressure-locking conditions are adequately identified and eliminated, and are thus acceptable short-term corrective action.
- c. The licensee stated that it used a thrust-prediction methodology developed by Commonwealth Edison (ComEd) to demonstrate that the following valves could open under pressure-locking conditions:

MO-2160	SIRW [Safety Injection and Refueling Water] Tank to CVCS [Chemical and Volume Control System] Isolation
MO-2140	Boric Acid Gravity Feed Isolation
MO-2169	Boric Acid Gravity Feed Isolation
MO-2170	Boric Acid Gravity Feed Isolation

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. ComEd indicated that its methodology is undergoing review and may be revised. 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. Therefore, controls are required to be in place to ensure that any industry pressure-locking thrust prediction methodology requirements and revisions thereto are properly implemented. Under this condition, the staff finds that the ComEd methodology provides a technically sound basis for assuring that valves susceptible to pressure locking are capable of performing their intended safety-related function.

- d. 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 pressurizer PORV block valves, MO-1042A and MO-1043A, exceed these temperature thresholds. The licensee stated that these valves will be converted from torque seating to position seating during the refueling outage scheduled for April 1998 to reduce the potential for 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. 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 Palisades Plant 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, 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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Dated: May 5, 1998