

January 28, 2005

Mr. Karl W. Singer
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNIT 1 — CLOSEOUT OF GENERIC LETTER 95-07, "PRESSURE LOCKING AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES," BROWNS FERRY NUCLEAR PLANT, UNIT 1 (TAC NO. MC3125)

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 that safety-related power-operated gate valves that are susceptible to pressure locking or thermal binding are capable of performing their safety functions.

By letter dated May 11, 2004, as supplemented by letter dated July 29, 2004, the Tennessee Valley Authority (TVA) provided its response to the GL for the Browns Ferry Nuclear Plant, Unit 1. The NRC staff has completed its review of the response, and concluded that, based on the evaluation contained in the enclosure, TVA has provided an acceptable resolution to the GL 95-07 concerns. If you have any questions regarding this matter, please contact me at (301) 415-4041.

Sincerely,

/RA/

Margaret H. Chernoff, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No.: 50-259

Attachment: 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
BROWNS FERRY NUCLEAR PLANT, UNIT 1

DOCKET NUMBER 50-259

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

Title 10, *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

ENCLOSURE

capable of performing their safety functions within the current licensing bases of the facility. GL 95-07 requested that each licensee (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 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 preparation for restart of Browns Ferry Nuclear Plant, Unit 1, following an extended outage, Tennessee Valley Authority (TVA) submitted its response to GL 95-07 for Browns Ferry Nuclear Plant, Unit 1, in a letter of May 11, 2004.

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 TVA letter of May 11, 2004, described the scope of valves evaluated in response to GL 95-07. 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 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.

3.2 Corrective Actions

GL 95-07 requested that licensees perform analyses as appropriate, and take appropriate corrective actions 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 submittal 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:

- a. The licensee stated that the high pressure core injection (HPCI) steam admission valve, 1-FCV-73-16, would be susceptible to thermal induced pressure locking if condensate was allowed to accumulate in the piping that the valve is located. However, piping configuration and steam trap location ensure that condensate does not accumulate in the piping during unit operation. The NRC staff finds that preventing the accumulation of condensate in the area that 1-FCV-73-16 is located eliminates the conditions that could render 1-FCV-73-16

inoperable due to thermal induced pressure locking. The licensee also stated that any condition which would result in a loss of steam pressure in the HPCI piping would also disable the HPCI system. The NRC staff finds that although a pressure-locking condition may exist upon a sudden loss of pressure in the HPCI steam supply piping, 1-FCV-73-16 would not be required to open if this event occurred. Therefore, no further corrective action is required.

- b. The licensee stated that the following valves are susceptible to pressure locking and that the valves would be modified to eliminate the potential for pressure locking prior to Unit 1 restart.

1-FCV-71-39 Reactor Core Isolation Cooling Injection
1-FCV-74-53 Residual Heat Removal Low Pressure Coolant Injection
1-FCV-74-67 Residual Heat Removal Low Pressure Coolant Injection
1-FCV-75-25 Core Spray Outboard Injection
1-FCV-75-53 Core Spray Outboard Injection

The staff finds that physical modification to these valves that were formerly susceptible to pressure locking to be an appropriate corrective action because the modification eliminates the potential for pressure locking.

- 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. The licensee stated that conditions for HPCI steam admission valve, 1-FCV-73-16, exceed the temperature threshold for which thermal binding could occur. The licensee stated that 1-FCV-73-16 would be replaced with a valve that is not susceptible to thermal binding prior to Unit 1 restart. 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 Browns Ferry Nuclear Plant, Unit 1, 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.

Principal Contributor: S. Tingen, NRR

Date: January 28, 2005