Florida Power
CORPORATION
Crystal River Unit 3
Docket No. 50-302

February 9, 1996
3F0296-06

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 2055

Subject: 180-Day Response to NRC Generic Letter 95-07: Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves

Reference: FPC to NRC letter, 3F1095-01, dated October 16, 1995

Dear Sir:

Florida Power Corporation (FPC) is submitting this response as requested in Generic Letter (GL) 95-07. FPC has completed the evaluation of safety-related power-operated gate valves in Crystal River Unit 3 (CR-3) Nuclear Power Plant systems for susceptibility to pressure locking or thermal binding. We have performed the analyses necessary and taken corrective actions where appropriate to ensure that the susceptible valves are capable of performing their intended safety functions. A summary description of the evaluations performed, listing of susceptible valves, and corrective actions taken are provided in Attachment 1.

Sincerely,

P. M. Beard, Jr.
Senior Vice President
Nuclear Operations

PMB/SCP:ff

xc: Regional Administrator, Region II
Senior Resident Inspector
NRR Project Manager

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STATE OF FLORIDA

COUNTY OF CITRUS

P. M. Beard, Jr. states that he is the Senior Vice President, Nuclear Operations for Florida Power Corporation; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission the information attached hereto; and that all such statements made and matters set forth therein are true and correct to the best of his knowledge, information, and belief.

P. M. Beard, Jr.
Senior Vice President
Nuclear Operations

P. M. Beard, Jr., personally known to me. Subscribed and sworn to before me, a Notary Public in and for the State and County above named, this 8th day of February, 1996.

LYNNE S. SMITH

Notary Public (print)

LYNNE S. SMITH
MY COMMISSION # CC 514380
EXPIRES: December 18, 1999
Bonded Thru Notary Public Underwriters

Notary Public (signature)

Notary Public, State of Florida at Large

ATTACHMENT 1
GENERIC LETTER 95-07 EVALUATION OF CRYSTAL RIVER UNIT 3

SUMMARY OF SUSCEPTIBILITY EVALUATION

CR-3 motor operated valves were evaluated for pressure locking and thermal binding during our resolution of GL 89-10 issues. Fifty-seven motor operated gate valves were identified which fell within the GL 89-10 scope. An additional 22 valves were identified through a search of our computerized Configuration Management Information System (CMIS). The search attributes were 1) safety-related, 2) gate valves, 3) motor operator, and 4) code key "EX". Code Key EX is a designation in the CMIS data base for "Safety related equipment and certain non-safety related electrical and mechanical equipment relied upon to remain functional during and after a design basis event."

Subsequent to the issuance of GL 95-07, safety related gate valves with diaphragm, piston or solenoid operators were evaluated. A search of the CMIS data base was used to identify all valves meeting these criteria. Thirty-eight additional valves were identified.

In addition, the safety and accident mitigation functions described in the CR-3 Final Safety Analysis Report, the Enhanced Design Basis Document, and the Emergency Operating Procedures were reviewed to verify that all important valves were included. FPC also considered the information provided by the NRC Staff during the Public Workshop on Pressure Locking and Thermal Binding in February 1994, regarding valves considered susceptible for Babcock & Wilcox plants. The CR-3 Environmental and Seismic Qualification Program Manual (ESQPM) was used to determine the locations where ambient conditions could lead to pressure locking.

The detailed evaluation of all valves considered is compiled in CR-3 Engineering Calculation M94-0003.

Two pressure locking mechanisms were considered in our evaluation.

1) pressure locking due to high pressure fluid on one side of a valve leaking into the valve bonnet and then forcing both valve disc faces against their seats and increasing the disc-seat friction, and

2) pressure locking due to fluid in a valve bonnet being heated by either process fluid or extraordinary ambient temperature conditions that results in pressurizing the fluid trapped in the bonnet and subsequently increasing valve disc-seat friction forces. This is also known as the boiler effect.

When the physical piping configuration supported the creation of convective currents which could have resulted in bonnet heating, the boiler effect (bonnet pressurization) was considered. Valves were not considered susceptible to pressure locking via the boiler effect if any one of the following conditions exist:

if an orifice plate was installed between the valve in question and the main process line (the orifice plate impedes formation of convective currents which could lead to bonnet pressurization).

if the valve in question was located at least 20 ft downstream of a normally closed valve off the main process line (any leakage or conduction through the first normally closed valve would be insufficient to cause bonnet pressurization in the downstream valve).

if the valve in question was located at least 20 ft below the main process line (no convective currents can form in this stagnant column of water which is coolest at the lowest elevation next to the valve).

Regarding plant ambient conditions, the following guidelines were used when evaluating the boiler effect:

normal plant ambient conditions are not sufficient to cause the boiler effect since piping system separation in the plant and HVAC systems will maintain ambient temperatures to less than 200°F even when close to high temperature lines.

if a valve located in a high energy line break area does not perform a safety function of opening during mitigation of the initiating event, the boiler effect for that valve will be inconsequential with regard to event mitigation.

The mechanism considered for thermal binding is differential thermal contraction of the body and disc of a closed valve during cooling, exerting high disc-to-seat forces so that reopening is difficult. This is principally a concern for solid wedge gate valves. Thermal binding is not considered to occur when nominal temperature reductions between closing and opening are less than 100°F.

RESULTS

All valves included in the scope identified above were evaluated for susceptibility to pressure locking and/or thermal binding. The valves listed below were found to be susceptible. No other valves were found to be susceptible to pressure locking or thermal binding that would compromise their safety functions.

DHV-3 and DHV-4 (Decay Heat Drop Line Isolation, valves are in series)

These valves isolate the decay heat removal system from the reactor coolant system (RCS). The differential pressure across DHV-3 is in excess of 2200 pounds per square inch (psi). If DHV-3 were to leak, then the differential pressure across DHV-4 would reach the same value. Since these are flexible wedge gate valves, pressure locking could occur.

The boiler effect is also a concern for these valves. The ESQPM identifies that both valves are located in an area where the temperature would remain above 200°F for approximately 1.4 hours following a LOCA event. This is considered sufficient time for bonnet pressurization to occur via the boiler effect.

A modification was made to these valves, identified as Modification Approval Record (MAR) 89-05-15-01, which drilled a 1/8 inch hole in the high pressure side disc of each valve to provide a pressure relief path.

DHV-5 and DHV-6 (Low Pressure Injection Isolation and Containment Isolation)

These valves are the outboard containment isolation valves on the two parallel low pressure injection lines to the RCS. These valves are required to open on a large break LOCA. Both DHV-5 and DHV-6 are separated from the RCS by two check valves in series. If the check valves were to leak then either or both DHV-5 and DHV-6 could be subject to differential pressure in excess of 2200 psi. Since these are flexible wedge gate valves pressure locking could occur.

A modification was made to these valves, identified as MAR 94-04-05-01, which drilled a 1/8 inch hole in the high pressure side disc of each valve to provide a pressure relief path.

RCV-11 (Block Valve for the Pressurizer Power Operated Relief Valve)

This valve is normally open during power operation and is required to close in order to isolate the RCS from the power operated relief valve (PORV) in the event the PORV develops leakage. If RCV-11 were closed during power operation, thermal binding may occur during subsequent plant shutdown and cooldown. RCV-11 is required to be opened to mitigate low temperature over pressure (LTOP) events.

Procedural controls exist in Operating Procedures (OP-209, 'Plant Cooldown' and OP-202, 'Plant Heatup') to establish alternative means to protect against LTOP events if RCV-11 cannot be opened. These alternative means are considered sufficient to mitigate an LTOP event should RCV-11 become thermally bound.