

July 17, 2000

Mr. Robert P. Powers, Senior Vice President
Indiana Michigan Power Company
Nuclear Generation Group
500 Circle Drive
Buchanan, MI 49107

SUBJECT: DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2 - EVALUATION OF
LICENSEE RESPONSE TO GENERIC LETTER 95-07, "PRESSURE LOCKING
AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE
VALVES," (TAC NOS. M93451 AND M93452)

Dear Mr. Powers:

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 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.

In a letter of February 16, 1996, Indiana Michigan Power Company (the licensee) submitted its 180-day response to GL 95-07 for Donald C. Cook Nuclear Plant, Units 1 and 2. The NRC staff reviewed the licensee's submittal and requested additional information in a letter dated June 18, 1996. In a letter of July 22, 1996, the licensee provided the additional information. In a letter dated April 3, 2000, the licensee revised its submittals dated February 16 and July 22, 1996. The NRC staff performed an inspection to review specific aspects of information summarized in the licensee's responses to GL 95-07. This inspection is documented in NRC Inspection Report Nos. 50-315, 316/00-02.

The NRC staff has reviewed the licensee's submittals and finds that the licensee has adequately addressed the actions requested in GL 95-07, as discussed in the enclosed safety evaluation. This completes the NRC efforts on TAC Nos. M93451 and M93452.

Sincerely,

/RA/

John F. Stang, Senior Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-315 and 50-316

Enclosure: As Stated

cc w/encls: 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"
DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2
DOCKET NUMBERS 50-315 AND 50-316

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 requires 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 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 GL (1) evaluate the operational configurations of safety-related power-operated gate valves in its plant to identify valves that

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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 GL, 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.

By letter dated February 16, 1996, Indiana Michigan Power Company (the licensee) submitted its 180-day response to GL 95-07 for Donald C. Cook Nuclear Plant, Units 1 and 2. The NRC staff reviewed the licensee's submittal and requested additional information in a letter dated June 18, 1996. By letter dated July 22, 1996, the licensee provided the additional information.

By letter dated April 3, 2000, the licensee revised its submittals dated February 16 and July 22, 1996. The NRC staff performed an inspection to review specific aspects of information summarized in the licensee's responses to GL 95-07. This inspection is documented in NRC Inspection Report Nos. 50-315, 316/00-02.

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 licensee's letters of February 16 and July 22, 1996, and April 3, 2000, and NRC Inspection Report Nos. 50-315, 316/00-02 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.

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."

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 staff's evaluation of the licensee's actions is discussed in the following paragraphs.

- a. The following valves are equipped with a bypass line that connected the bonnet cavity to the high pressure side of each valve which eliminates the potential for pressure locking:

1,2-ICM-129	Reactor Coolant System (RCS) to Residual Heat Removal (RHR)
1,2-ICM-250 and 251	Boric Injection Tank Outlet
1,2-IMO-128	RCS to RHR Pump Suction
1,2-IMO-255 and 256	Boric Injection Tank Inlet
1,2-IMO-310 and 320	RHR Pump Suction
1,2-IMO-314 and 324	RHR Pump Discharge Crosstie
1,2-IMO-315 and 325	RHR/Safety Injection to RCS Hot Leg
1,2-IMO-340	RHR to Charging Pump Suction
1,2-IMO-350	RHR to Safety Injection Pump Suction
1,2-IMO-390	RHR Pump Suction From Refueling Water Storage Tank

The following Unit 2 valves were modified to eliminate the potential for pressure locking and the licensee plans to modify the following Unit 1 valves to eliminate the potential for pressure locking prior to the restart from its current outage:

1,2-ICM-305 and 306	Containment Sump Recirculation
1,2-IMO-330 and 331	RHR to Upper Containment Spray Isolation
1,2-NMO-151, 152, and 153	Pressurizer Power Operated Relief Valve Isolation

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. A thrust-prediction methodology developed by Commonwealth Edison (ComEd) was used to demonstrate that the Unit 2 refueling water storage tank to chemical and volume control system charging pumps suction header isolation valves, 2-IMO-910 and 911, are capable of opening during pressure-locking conditions. The licensee stated that the ComEd thrust-prediction methodology will be used to demonstrate that the Unit 1 valves, 1-IMO-910 and 911, are capable of operating during pressure-locking conditions and that the calculations will be complete prior to the restart from its current outage.

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. The NRC considers the use of the ComEd pressure locking methodology acceptable provided these margins, diagnostic equipment accuracy requirements 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.

- c. 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 Donald C. Cook Nuclear Plant, Units 1 and 2, 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.

Date: July 17, 2000