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NewYork Power Authority

L. M. Hill
Site Executive Officer

February 13, 1996
IPN-96-011

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

SUBJECT: Indian Point 3 Nuclear Power Plant
Docket No. 50-286
Evaluation Results for Generic Letter 95-07
Pressure Locking and Thermal Binding of
Safety-Related Power-Operated Gate Valves

REFERENCES:

1. NRC Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," dated August 17, 1995.
2. NYPA letter IPN-95-105, regarding Sixty-Day Response to Generic Letter 95-07, dated October 16, 1995.
3. Westinghouse Electric Corporation letter ESBU/WOG-96-022, "Summary of January 4 & 5, 1996 Pressure Locking & Thermal Binding Task Team Meeting," dated January 19, 1996.

Dear Sir:

The Power Authority has completed a screening review of safety-related power-operated gate valves and has evaluated those found potentially susceptible to pressure locking or thermal binding (PLTB), as requested in Generic Letter 95-07 (Reference 1). The screening criteria and evaluation results are summarized in Attachment I.

The screening review identified two safety-related gate valves with pneumatic actuators. The evaluation concluded that PLTB is not a concern for these valves. A review of safety-related motor-operated gate valves, previously evaluated as part of our Generic Letter 89-10 Program, was also performed. Attachment I includes the results of the updated screening review and evaluation. The basis of acceptability for each of these valves was documented and the evaluation concludes that these valves are capable of performing their intended safety function.

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The Power Authority is continuing to monitor industry initiatives regarding the technical resolution of this issue, as committed in Reference 2. Recent recommendations (Reference 3) from a Westinghouse Owners Group (WOG) committee on PLTB were incorporated into our updated evaluation of the motor-operated gate valves.

Additional analyses or design enhancements will be considered for increasing the margin for PLTB effects on certain motor-operated gate valves. Commitments made by the Power Authority with this letter are contained in Attachment II. If you have any questions please contact me.

Very truly yours,

J. M. Hill
Site Executive Officer
Indian Point 3 Nuclear Power Plant

STATE OF NEW YORK
COUNTY OF WESTCHESTER
Subscribed and sworn to before me
this 13 day of February 1996.

Barbara Ann Taggart
Notary Public

BARBARA ANN TAGGART
NOTARY PUBLIC, State of New York
No. 4851437
Qualified in Putnam County
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Attachments

cc: next page

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ATTACHMENT I TO IPN-96-011

PRESSURE LOCKING AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES

EVALUATION SUMMARY FOR GENERIC LETTER 95-07

1.0 INTRODUCTION

This report provides a summary description of the evaluation performed in response to Generic Letter 95-07 regarding the susceptibility of safety-related power-operated gate valves to pressure locking or thermal binding (PLTB). This report contains the criteria used to identify potentially susceptible valves and provides a summary of the analyses performed to evaluate the capability of susceptible valves to perform their intended safety function. A review of motor-operated valves previously evaluated for Generic Letter 89-10 was performed in addition to a search for safety-related gate valves powered by other actuator types. New screening criteria and analytical techniques for opening thrust requirements were included to update the previously performed evaluation of motor-operated valves.

2.0 SUSCEPTIBILITY SCREENING EVALUATION

2.1 MOTOR-OPERATED GATE VALVES

There are presently 89 Motor Operated Valves (MOV) included in the Generic Letter 89-10 Program at Indian Point 3. Fifty-nine of these valves are gate valves which were screened for susceptibility to PLTB using the following criteria:

* Valves with no open safety function were excluded from being potentially susceptible to pressure locking and thermal binding.

* Valves with disc bleed holes, bonnet vent lines, or other means of equalizing valve cavity pressure with upstream or downstream pressure, are not susceptible to pressure locking.

* Valves with a maximum fluid temperature less than 200 ^{0}F were excluded from being potentially susceptible to thermal binding.

* Mispositioning scenarios are not considered.

* Flexible wedge, split wedge, and double disc valves are potentially susceptible to pressure locking.

* Flexible wedge and solid wedge valves are potentially susceptible to thermal binding.

Table One lists the MOVs identified as potentially susceptible to PLTB.

2.2 OTHER POWER OPERATED GATE VALVES

A search of the Indian Point 3 Plant Equipment Database (PEDB) was performed for Category 1 (safety-related) hydraulic and pneumatic actuators attached to gate valves. Two valves were identified (MS-PCV-1310A & -1310B) which are the pressure control valves for the main steam supply to the turbine driven auxiliary feed water pump. The valves are double disc gate valves and, based on the criteria in the previous section, are not susceptible to thermal binding. These valves are required to be open prior to reactor coolant system (RCS) heatup above 350 ^{0}F, in order to consider the auxiliary feed water system to be operable. Pressure locking is not a concern for these valves in the open position under normal operating conditions. There are two surveillance tests which apply to these valves. One test involves stroke time measurement while the plant is in cold shutdown. Since these valves have no safety function with the plant in cold shutdown, pressure locking is not a concern for this test. The other is an Inservice Test which may be performed at any plant condition. If it is performed with the RCS above 350 ^{0}F, a Limiting Condition for Operation would apply for the auxiliary feed water system. The test procedure in this case provides for the valve to be closed and then reopened so that there is minimal time duration for a differential pressure to develop that could lead to pressure locking.

3.0 ANALYSIS AND RESULTS

3.1 ANALYSIS METHOD AND ASSUMPTIONS

Valves identified in the susceptibility screening evaluation were analyzed for applicable design and licensing basis operating conditions to determine if PLTB could prevent the valve from performing its intended safety function. Design and licensing basis operating conditions were determined using references such as the Updated Final Safety Analysis Report, Design Basis Documents, and System Operating Procedures. The bounding operating condition or test condition which resulted in the limiting PLTB induced forces was then determined. The following assumptions were used in the evaluation for PLTB:

* Fluid is assumed to become trapped in the valve cavity either while the valve is closing or as a result of leakage while the valve is closed.

* Check valves, including multiple check valves in series, are assumed to allow back leakage.

* Once the valve cavity becomes pressurized with trapped fluid, it is generally assumed that the valve becomes leak tight, precluding gradual depressurization. However, where circumstances allow long periods between pressurization and valve opening, test data regarding valve bonnet depressurization available from the Westinghouse Owners Group (ESBU-WOG-96-022, dated January 19, 1996) may be used.

* The potential for pressure locking can result from:
  (i) a decrease in the line pressure that initially pressurized the valve cavity, and/or
  (ii) heat transfer, from ambient or other heat sources, which increases the pressure of the trapped fluid.

* All motor actuators have the open torque switch bypassed for the valve unseating portion of the opening stroke. The motor output torque corresponding to the minimum bus voltage is generally assumed. Full bus voltage may be assumed for valves that are operated during the hot-leg recirculation phase of an accident. This assumption is supported by operations procedures which restore full bus voltage, if lost, using the emergency diesel generators.

* Valves subject to normal ambient temperature fluctuations (either routine or seasonal) are not considered susceptible to thermally induced PL or TB.

* The valve factor used in supporting calculations of opening thrust requirements is generally assumed to be 0.5 and the stem friction coefficient is generally assumed to be 0.2. If actual opening valve factors and stem friction coefficients were determined during diagnostic testing, the derived values may be used, if lower and must be used, if higher.

3.2 ANALYSIS RESULTS

The results for the updated evaluation of safety-related motor-operated gate valves potentially susceptible to PL and TB are summarized in Tables 2 and 3, respectively. These tables summarize the bounding condition determined in the evaluation for PLTB and provide the basis for acceptability. In some cases, the thrust requirements for PL and/or TB effects are bounded by the analysis results for other factors evaluated under the Generic Letter 89-10 MOV program.

4.0 CONCLUSIONS

The susceptibility screening evaluation performed in response to Generic Letter 95-07 determined that there were no additional safety-related power-operated gate valves susceptible to pressure locking and thermal binding other than the motor operated valves previously evaluated under the Generic Letter 89-10 Program at Indian Point 3. The Power Authority is continuing to follow industry developments regarding this issue and has included recent recommendations from a Westinghouse Owners Group committee in an updated PLTB evaluation for MOVs. The updated evaluation provides a basis for acceptability for each of the susceptible valves and concludes that PLTB will not prevent these valves from performing their intended safety function. Additional analyses or design enhancements will be considered for increasing the margin for PLTB effects on certain MOVs.

TABLE ONE
MOVs POTENTIALLY SUSCEPTIBLE TO PLTB

VALVE ID AND DESCRIPTION	TYPE	PRA [(a)]	SUSCEPTIBILITY
AC-MOV-730: RHR loop suction isolation	dbl disc	low	PL
AC-MOV-743: RHR Pump miniflow isolation	dbl disc	low	PL
AC-MOV-744: RHR Pump discharge isolation	dbl disc	medium	PL
RC-MOV-535 & -536: PORV block valves	flex wdg	high	PL & TB
SI-MOV-850A & -850C: SI Pump 31 discharge isolation	flex wdg	low	PL & TB
SI-MOV-851A & -851B: SI Pump 32 discharge isolation	dbl disc	low	PL
SI-MOV-866A & -866B: Containment Spray Pump discharge isolation	dbl disc	medium	PL
SI-MOV-883: RHR Pump recirc valve to the RWST	dbl disc	low	PL
SI-MOV-888A & -888B: low head to high head recirc isolation	dbl disc	high	PL
SI-MOV-899A & -899B: RHR outlet HX isolation	flex wdg	low	PL & TB
SI-MOV-1835A & -1835B: Boron Injection Tank Outlet isolation	dbl disc	low	PL
SI-MOV-746 & -747: RHR outlet HX isolation	flex wdg	low	TB

(a) "PRA" refers to the relative risk significance category assigned to each valve based on probabalistic risk assessment techniques.

TABLE TWO
SUMMARY OF ANALYSIS RESULTS FOR MOVs SUSCEPTIBLE TO PRESSURE LOCKING

Valve Description	Bounding Pressure Locking (PL) Condition Description	Disposition
AC-MOV-730: RHR loop suction isolation	Hydraulically induced PL. Opening to enable RHR to acheive cold shutdown, non-LOCA conditions, App. R Cold Shutdown requirements.	Bonnet pressure decays to GL 89-10 analysis conditions.
AC-MOV-743: RHR Pump miniflow isolation	Thermally induced PL. Post LOCA and passive failure of RHR HX 32.	Margin of 38.4%
AC-MOV-744: RHR pump discharge isolation	Thermally induced PL. Post LOCA and passive failure of RHR HX 32.	Margin of 22%
RC-MOV-535 and 536: PORV Block Valves	Feed and Bleed Operation during rapid depressurization of RCS.	Margin of 44% and 29%, respectively
SI-MOV-850A and 850C: SI Pump 31 discharge isolation	Thermally induced PL. Post LOCA reopening to support hot-leg recirc.	Margin exceeds 100%
SI-MOV-851A and 851B: SI Pump 32 discharge isolation	Thermally induced PL. Post LOCA reopening to support hot-leg recirc.	Margin of 21% and 10%, respectively
SI-MOV-866A and 866B: Containment Spray Pump Discharge Isolation	GL 89-10 requirements bound the postulated bonnet pressurization.	PL not a concern based on GL 89-10 bounding analysis
SI-MOV-883: RHR Pump recirc valve to the RWST	Hydraulically induced PL. Opening to support alternate recirc path to high head safety injection in the event of a passive failure, post LOCA.	Margin of 65.4%
SI-MOV-888A and 888B: Low to High Head Recirc Stop Valves	Hydraulically induced PL. Valve opening to support high head RHR cooling.	Margin of 21% and 27%, respectively
SI-MOV-899A and 899B: RHR HX Outlet Isolation	No design basis function to open. Not susceptible, due to method of controlling valve closure (limit switch), and procedural cycling prior to reopening.	PL not a concern based on no safety function to open
SI-MOV-1835A and 1835B: Boron Injection Tank Header Isolation Valves	Hydraulically induced PL. Opening to support SI, at initiation of LOCA. (See Note A)	Margin of 21% and 15%, respectively

Note A: The Power Authority is evaluating a design documentation change to reflect these valves as 'normally open' instead of 'normally closed'

TABLE THREE
SUMMARY OF ANALYSIS RESULTS FOR MOVs SUSCEPTIBLE TO THERMAL BINDING

Valve Description	Bounding Thermal Binding (TB) Condition Description	Disposition
RC-MOV-535 and 536: PORV Block Valves	Closed at power to isolate leaking PORV, then opened to arm Overpressure Protection System during plant cooldown.	TB not a concern based on past valve performance and material properties of valve stem and wedge
SI-MOV-850A and 850C: SI Pump 31 discharge isolation	Closed post LOCA and post SI. Opened to provide hot leg recirculation	TB not a concern based on temperature differential less than 100 ^{0}F.
SI-MOV-899A , 899B, SI-MOV-746 and 747: RHR HX Outlet Isolation Valves	No design basis function to open. Not susceptible, due to method of controlling valve closure (limit switch), and procedural cycling prior to reopening.	TB not a concern based on no safety function to open

ATTACHMENT II TO IPN-96-011

LIST OF COMMITMENTS

Number	Commitment	Due
IPN-96-011-01	Evaluate implementation of a design change to reflect valves SI-MOV-1835 A and B as 'normally open' instead of 'normally closed.'	October 31, 1996